TP CENTRAL ODISHA DISTRIBUTION LIMITED
(A Tata Power & Odisha Govt. joint venture)
2nd Floor, IDCO Tower, Janpath Bhubaneshwar, Odisha 751022

NIT No.: TPCODL/P&S/1000000324/2022-23

Open Tender Notification

for

Design, Supply & Erection of 2No's of UR+6 (D type tower) Tower along with all fabrication & civil related work on both side of Daya river near Balakati Area

Tender Enquiry No.: TPCODL/P&S/1000000324/22-23, Due Date for Bid Submission: 05th January 2023 [18:00 Hrs.]

TP Central Odisha Distribution Limited
(A TATA Power and Odisha Government Joint Venture)
Procurement & Stores Department,
2nd Floor, IDCO Towers, Janpath, Bhubaneswar – 751022

TP CENTRAL ODISHA DISTRIBUTION LIMITED
(A Tata Power & Odisha Govt. joint venture)
2nd Floor, IDCO Tower, Janpath Bhubaneshwar, Odisha 751022

NIT No.: TPCODL/P&S/1000000324/2022-23

Tender Enquiry No - TPCODL/P&S/100000324/2022-23

Tender Enquiry No.	Work Description	EMD (Rs.) *	Tender Fee (Rs.) **	Last Date and Time for payment of Tender Fee
TPCODL/P&S/1000003 24/2022-23	Design, Supply & Erection of 2No's of UR+6 (D type tower) Tower along with all fabrication & civil related work on both side of Daya river near Balakati Area	1,00,000	5,000	23.12.22, 17:00Hrs

*** EMD is exempted for MSMEs registered in the State of Odisha.**
**** MSMEs registered in the State of Odisha shall pay tender fee of Rs. 1,000/- including GST. For details of MSME norms, pls refer "Annexure A" below.**

INFORMATION TO THE BIDDERS TO PARTICIPATE IN E-OPEN TENDER SYSTEM OF TPCODL

-: Steps for E-tender submission:-

Bids are to be submitted only through online e-procurement platform, ARIBA. Any other form of bid submission will not be accepted. Online Link for submission of bid through ARIBA will be sent only after confirmation of payment of tender fee from bidder.

Step 1: The bidder can get primary information about the tender from the Newspaper advertisement / TPCODL website <www.tpcentralodisha.com> and can download the tender document from the above website.

Step 2: Non-Refundable Tender Participation Fee, as indicated in tender document, to be submitted before last date of tender fee payment, in the form of direct deposit/NEFT/RTGS in the following bank account.

Account Name: TP Central Odisha Distribution Limited
Bank Name: State Bank of India,
IDCO Towers, Bhubaneswar
Bank Account No. : 10835304915
IFSC Code : SBIN0007891

Step 3: Eligible and Interested bidder to send an email to TPCODL attaching duly signed and stamped letter on Bidder's letterhead, with following details, expressing their intend to bid against above tender:

Sl No	Description	Bidder's Response
i)	Tender Enquiry No.	
ii)	Description of materials / Works Tendered	
iii)	Name and address of the bidding company	
iv)	Name of the authorized contact person	
v)	Contact No. authorized person	
vi)	E-mail Id of the where online ARIBA link to be	
vii)	Tender Fee details (Amount / NEFT-RTGS UTR No	
viii)	GST No.of bidder	
ix)	MSME Certificate, wherever applicable	
x)	Postal address of bidder for return of EMD BG	

E-mail has to be sent to <prashant.gupta@tpcentralodisha.com> with copy to <sudhakar.behera@tpcentralodisha.com> before "Last date and time for payment of Tender Participation Fee".

Step 4: On receipt of the document as mentioned in Step 3 above and after due verification of the same, ARIBA link for participation in the tender will be sent to bidder's mail address from ARIBA system.

Step 5: In this mail there will be an online link as **Click Here** to participate in the tender.

Step 6: Click **"Click Here"** to access this event.

Step 7: If bidder is bidding first time for TPCODL through ARIBA site then please "Sign UP" by creating User Name and password as mentioned in Sign Up page. Please follow the process, as mentioned in the Sign Up page, during creation of User Name and password. Also a simple one-page registration screen will open for first time user. All * mark mandatory field to be filled in.
Those who are already having User Name and password for accessing TPCODL events, they can LOGIN using same User Name and password.

If bidder has got User name and password for their other customer, same will not be applicable for TPCODL.

Step 8: You will be able to see the RFQ

Step 9: After review and downloading of all documents click on **"Review Pre-requisites"**

Step 10: Review and accept **"Bidder Agreement".**

Step 11: You can see attached pdf tender document against clause no 1.1.1 (Introduction).

Step 12: Vendor has to attach pdf version of technical bid in clause no. 2.1 and 2.2. In this field do not attach any price document.

Price schedule is attached in clause no.3.2. Same has to be downloaded and price and tax details to be filled in as per the format given, print to be taken in vendor's letter head and signature and seal to be made by authorised person. PDF version of this price bid to be attached in clause 3.2 For Price Bid put all the unit price and taxes and duties in provided field. Put "0" (ZERO) in not applicable field.

Step 13: After successfully putting Techno commercial offer and price part then click on **"Submit Entire Response"**

Note: Once user ID and password created, bidder can also login to ARIBA site through the following URL:

https://service.ariba.com/Sourcing.aw/124997008/aw?awh=r&awssk=oxt0s1BN&dard=1

Annexure-A

Preferential norms for procurement from MSMEs registered in the State of Odisha

1) Tender Fees

To participate in the tender, MSMEs registered in the State of Odisha shall pay Rs.1,000/- including GST towards cost of tender paper.

2) Earnest Money Deposit (EMD)

EMD shall be exempted for MSME registered in the State of Odisha. However, Bidder shall be barred to participate in the tendering process for a period of 2 years in case it backs out post award of the contract.

3) Qualification Requirement for Open Tenders

Qualification Requirement of Financial Turnover for MSME registered in the State of Odisha shall be reduced to 20% of the existing criteria.

For past experience, instead of relying on the volumes / value of earlier Supplies / Projects, assessment of the Bidder shall be done on the basis of feedback from Customers. Past performance experience at Tata Power and its Group Companies shall supersede feedback from other Customers.

4) Reservation for MSME

It shall be mandatory to procure at least 20% of the total volume of the procurement from MSME registered in the State of Odisha (however, it shall not apply where goods/services are not available with the MSME), subject to matching L1 discovered prices and meeting technical specifications including quality requirements.

5) Performance Bank Guarantees

Performance Bank Guarantee for MSME registered in the State of Odisha shall be 25% of the value normally prescribed.

CONTENTS OF THE ENQUIRY

1.0 Event Information

1.1. Scope of work

Bids are invited from interested Bidders to award Rate Contract for Supply of GI Pipe and Earthing Coil as mentioned below:

S. No.	Description	UOM	Quantity
1.	Design, Supply & Erection of 2No's of UR+6 (D type tower) Tower along with all fabrication & civil related work on both side of Daya river near Balakati Area	EA	1

1.2. Availability of Tender Documents

Please refer "Procedure to participate in the e-tender".

1.3. Calendar of Events

(a)	Date of availability of tender documents from TPCODL Website	15.12.2022
(b)	Last date and time of Payment of Tender Fee	23.12.2022, 17:00 Hours
(c)	Last Date of receipt of pre-bid queries, if any	26.12.2022, 17:00 Hours
(d)	Last Date of Posting Consolidated replies to all the pre-bid queries as received	29.12.2022, 17:00 Hours
(e)	Last date and time of receipt of Bids	05.01.2023, 18:00 Hours

Note: In the event of last date specified for submission of bids and date of opening of bids is declared as a closed holiday for TPCODL's office, the last date of submission of bids and date of opening of bids will be the day following working day at appointed times.

1.4 Mandatory documents required along with the Bid

1.4.1 EMD of requisite value and validity
1.4.2 Tender Fee.
1.4.3 Requisite Documents for compliance to Qualification Criteria mentioned in Clause 1.7.
1.4.4 Acceptance of Specification, drawing with filled in GTP as per Annexure II.
1.4.5 Duly signed and stamped 'Schedule of Deviations' as per Annexure III on bidder's letter head.
1.4.6 Duly signed and stamped 'Schedule of Commercial Specifications' as per Annexure IV on bidder's letter head.
1.4.7 Duly filled in Annexure V and VI.
1.4.8 Proper authorization letter/ Power of Attorney to sign the tender on the behalf of bidder.

1.4.9 Copy of PAN, GST registration (In case any of these documents is not available with the bidder, same to be explicitly mentioned in the 'Schedule of Deviations')

Please note that in absence of any of the above documents, the bid submitted by a bidder shall be liable for rejection.

1.5. Deviation from Tender

Normally, the deviations to tender terms are not admissible and the bids with deviation are liable for rejection. Hence, the bidders are advised to refrain from taking any deviations on this Tender. Still in case of any deviations, all such deviations shall be set out by the Bidders, clause by clause in the 'Annexure III - Schedule of Deviations' and same shall be submitted as a part of the Technical Bid.

1.6. Right of Acceptance/Rejection

Bids are liable for rejection in absence of following documents:

i. EMD of requisite value and validity.
ii. Tender fee of requisite value.
iii. Price Bid as per the Price Schedule mentioned in Annexure I (BOQ)
iv. Necessary documents against compliance to Qualification Requirements mentioned at Clause 1.7 of this Tender Document.
v. Filled in Schedule of Deviations as per Annexure III.
vi. Filled in Schedule of Commercial Specifications as per Annexure IV.
vii. Signed and filled in Specification and GTP as per Annexure II.
viii. Duly filled and signed Annexure V and VI.
ix. Receipt of Bid within the due date and time.

TPCODL reserves the right to accept/reject any or all the bids without assigning any reason thereof.

1.7 Qualification Criteria

a) The average annual turnover of the bidder shall be a minimum of Rs. 2.0 Crs for last three financial years. (FY 19-20, FY 20-21 & FY 21-22) Copy of audited Balance Sheet and P&L Account to be submitted in this regard.

b) Qualification Requirement of Financial Turnover for MSME registered in the State of Odisha shall be reduced to 20% of the existing criteria.

c) Bidder shall have successfully completed similar type of work within last 3 year.

d) Bidder should have at least the Purchase order single / Multiple & in similar type of work (in Govt. Org/Discoms/Utilities/Industries/PSU) with performance certificate.

The bidder must have all statutory compliance like valid PAN no, GSTN and valid Electrical License, etc. The bidder must submit the copy of all these registrations.

1.8. Marketing Integrity

We have a fair and competitive marketplace. The rules for bidders are outlined in the General Condition of Contracts. Bidders must agree to these rules prior to participating. In addition to other remedies available, TPCODL reserves the right to exclude a bidder from participating in future markets due to the bidder's violation of any of the rules or obligations contained in the General Condition of Contracts. A bidder who violates the market place rules or engages in behavior that disrupts the fair execution of the marketplace, may result in restriction of a bidder from further participation in the marketplace for a length of time, depending upon the seriousness of the violation. Examples of violations include, but are not limited to:

- Failure to honor prices submitted to the marketplace
- Breach of terms as published in TENDER/NIT

1.9. Supplier Confidentiality

All information contained in this tender is confidential and shall not be disclosed, published or advertised in any manner without written authorization from TPCODL. This includes all bidding information submitted to TPCODL. All tender documents remain the property of TPCODL and all suppliers are required to return these documents to TPCODL upon request. Suppliers who do not honor these confidentiality provisions will be excluded from participating in future bidding events.

2.0 Evaluation Criteria

- The bids will be evaluated technically and on qualifying criteria of tender terms and conditions.
- The bids will be evaluated commercially on individual item basis (all-inclusive lowest cost at item level) for the complete tender as calculated in Schedule of Items [Annexure I].
- Bidder has to mandatorily quote against each item of Schedule of Items *[Annexure I].* Failing to do so, TPCODL may reject the bids.

NOTE: *In case a new bidder is not registered with TPCODL, factory inspection and evaluation shall be carried out to ascertain bidder's manufacturing capability and quality procedures. However, TPCODL reserves the right to carry out factory inspection and evaluation for any bidder prior to technical qualification.*

In case a bidder is found as Disqualified in the factory evaluation, their bid shall not be evaluated any further and shall be summarily rejected. The decision of TPCODL shall be final and binding on the bidder in this regard.

2.1 Price Basis: Price will be fixed and firm during the contractual period.

3.0 Submission of Bid Documents

3.1 Bid Submission

Bidders are requested to submit their offer in line with this Tender document through e-tendering process.

Please note all future correspondence regarding the tender, bid submission, bid submission date extension, Pre-bid query etc. will happen only through TPCODL E-Tender system (Ariba).

No e-mail or verbal correspondence will be responded. All communication will be done strictly with the bidder who have done the above step to participate in the Tender.

Bids shall be submitted in 3(Three) parts:

FIRST PART: "EMD" as applicable shall be submitted. The EMD shall be valid for 210 days from the due date of bid submission in the form of Bank Guarantee / Bank Draft / Bankers Pay Order (issued from a Scheduled Bank) online NEFT/ RTGS transfer favoring 'TP Central Odisha Distribution Limited' payable at Bhubaneswar.

The EMD BG has to be strictly in the format as mentioned in General Condition of Contract, failing which it shall not be accepted by TPCODL and the bid as submitted shall be liable for rejection. A separate non-refundable tender fee of stipulated amount also needs to be transferred online through NEFT/ RTGS in case the tender document is downloaded from our website.

TPCODL Bank Details for transferring Tender Fee and EMD is as below:

Account Name: TP CENTRAL ODISHA DISTRIBUTION LIMITED
Bank Name: SBI, IDCO Towers, Bhubaneswar
Bank Account No.: 10835304915
IFSC Code: SBIN0007891

Note- EMD is preferred in form of Bank Guarantee and to be delivered at the following address. However, in view of present situation if Bidder is finding it difficult to make and submit BG for EMD amount, they can do online transfer of EMD amount in the above mentioned Account and submit proof of the same as part of Bid Submission.

Please note that in such case, Tender Fee and EMD should be strictly 2 separate transactions.

Please note as return of EMD from Bank Account is non-standard practice and the same may take more time than return of EMD BG.

EMD Original Hard Copy shall be delivered at the following address in Envelope clearly indicating Tender Reference/ Enquiry Number, Name of Tender and Bidder Name

Chief (Procurement & Stores)
TP Central Odisha Distribution Limited
2nd Floor, IDCO Towers, Janapath, Bhubaneswar- 751022

EMD shall be exempted for MSME registered in the State of Odisha. However, Bidder shall be barred to participate in the tendering process for a period of 2 years in case it backs out post award of the contract.

SECOND PART: "TECHNICAL BID" shall contain the following documents:

i) Requisite Documents for compliance to Qualification Criteria mentioned in Clause 1.7 and clause no. 1.4.
ii) Type Test Certificate of Lightning Arrester of same or higher rating.
iii) Acceptance of Specification as per Annexure II.
iv) Duly signed and stamped 'Schedule of Deviations' as per Annexure III on bidder's letter head.
iv) Duly signed and stamped 'Schedule of Commercial Specifications' as per Annexure IV on bidder's letter head.
v) Duly filled in Annexure V and VI.
vi) Proper authorization letter/ Power of Attorney to sign the tender on the behalf of bidder.
vii) Copy of PAN, GST registration (In case any of these documents is not available with the bidder, same to be explicitly mentioned in the 'Schedule of Deviations')

The technical bid shall be properly indexed and is to be submitted through TPCODL E-tender System (Ariba) only. Hard Copy of Technical Bids need not be submitted

THIRD PART: "PRICE BID" shall contain only the price details and strictly in format as mentioned in Annexure I along with explicit break up of basic prices and Taxes & duties etc. In case any discrepancy is observed between the item description stated in Schedule of Items mentioned in the tender and the price bid submitted

by the bidder, the item description as mentioned in the tender document (to the extent modified through Corrigendum issued if any) shall prevail.

Price Bid is to be submitted in soft copy through TPCODL E-Tendering system (Ariba) only. Hard copy of Price Bid not be submitted

The EMD in the form of Bank Draft / BG / Bankers Pay Order shall be submitted in original hard copy and then placed in sealed envelope which shall be clearly marked as below:

EMD

"Design, Supply & Erection of 2No's of UR+6 (D type tower) Tower along with all fabrication & civil related work on both side of Daya river near Balakati Area**"**

The Bid prepared by the Bidder, and all correspondence and documents relating to the Bid exchanged by the Bidder and the TPCODL, shall be written in the English Language. Any printed literature furnished by the Bidder may be written in another Language, provided that this literature is accompanied by an English translation, in which case, for purposes of interpretation of the Bid, the English translation shall govern.

SIGNING OF BID DOCUMENTS:

The bid must contain the name, residence and place of business of the person or persons making the bid and must be signed and sealed by the Bidder with his usual signature. The names of all persons signing should also be typed or printed below the signature.

The Bid being submitted must be signed by a person holding a Power of Attorney authorizing him to do so, certified copies of which shall be enclosed.

The Bid submitted on behalf of companies registered with the Indian Companies Act, for the time being in force, shall be signed by persons duly authorized to submit the Bid on behalf of the Company and shall be accompanied by certified true copies of the resolutions, extracts of Articles of Association, special or general Power of Attorney etc. to show clearly the title, authority and designation of persons signing the Bid on behalf of the Company. Satisfactory evidence of authority of the person signing on behalf of the Bidder shall be furnished with bid.

A bid by a person who affixes to his signature the word 'President', 'Managing Director', 'Secretary', 'Agent' or other designation without disclosing his principal will be rejected.

The Bidder's name stated on the Proposal shall be the exact legal name of the firm.

3.2 Contact Information

All the bidders are requested to send their pre-bid queries (if any) against this tender through e-mail within the stipulated timelines. The consolidated reply to all the queries received shall be posted on TPCODL website by the stipulated timelines as detailed in calendar of events.

Communication Details:

Handling Executive for this Tender:

Name: Prashant Gupta
Contact No.: 9634077589
E-Mail ID: prashant.gupta@tpcentralodisha.com

Escalation:General Manager (Material Procurement):

Name: Mr. Sudhakar Behera,
Contact No.: 9437282663

3.3 Bid Prices

Bidders need to quote for all items as per the Price schedule attached in Annexure I. The bidder shall complete the appropriate Price Schedules included herein, stating the Unit Price for each item & total price with taxes, duties & freight up to destination at various sites of TPCODL. The all-inclusive prices offered shall be inclusive of all costs as well as Duties, Taxes and Levies paid or payable during the execution of the supply work, breakup of price constituents.

Applicable GST to be specified clearly.

The quantity break up shown else-where other than Price Schedule is tentative. The bidder shall ascertain himself regarding material required for completeness of the entire work. Any items not indicated in the price schedule but which are required to complete the job as per the Technical Specifications/ Scope of Work/ SLA mentioned in the tender, shall be deemed to be included in prices quoted.

3.4 Bid Currencies

Prices shall be quoted in Indian Rupees Only.

3.5 Period of Validity of Bids

Bids shall remain valid for 180 days from the due date of submission of the bid.

Notwithstanding clause above, the TPCODL may solicit the Bidder's consent to an extension of the Period of Bid Validity. The request and responses thereto shall be made in writing.

3.6 Alternative Bids

Bidders shall submit Bids, which comply with the Bidding documents. Alternative bids will not be considered. The attention of Bidders is drawn to the provisions regarding the rejection of Bids in the terms and conditions, which are not substantially responsive to the requirements of the bidding documents.

3.7 Modifications and Withdrawal of Bids

The bidder is not allowed to modify or withdraw its bid after the Bid's submission. The EMD as submitted along with the bid shall be liable for forfeiture in such event.

3.8 Earnest Money Deposit (EMD)

The bidder shall furnish, as part of its bid, an EMD amounting as specified in the tender. The EMD is required to protect TPCODL against the risk of bidder's conduct which would warrant forfeiture.

The EMD shall be denominated in any of the following form:

- Banker's Cheque/ Demand Draft/ Pay order drawn in favor of TP Central Odisha Distribution Limited payable at Bhubaneswar.
- Online transfer of requisite amount through NEFT/ RTGS.
- Bank Guarantee valid for 210 days after due date of submission.

The EMD shall be forfeited in case:

a) The bidder withdraws its bid during the period of specified bid validity.

Or

b) The successful Bidder does not

a) accept the Purchase Order, or
b) furnish the required Performance Security Bank Guarantee

3.9 Type Tests (if applicable)

The type tests specified in TPCODL specifications should have been carried out within five years prior to the date of opening of technical bids and test reports are to be submitted along with the bids. If type tests carried out are not within the five years prior to the date of bidding, the bidder will arrange to carry out type tests specified, at his cost. The decision to accept/ reject such bids rests with TPCODL

4 Bid Opening & Evaluation process

4.1. Process to be confidential

Information relating to the examination, clarification, evaluation and comparison of Bids and recommendations for the award of a contract shall not be disclosed to Bidders or any other persons not officially concerned with such process. Any effort by a Bidder to influence the TPCODL's processing of Bids or award decisions may result in rejection of the Bidder's Bid.

4.2. Technical Bid Opening

Bids will be opened at TPCODL Office, Bhubaneswar. All tender bids shall be opened internally by TPCODL. Presence of any bidder will not be allowed during bid opening process. Technical bid must not contain any cost information whatsoever.

First the envelope marked “EMD” will be opened. Bids without EMD/cost of tender (if applicable) of required amount/ validity in prescribed format, shall be rejected.

Next, the technical bid of the bidders who have furnished the requisite EMD will be opened, one by one.

4.3. Preliminary Examination of Bids/Responsiveness

TPCODL will examine the Bids to determine whether they are complete, whether any computational errors have been made, whether required sureties have been furnished, whether the documents have been properly signed, and whether the Bids are generally in order. TPCODL may ask for submission of original documents in order to verify the documents submitted in support of qualification criteria.

Arithmetical errors will be rectified on the following basis: If there is a discrepancy between the unit price and the total price per item that is obtained by multiplying the unit price and quantity, the unit price shall prevail and the total price per item will be corrected. If there is a discrepancy between the Total Amount and the sum of the total price per item, the sum of the total price per item shall prevail and the Total Amount will be corrected.

Prior to the detailed evaluation, TPCODL will determine the substantial responsiveness of each Bid to the Bidding Documents including production capability and acceptable quality of the Goods offered. A substantially responsive Bid is one, which conforms to all the terms and conditions of the Bidding Documents without material deviation.

Bid determined as not substantially responsive will be rejected by the TPCODL and may not subsequently be made responsive by the Bidder by correction of the non-conformity.

4.4. Techno Commercial Clarifications

Bidders need to ensure that the bids submitted by them are complete in all respects. To assist in the examination, evaluation and comparison of Bids, TPCODL may, at its discretion, ask the Bidder for a clarification on its Bid for any deviations with respect to the TPCODL specifications and attempt will be made to bring all

bids on a common footing. All responses to requests for clarification shall be in writing and no change in the price or substance of the Bid shall be sought, offered or permitted owing to any clarifications sought by TPCODL.

4.5. Price Bid Opening

Price bids will be opened internally without the presence of any bidder representative. The EMD of the bidder withdrawing or substantially altering his offer at any stage after the technical bid opening will be forfeited at the sole discretion of TPCODL without any further correspondence in this regard.

4.6. Reverse Auctions

TPCODL reserves the right to conduct the reverse auction (instead of public opening of price bids) for the products/ services being asked for in the tender. The terms and conditions for such reverse auction events shall be as per the Acceptance Form attached as Annexure VI of this document. The bidders along with the tender document shall mandatorily submit a duly signed copy of the Acceptance Form attached as Annexure VI as a token of acceptance for the same.

5 Award Decision

TPCODL will award the contract to the successful bidder whose bid has been determined to be the lowest-evaluated responsive bid as per the Evaluation Criterion mentioned at Clause 2.0. The Cost for the said calculation shall be taken as the all-inclusive cost quoted by bidder in Annexure I (Schedule of Items) subject to any corrections required in line with Clause 3.1 above. The decision to place purchase order/LOI solely depends on TPCODL on the cost competitiveness across multiple lots, quality, delivery and bidder's capacity, in addition to other factors that TPCODL may deem relevant.

TPCODL reserves the rights to award contract to one or more bidders so as to meet the delivery requirement or nullify award decision without assigning any reason thereof.

In case any supplier is found unsatisfactory during delivery process, the award will be cancelled and TPCODL reserves right to award contract to other suppliers who are found fit.

6 Order of Preference/Contradiction

In case of contradiction in any part of various documents in tender, following shall prevail in order of preference:

1. Schedule of Items (Annexure I)
2. Technical Specifications (Annexure II)
3. Special Conditions of Contract (Clause 7.0)
4. Submission of Bid Documents (Clause 3.0)
5. Acceptance Form for Participation in Reverse Auction (Annexure VI)
6. General Conditions of Contract (Annexure VIII)

7 Post Award Contract Administration

7.1. Special Conditions of Contract

- PO shall be valid for a period of 1 year from the placement of Contract. PO shall be placed as per the requirement of TPCODL. Rate shall be firm and fixed during the validity of the contract.

- Business Associate (BA) shall submit applicable Performance Bank Guarantee as per GCC within 30 days of issuance of purchase order. PBG applicable shall be @ 5% of Rate Contract Value or 10% of PO Value. Validity of BG shall be till expiry date of PO plus delivery period plus warranty period in case of 5% value BG. Validity will be till delivery period plus warranty period for 10% value BG. Claim period will be additional one month for both cases.

Performance Bank Guarantee for MSME registered in the State of Odisha shall be 25% of the value normally prescribed

- Any change in statutory taxes, duties and levies during the contract period shall be borne by TPCODL. However, in case of delay in work execution owing to reasons not attributable to TPCODL, any increase in total liability shall be passed on the Bidder, whereas any benefits arising owing to such statutory variation in taxes and duties shall be passed on TPCODL.
- Statutory Variations: Any changes in existing taxes/ Duties and levies, Introduction of new taxes and duties etc. during the period of the contract shall be paid at actuals to BA subject to BA shall submit the tax break up in details, however, where BA has quoted the all-inclusive prices and not shown the tax break-up, this clause will not be applicable. The date of issue of MDCC shall be used for this purpose.
- Quotation in all BOQ items is mandatory, and bid shall be rejected if any line of found blank in price bid.
- Delivery period shall be 30 days from date of receipt of release order / CAT-A issuance, whichever is later
- Warranty period: As mentioned in technical specification, Annexure-II enclosed.
- Delivery location: TPCODL Store at Cuttack or at Bhubaneswar, Odisha.
- Late delivery(LD) clause will be applicable as per GCC.
- All other terms and conditions of TPCODL General Conditions of Contract shall be applicable.
- TPCODL shall short close the issued Purchase Order/ Release Order / Rate contract, in case of any quality issues
- Terms of Payment:

  On delivery of the materials in good condition and certification of acceptance by certified official, Associate shall submit the Bills/ Invoices in original in the name of TP Central Odisha Distribution Limited to Invoice Desk. The payment shall be released within 45 days from the date of submission of certified bills/ invoices.

7.2 Drawing Submission and Approval

The relevant drawings need to be submitted within two weeks of receipt of firm purchase order by the successful bidder to TPCODL for approval. In case, re-submission of drawings is required on request of TPCODL, same needs to be submitted back to TPCODL within 5 days of such request.

7.3 Payment Terms

As per SCC, Clause number 7.1.

7.4 Climate Change

Significant quantities of waste are generated during the execution of project and an integrated approach for effective handling, storage, transportation and disposal of the same shall be adopted. This would ensure the minimization of environmental and social impact in order to combat the climate change. Please refer attached Environment Policy and Sustainability Policy, enclosed for more details.

7.5 Ethics

TPCODL is an ethical organization and as a policy TPCODL lays emphasis on ethical practices across its entire domain. Bidder should ensure that they should abide by all the ethical norms and in no form either directly or indirectly be involved in unethical practice.

TPCODL work practices are governed by the Tata Code of Conduct which emphasizes on the following:

- We shall select our suppliers and service providers fairly and transparently.
- We seek to work with suppliers and service providers who can demonstrate that they share similar values. We expect them to adopt ethical standards comparable to our own.
- Our suppliers and service providers shall represent our company only with duly authorized written permission from our company. They are expected to abide by the Code in their interactions with, and on behalf of us, including respecting the confidentiality of information shared with them.
- We shall ensure that any gifts or hospitality received from, or given to, our suppliers or service providers comply with our company's gifts and hospitality policy.
- We respect our obligations on the use of third party intellectual property and data.

Bidder is advised to refer Tata Code of Conduct (TCOC) attached for more information.

Any ethical concerns with respect to this tender can be reported to the following e-mail ID:

pravin.jain@tpcentralodisha.com

8 Specification and standards

As per Annexure II

9 General Condition of Contract

Any condition not mentioned above shall be applicable as per GCC attached along with this tender.

Annexure-I, Price Schedule

Sl No	Item Description	UOM	Qty	Rate (Rs)	Amount (Rs)	GST Amount(Rs)	Total with GST (Rs)
1.	Design, Supply & Erection of 2No's of UR+6 (D type tower) Tower along with all fabrication & civil related work on both side of Daya river near Balakati Area	EA	1				

NOTE:

ii) All rates are to be quoted on delivered basis at TPCODL Store -Cuttack or Bhubaneswar, Odisha, and should be inclusive of freight, insurance, loading & unloading, handling charges and any other charges which may be applicable.

iii) The overall period of the rate contract/PO shall be for a period of 1 year. PO/ Release order shall be issued as
per requirement of TPCODL. Rates will remain firm and fixed during the rate contract/PO validity of 1 year.

iv)The bids will be evaluated commercially on itemwise lowest cost.

v) The bidders are advised to quote prices strictly in the above format. Failing to do so, bids are liable for rejection.

vi) The bidder must fill each and every column of the above format. Mentioning "extra/inclusive" in any of the column may lead for rejection of the price bid.

vii) No cutting/ overwriting in the prices is permissible.

viii) Quantities mentioned above is for evaluation purpose only and not guaranteed. Quantities may change as per actual requirements.

ANNEXURE III

Schedule of Deviations

Bidders are advised to refrain from taking any deviations on this TENDER. Still in case of any deviations, all such deviations from this tender document shall be set out by the Bidders, Clause by Clause in this schedule and submit the same as a part of the ***Technical Bid.***

Unless specifically mentioned in this schedule, the tender shall be deemed to confirm the* TPCODL*'s specifications:

S. No.	Clause No.	Tender Clause Details	Details of deviation with justifications

By signing this document we hereby withdraw all the deviations whatsoever taken anywhere in this bid document and comply to all the terms and conditions, technical specifications, scope of work etc. as mentioned in the standard document except those as mentioned above.

Seal of the Bidder:

Signature:

Name:

TP CENTRAL ODISHA DISTRIBUTION LIMITED
(A Tata Power & Odisha Govt. joint venture)
2nd Floor, IDCO Tower, Janpath Bhubaneshwar, Odisha 751022

NIT No.: TPCODL/P&S/1000000324/2022-23

ANNEXURE IV

Schedule of Commercial Specifications

(The bidders shall mandatorily fill in this schedule and enclose it with the offer Part I: Technical Bid. In the absence of all these details, the offer may not be acceptable.)

S. No.	Particulars	Remarks
1.	Prices firm or subject to variation (If variable indicate the price variation clause with the ceiling if applicable)	Firm / Variable
1a.	If variable price variation on clause given	Yes / No
1b.	Ceiling	--------- %
1c.	Inclusive of GST	Yes / No (If Yes, indicate % rate)
1d.	Inclusive of transit insurance	Yes / No
2.	Delivery	Weeks / months
3.	Guarantee clause acceptable	Yes / No
4.	Terms of payment acceptable	Yes / No
5.	Performance Bank Guarantee acceptable	Yes / No
6.	Liquidated damages clause acceptable	Yes / No
7.	Validity (180 days) (From the date of opening of bid)	Yes / No
8.	Inspection during stage of manufacture	Yes / No
9.	Rebate for increased quantity	Yes / No (If Yes, indicate value)
10.	Change in price for reduced quantity	Yes / No (If Yes, indicate value)
11.	Covered under Small Scale and Ancillary Industrial Undertaking Act 1992	Yes / No (If Yes, indicate, SSI Reg'n No.)

Seal of the Bidder:

Signature:

Name:

TPCODL

TP CENTRAL ODISHA DISTRIBUTION LIMITED
(A Tata Power & Odisha Govt. joint venture)
2nd Floor, IDCO Tower, Janpath Bhubaneshwar, Odisha 751022

NIT No.: TPCODL/P&S/1000000324/2022-23

ANNEXURE V

Checklist of all the documents to be submitted with the Bid

Bidder has to mandatorily fill in the checklist mentioned below:

S. No.	Documents attached	Yes / No / Not Applicable
1	EMD of required value	
2	Tender Fee as mentioned in this tender	
3	Signed copy of this tender as an unconditional acceptance	
5	Duly filled schedule of commercial specifications (Annexure IV)	
6	Sheet of commercial/technical deviation if any (Annexure III)	
7	Balance sheet for the last completed three financial years; mandatorily enclosing Profit & loss account statement	
8	Acknowledgement for Testing facilities if available (duly mentioned on bidder letter head)	
9	List of Machine/tools with updated calibration certificates if applicable	
10	Details of order copy (duly mentioned on bidder letter head)	
11	Order copies as a proof of quantity executed	
12	Details of Type Tests if applicable (duly mentioned on bidder letter head)	
13	All the relevant Type test certificates as per relevant IS/IEC (CPRI/ERDA/other certified agency) if applicable	
14	Project/supply Completion certificates	
15	Performance certificates	
16	Client Testimonial/Performance Certificates	
17	Credit rating/solvency certificate	
18	Undertaking regarding non blacklisting (On company letter head)	
19	List of trained/untrained Manpower	

Seal of the Bidder:

Signature:

Name

TP CENTRAL ODISHA DISTRIBUTION LIMITED
(A Tata Power & Odisha Govt. joint venture)
2nd Floor, IDCO Tower, Janpath Bhubaneshwar, Odisha 751022

NIT No.: TPCODL/P&S/1000000324/2022-23

ANNEXURE VI

ACCEPTANCE FORM FOR PARTICIPATION IN REVERSE AUCTION EVENT

(To be signed and stamped by the bidder)

In a bid to make our entire procurement process more fair and transparent, TPCODL intends to use the reverse auctions as an integral part of the entire tendering process. All the bidders who are found as technically qualified based on the tender requirements shall be eligible to participate in the reverse auction event.

The following terms and conditions are deemed as accepted by the bidder on participation in the bid event:

1. TPCODL shall provide the user id and password to the authorized representative of the bidder. *(Authorization Letter in lieu of the same shall be submitted along with the signed and stamped Acceptance Form)*.
2. TPCODL will make every effort to make the bid process transparent. However, the award decision by TPCODL would be final and binding on the supplier.
3. The bidder agrees to non-disclosure of trade information regarding the purchase, identity of TPCODL, bid process, bid technology, bid documentation and bid details.
4. The bidder is advised to understand the auto bid process to safeguard themselves against any possibility of non-participation in the auction event.
5. In case of bidding through Internet medium, bidders are further advised to ensure availability of the entire infrastructure as required at their end to participate in the auction event. Inability to bid due to telephone line glitch, internet response issues, software or hardware hangs, power failure or any other reason shall not be the responsibility of TPCODL.
6. In case of intranet medium, TPCODL shall provide the infrastructure to bidders. Further, TPCODL has sole discretion to extend or restart the auction event in case of any glitches in infrastructure observed which has restricted the bidders to submit the bids to ensure fair & transparent competitive bidding. In case of an auction event is restarted, the best bid as already available in the system shall become the start price for the new auction.
7. In case the bidder fails to participate in the auction event due any reason whatsoever, it shall be presumed that the bidder has no further discounts to offer and the initial bid as submitted by the bidder as a part of the tender shall be considered as the bidder's final no regret offer. Any offline price bids received from a bidder in lieu of non-participation in the auction event shall be out-rightly rejected by TPCODL.
8. The bidder shall be prepared with competitive price quotes on the day of the bidding event.
9. The prices as quoted by the bidder during the auction event shall be inclusive of all the applicable taxes, duties and levies and shall be FOR at TPCODL site.
10. The prices submitted by a bidder during the auction event shall be binding on the bidder.
11. No requests for time extension of auction event shall be considered by TPCODL.
12. The original price bids of the bidders shall be reduced on pro-rata basis against each line item based on the final all-inclusive prices offered during conclusion of the auction event for arriving at Contract amount.

TECHNICAL SPECIFICATION

Designing, Supply & Installation of Transmission Line Towers (UR+6) For Riverbed Span of 550mtr.

Design, Supply & Erection of 2No's of UR+6 Tower along with all fabrication & civil related work

1.0 SCOPE

The Bidder has to design, supply & erect the tower as per wind zone –V with sustaining wind speed up to 300Kmph .The Bidder will carry out the necessary site visit & will assess the span length, soil investigation, Tower position afterward will submit the necessary engineering calculation for selection of suitable Tower type & civil foundation design to TPCDOL team for approval before installation. It has been proposed bidder shall supply 2No's UR +6 (D type tower) for 33KV line span length -550Mtr. Both the towers will be designed to carry double circuit line with conductor size 232sqmm. Both the towers are proposed to be installed on both side of Daya river near Balakati Area. Bidder will do the necessary arrangement for transporting of these tower from factory to site, will carry out the necessary civil work for installation of Tower. Bidder will also arrange necessary ROW permission at his own Cost.

Firms shall quote their rates for their own design of towers as well as the TPCODL design towers as per the enclosed schedule. The tower design shall be for Multi circuit tower with Special type Towers of UR and its extensions, for which TPCODL shall provide bill of materials and out line drawings.

This specification also provides relevant data for design, proto fabrication, galvanizing and delivery FOR (destination) of transmission line towers including super-structure stubs, tower extensions, stub-templates, tower accessories (Hangers, U-bolts, bird guards, anti-climbing devices), bolts and nuts, step bolts, flat and spring washers etc. for utilization in TPCODL's transmission network. General: Preliminary route alignment in respect of the proposed transmission lines has been fixed by the employer (TPCODL) subject to alteration of places due to way leave or other unavoidable constraints. The Right of way shall be solved by the contractor and all expenses there of shall be borne by him. However, TPCODL shall render all helps in co- ordination with law and order department for solving the same. Vendor shall arrange statutory clearance if any.

Provisional quantities/numbers of different types of towers have been estimated and indicated in the BOQ Schedule given. However final quantities for work shall be as determined by the contractor, on completion of the detail survey, preparation of route profile drawing and designing of the appropriate types of towers as elaborated sin the specification and scope of work.

The contractor shall undertake detailed survey on the basis of the tentative alignment fixed by the employer. The said preliminary alignment may, however, change in the interest of economy to avoid forest and hazards in work. While surveying the alternative route the following points shall be taken care by the contractor.

(a) The line is as near as possible to the available roads in the area.

(b) The route is straight and short as far as possible.

(c) Good farming areas, religious places, forest, civil and defence installations, aerodromes, public and private premises, ponds, tanks,

lakes, gardens, and plantations are avoided as far as practicable.

(d) The line is far away from telecommunication lines as reasonably possible. Parallelism with these lines shall be avoided as far as practicable.

(e) Crossing with permanent objects are minimum but where unavoidable preferably at right angles.

(f) Difficult and unsafe approaches are avoided.

(g) The survey shall be conducted along the approved alignment only in accordance with IS: 5613 (Part-II/Section-2), 1985.

(h) For river crossing/ Crossing of Nallas: Taking levels at 20 metre interval on bank of river and at 40 metre interval at bed of river so far as to show the true profile of the ground and river bed. The levels may be taken with respect to the nearest existing towers, pile foundation of towers, base or railway/road bridge, road culvert etc. The levels shall be taken at least 100 m. on either side of the crossing alignment. Both longitudinal and cross sectional shall be drawn preferably to a scale of 1:2000 at horizontal and 1:200 vertical.

After completing the detailed survey, the contractor shall submit the final profile and tower schedule for final approval of the employer. The final profile and tower schedule shall incorporate position of appropriate type of towers. To facilitate checking of the alignment, suitable reference marks shall be provided. For this purpose, concrete pillars of suitable sizes shall be planted at all angle locations and suitable wooden/iron pegs shall be driven firmly at the intermediate points. The contractor shall quote the rate covering all the scope including supply of material, Survey, Soil profiling, Installation & testing required for the project.

Only approved sag template shall be used for tower spotting and the final profiles by the contractor.

PROFILE PLOTTING AND TOWER SPOTTING

The profile shall be plotted and prepared to the scale 1 in 2,000 for horizontal and 1 in 200 for vertical on squared (mm) paper. If somewhere the difference in levels be too high, the chart may be broken up according to the requirements. A 10 mm overlap shall be shown on each following sheet. The chart shall progress from left to right for convenience in handling. The sheet size may be conveniently chosen.

With the help of sag template, final tower location shall be marked on the profiles and while locating the tower on survey chart, the following shall be kept in mind:

[The contractor shall also submit the land schedule on revenue (if required) maps indicating alignment therein duly authenticated by Revenue Inspector & Tahasildar,

enumeration of trees with the help of Forest officer and other prominent features required for alignment of the proposed line. Final route to be plotted on 1:50000 topo sheet for approval. Detail GIS (Geographical Information System) of towers to be included.]

(a) The number of consecutive span between the section points shall not exceed 10 in case of straight run on a more or less plain stretch.

(b) Individual span shall be as near as to the normal design ruling span.

In different crossing the contractor shall take into consideration the prevailing regulations of the respective authorities before finalizing type and location of the towers. While carrying out survey work, the contractor has to collect all relevant data, prepare and submit drawings in requisite number for obtaining clearance from the PTCC, road, aviation, railways, river and forest authorities.

The contractor shall remain fully responsible for the exact alignment of the line. If after erection, any tower is found to be out of alignment, the same shall have to be dismantled and re- erected after correction by the contractor at his own cost, risk and responsibility, including installation of fresh foundation, if belt necessary by the employer.

After peg marking of the angle tower or tension towers, the contractor shall obtain approval from the employer and thereafter pegging of suspension type tower shall be done by the contractor and pegging of all the four legs of each type of towers at all the locations shall be done.

a) Wind effects:

Tower shall be designed for reliability Level-I, Terrain category-I & Wind Zone-V Design wind pressure on towers, conductors, earth wire and insulator string in the range of 30.45 mt. In addition, above 45 mt. Height shall be computed as per IS-802(Part/Sec-I) 1995 Bidder shall furnish the maximum wind pressure adopted in their design against each component mentioned above.

b) Design Temperatures:

The following temperature range for the power conductor and ground wires shall be adopted for the line design:

(i)	Minimum temperature:	5 deg. C
(ii)	Everyday temperature of conductor	32 deg. C
(iii)	Maximum temperature of Conductor	
1.	75 deg. C for ACSR/Zebra/Panther	90 deg. C for AAAC Moose.
2.	Ground wire exposed to sun	53 deg. C

The above values are subject to latest revision if any made in IS-802 (part-I/Sec-I) 1995

c) Maximum Tension:

Maximum tension shall be based on either:

i)	at 5 deg. C with 2/3rd. full wind pressure	or Conform to IS 802-1995
ii)	At 32 deg. C with full wind pressure whichever is more stringent.	Part-I/Sec-I-Clause No.10.3

d) Factors of Safety & Span details:

i)	Factor of Safety	Should conform to IS-802 Part-I-1995
ii)	Normal span:	The normal span of the line shall be 350 meters of220KV and 320 meters for 132 KV.
iii)	Wind & Weight Span	The wind and weight span to be adopted in the designof the structures shall be as follows
iv)	Wind span:	The wind span is the sum of the two half spans adjacent to the support under consideration. In case of towers located on a perfectly horizontal terrain, this shall be the normal span. For design purpose the wind on conductor shall be calculated on a wind span of at least 1.1 times the normal span
v)	Weight Span	The weight span is the horizontal distance between the lowest point of the conductors on the two spans adjacent to the tower. All C and D type towers shallbe designed for uplift spans (minimum weight spans in the following table) also. These are applicable both for pointed and square cross arms.

1.10 For details of cross arms and towers, the span limits given below shall prevail.

Tower type.	220 KV				132 KV			
	Normal condition.		Broken wire condition.		Normal condition.		Broken wire condition.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
A/DA & B/DB	525	100	315	100	500	100	300	100
C/DC & D/DD	600	100	360	100	500	100	300	100

1.11 The design of towers and their extensions shall be done conforming to the design parameters specified herein, the scope of design also includes supply of design calculation for towers and extensions including detailed structural/shop drawings of towers extensions and stub setting templates. The bidder, who has already type tested the various tower viz: 0-2˚, +3, +6; 0-15˚, +3, +6; 0-30˚, +3, +6; 0-60˚, +3, +6 (220 KV) in any nationally or internationally recognized laboratories, and conforming to our specification,may also offer the same.

1.12 Standards:

Except as modified in this specification, the material and work covered under this specification shall conform to the latest revision with amendments thereof of the following of Indian Standards and equivalent International Standards whenever indicated below.

Sl No	Bureau of Indian standards (BIS)	Title	International & Internationally recognized standard
1	IS:209	Specification for Zinc	ISO/R/752
2	IS: 2062	Structural steel (Standard quality)	ISO/R/660
3	IS: 432	Mild steel and medium tensile bars and for concrete reinforcement	BS-785CSA-G-30

4	IS: 802	Code of practice for use of structural steel in overhead transmission line Part-I/Section-I & Section2: Load and permissible stresses Part-II: Fabrication Galvanizing Inspection and Packing	
		PART-III: TESTING	
5	IS: 136	Technical supply conditions for threaded fasteners	
6	IS: 1893	Criteria of Earthquake resistant design structures	
7	IS: 2016	Plain washers	ISO/R/987
8	IS: 2551	Danger Notice Plates	
9	IS: 2629	Recommended practice for hot dip galvanizing of iron and steel	
10	IS: 2633	Method of testing uniformity of casting of zinc coated articles	
11	IS: 3063	Single coil rectangular section spring washers for bolts, bolts, screws	DIN-127
12	IS: 5358	Hot dip galvanized coatings on Fasteners	
13	IS:5613 Part-1 & 2 Of Section-I	Code of Practices for design installation & maintenance of, overhead power line	
14	IS: 6610	Specification for heavy washers for steel structures	
15	IS: 6745	Methods of determination of weight of zinc coating of zinc coated iron and steel articles	

1.13 The standards mentioned above are available from

Reference/ Abbreviation	Name and Address from which the Standards are available
IS	BUREAU OF INDIAN STANDARDS Manak Bhavan, 9, Bahadur Shah Zafar Marg, NEW DELHI(India)
ISO	INTERNATIONAL ORGANISATION FOR STANDARDISATION, Danish Board Standardisation, Danish Standardisening Street, Aurehoegbvej-12, DK-2900, Helleprup, DENMARK
CSA	CANADIAN STANDARD ASSOCIATION 178, Rexdale Boulevard, Rexdale, Ontario, CANADAM9W IR
BS	BRITISH STANDARDS British Standard Institution, 101, Pentonvile Road,N-19-ND-UK
DIN	DEUTSCHES INSTITUTE FIIR NOR Gurggrafenstrasse 5-10, Post Fach 1107D-1000, Berlin – 30

Indian Electricity Rules 1956, Regulation for Electrical crossing of Railway tracks.	KITAB MAHAL , Baba Kharak Singh Marg, NEW DELHI –110 001(INDIA)

2.0 PRINCIPAL PARAMETERS

2.1 Electrical System Data:

a)	System voltage (kV rms)	220	132
b)	Max. voltage (kV rms)	245	145
c)	Lightning impulse withstand voltage (dry &wet) (kVp)	1050 to 1250	650 to 750
d)	One min. Power frequency withstand voltage(wet) (KV rms)	460	275
e)	Short circuit level (KA for 1 sec.)	40	31.5

2.2 Line data

2.2.1 Conductor

a)	Name	ACSR Zebra	AAAC Moose
b)	Strength & wire dia		
i)	Aluminium	54/3.18	61/3.55
ii)	Steel	7/3.18	---
c)	Conductors per	Single	Single
d)	Spacing between the conductors of same phase (sub-conductor spacing) (mm)	----	-----
e)	Inter-phase spacing (mm)	8,400	8,400
f)	Configuration		
i)	Single circuit	Delta	Delta
ii)	Double circuit	Vertical	Vertical
g)	Nominal Aluminium area (mm^2)	420	520(Alu. Alloy)
h)	Section area of Aluminium (mm^2)	428.90	603.7 (Alu. Alloy)
i)	Total sectional area (mm^2)	484.50	603.7
j)	Calculated resistance at 200 c (Max.) ohm/km per conductor	0.06915	0.05502
k)	Approx. calculated breaking load (KN)	130.32	159.8
l)	Modulus of elasticity (GN/M^2)	69	54
m)	Co-efficient of linear exp. Per degree cent.	19.3X10	23X10
n)	Mass of zinc in gms/sqm		
o)	Overall diameter (mm)	28.62	31.95
p)	Weight (kg/km)	1621	1666
q)	Minimum ultimate tensile strength (KN)	130.32	159.8
r)	Conductor tension at 32˚ C without external load		
i)	Initial unloaded tension		
ii)	Final unloaded tension		

2.2.2 Galvanized Steel Ground Wire

a)	Size (no. of strands/strand dia)	.....7/3.15.....
b)	Overall diameter (mm)	.....9.45.....
c)	Standard weight (Kg/km)	.....432.....
d)	Location of ground wire	One continuous ground wire to run horizontally on the top of the towers.
e)	Tensile load in each ground wire	
i)	At min. temp. of 5˚ C and in still air (kgs)	
ii)	At every day temp. of 32˚ C and still air (kgs)	
iii)	At 5˚ C and 2/3rd of full wind (kgs)	

2.2.2.1 Towers

a)	Span lengths in meters	220 KV ACSR Zebra/Moose	220 KV AAAC Zebra	132 KV ACSR Panthor	132 KV AAAC panthor
i)	Ruling design span	300,335,350,375	300,335,350	300,315,325, 335	300,315,325
b)	Wind load (kg/sqm) on conductor	52	52	52	52
c)	Shielding angle with vertical	20˚	20˚	20˚	20˚
d)	Towers to be designed for heavy wind zone				

2.2.2.2 Insulator Strings

Sl. No.	Particulars	Single Suspension string/ Single Tension string/	Double suspension string/ Double Tension string	Single Suspension string/ Single Tension string	Double suspension string/ Double Tension string
1.	No. of standard Discs (Nos) (220kV)	1X14/1X15	2X14/2X15	1X10/1X11	2X10/2X11
2.	Size of Disc	280	280	305	305
3.	Electromechanical strength (kg)	90/120 KN	90/120 KN	90/160 KN	90/160 KN

The towers should be also designed for Double circuit both for ACSR and AAAC Zebra for 220 KV and Double circuit ACSR and AAAC Panther for 132KV System of TPCODL. All thetowers should be suitable for Double circuit. However, the tower should be designed in such a way that in case of single Circuit stringing, there should not be any unbalance. The towers should also be designed taking into consideration of other type of earth wires, insulators of highest tensile strength.

2.3 GENERAL TECHNICAL REQUIREMENTS

2.3.1 Tower Design – General

The employer is looking for a structurally safe design of transmission line towers to be installed on EHV lines keeping the loadings and line parameters detailed in this specification and in compliance with IS: 802 (Part-1/Sec-1)-1995, IS: 802(Part-1/Sec-2)-1992.

The Bidder may offer economical designs with rational sections or offer towers of recent design, proven in service and accepted by other reputed Central and State Sector Utilities and by TPCODL (Previously ODISHA POWER TRANSMISSION CORPORATION) confirming to this technical specification. The Bidder in the latter case shall forward documentation of proto type tests conducted and acceptance given by the user authorities as also performance report for such towers in service.

2.4 Transmission Towers

2.4.1 General Description: The towers shall be of the following types.

(a) Double Circuit (A, B& C) and their extensions of +3 mtr,6 mtr,+9 mts,+15mtrs and +24mtrs

(b) Double Circuit (A, B, C & D) and their extensions of +3 mtr,6 mtr,+9 mts,+15mtrs and +24mtrs

(c)Special Towers (River Crossing, Railway Track Crossing, Power Line Crossing etc.)

(d) Multi circuit Towers for 220 KV System

2.4.2 The towers shall be of the self-supporting type, built up of lattice steel sections or members and designed to carry the power conductors with necessary insulators. Ground wires and all fittings under all loading conditions. Outline diagrams of the towers required are to be furnished by the Bidder.

2.4.3 The towers shall be fully galvanized structures built up of structural mild steel sections. All members shall be connected with bolts, nuts and spring washers.

2.4.4 Stubs and Superstructures:

(i) Stub: shall mean a set of four stub angles fully galvanized and shall include cleats, gussets, bolts and nuts, etc. the black portion of the stub being cast in foundation footings. Stub length shall correspond to foundation depth of 3-0 metres from ground level.

(ii) Superstructure: shall mean the galvanized tower assembly above the stubs which includes structural members like angle sections, cross arms, ground wire peaks, accessories and fittings such as gusset plates, pack washers, spring, washers, ladders, step bolts, anti climbing devices and such other items which are required for completing the towers in all respect. Steel and zinc required for manufacturing these items will be arranged by the supplier.

(iii) Bolts, nuts, spring washers, D shackles, U bolts: Supply of bolts and nuts and spring washers, hangers/D-shackles for attaching suspension strings and 'U' bolts for attaching ground wire suspension assemblies are included in the supply of tower.

The Bidder shall make his own arrangement for procurement of required Bolt- Nuts, accessories, attachments like 'D' shackles. 'U' bolts, anchor bolts, step bolts etc fromthe following approved vendor of TPCODL well in advance and supply as per scheduled

completion period along with the inspection at sub vendor's premises.

Sl No	Name of the approved vendor of TPCODL
1	NEXO/GKW / ASP / MAHESWARI(P) FASTNERS & BRIGHT PVT LTD / REMAX

The bolt nuts shall be procured from the above manufacturer's approved by TPCODL. For any other make of bolt nuts, the Bidder will have to take prior approval of the TPCODL. For such approval the Bidder has to submit the following in respect of prospective bolt-nut supplier.

(1) Plant Capacity per annum.

(2) Type test reports for bolt nuts to be supplied (not older than 5 years).

(3) List of orders executed / under execution.

(4) However, TPCODL reserves right to test the samples of Bolts & nuts of the proposed Bolt-nut supplier before approving the make. TPCODL is at liberty to have samples of steel, zinc etc. to be used, test, check in any Laboratory recognized by the Government at the cost of Bidder and reject the material if found below standard.

(5) The zinc used for galvanizing of fabricated materials shall be electrolytic high grade zinc (99.95% Purity).

(iv) Procurement of Steel and Zinc: The following provisions shall apply in connection with the procurement of steel and zinc by the supplier.

(a) The steel used for fabrication of tower parts extensions, templates etc. shall be of mild steel of tested quality as per IS: 2062 GRA.

(b) The Bidder shall take into account the fabrication wastage while quoting the rates. The employer will not accept any liability in connection with the wastage of steel during fabrication or otherwise.

(c) The Bidder shall indicate in his offer the sizes of steel sections which are proposed to be used by him in the design of towers.

(d) Substitutions, if any, of steel sections of the tower parts by higher sizes, due to non-availability or otherwise shall be to the supplier's account. The employer will not accept any liability on this account.

(e) The contractor shall procure all structural steel members i.e. Angles, tees, Plates, nuts & bolts etc. conforming to relevant I.S. Codes from main producers as approved by the Ministry of Steel namely SAIL, TISCO, ISCO and RINL. All MS angles, Tees and Plates shall be of grade 'A' as per IS: 2062-1999 and IS: 8500-1991. Samples shall also be taken and got tested by the Engineer-in-charge as per the provisions in this regard in the relevant I.S. Codes. In case the test results indicate that the steel arranged by the contractor does not conform to I.S. Codes, the same shall stand rejected. The proof of manufacturer of structural steel members from virgin billets purchased from main steel producers is to be furnished by him before tower member / templates are cut.

(f) Structural steel section not available from main producers can be procured fromsecondary producers/re-rollers subject to production of proof of manufacture ofstructural steel members from virgin billets produced from main steel producers before starting fabrication work. In case of sections not rolled by main producers, can be procured from re-rollers provided.

Production of proof of manufacture of structural steel members from virgin billets produced from main steel producers before starting fabrication work.

- Re-rolling of structural steel sections is done from billets/ingots of tested quality.
- Re-rolled sections are duly tested as per relevant standard.

(g) The zinc used for galvanizing fabricated material shall be of High Grade Electrolytic zinc.

2.4.5 Extensions:

a) The towers shall be designed so as to be suitable for adding 3 metres, 6 metres, 9 metres extensions for maintaining adequate ground clearances without reducing the specified factor of safety in any manner.

b) The Bidder shall have to design leg extensions for all types of towers ranging from minus 3 metres to plus 9 metres at intervals of 1.5 metres and such leg extensions shallbe suitable for being fitted to a normal tower as well as a tower with extensions. This is to enable tower spotting in hilly terrain.

2.4.6 Stub setting Templates:

Stub templates shall be designed and supplied by the supplier as per requirement for all types of towers with or without extensions. Stub templates for standard towers and towers with extension shall be fined type. The stub templates shall be painted with anti-corrosive paints.

2.4.7 Fasteners: Bolts, Nuts & Washers to be used for the towers All bolts shall be of property class 5.6 and nuts of property class 5.0 IS: 1367 (Part–3) 1991 and IS: 6639-1972 shall conform to IS: 12427, they shall be galvanized and shall have hexagonal heads and nuts, the heads being forged out of solid steel rods and shallbe truly concentric and square with the shank. The shank shall be perfectly straight.

2.4.8 Manually threaded bolts shall not be used, the length of bolts should be such that the threaded portion shall not extend into the place of contact of the members.

2.4.9 (i) The bolts shall be threaded to take the full depth of the nut and threaded far enough to permit VARIABLE gripping of the members, but not any further. It shall be ensured that the threaded portion of each bolt protrudes not less than 3 mm and notmore than 8 mm when fully tightened. All nuts shall fit hand tight to the point where the shank of the bolt connects to the head.

(ii) Flat and tapered washers shall be provided wherever necessary. Spring washers shall be provided for insertion under all nuts. These washers shall be of electro-galvanized steel and of the positive lock type. Their thickness shall be 2.5 mm for 12 mm dia bolts, 3.5 mm for 16 mm dia bolts and 4.5 mm for 20 mm dia bolts.

(iii) The Bidder shall furnish bolt schedules giving thickness of members connected, size of bolts and nuts, the length of the shank, the length of the threaded portion of bolts, sizesof bolt holes, thickness of washers and any other special details of this nature.

(iv) To obviate bending stress in bolts or to reduce it to a minimum, no bolt shall connect aggregate thickness of more than three (3) times its dia.

(v) The bolt positions in assembled towers shall be as per IS: 5613 (Part-I/Section-I) (Part-

II/Section-2)-1985.

(vi) Bolts at the joints shall be so staggered that nuts may be tightened with spanners without fouling.

3.0 TOWER ACCESSORIES

3.1 Step Bolt Ladders: These bolts shall be of property class 4.6 conform to IS: 6639-1972. Each tower shall be provided with step bolts on one of the main legs, of not less than 16 mm diameter and 175 mm long, spaced not more than 400 mm apart and extending from about 2.5 metres above the ground level to the top of the tower. Each step bolt shall be provided with two nuts on one end to fasten the bolt security to the tower and button head at the other end to prevent the feet from slipping away. The step bolts shall be capable of withstanding a vertical load not less than 1.5 KN and shall be used as a ladder for climbing.

3.2 Anti-climbing devices: This shall conform to IS: 5613 (Part-I/Sec –I), 19085.
Fully galvanized barbed wire type anti-climbing device shall be provided at a height of approximately 3 metres as an anti-climbing measure. Four layers of barbed wires will be provided each inside and outside the tower in horizontal plane, spacing between the layers being 140 to 150 mm. The towers to be designed by the supplier shall have provision to fixed the barbed wire as indicated above. Thus the angle pieces with notches for accommodating barbed wire shall be designed and supplied with the towers along with provision for suitable bolt holes on leg members for fitting bolt holes on leg member for fitting the angles. The scheme of the anti-climbing device shall be submitted along with the tower drawing. Barbed wire shall be included in the scope of bidder.

3.3 Insulator strings and ground wire clamp attachments: For the attachment of suspension insulator strings a suitable swinging hanger on the tower shall be provided so as to obtain requisite clearance under extreme swinging conditions and free swinging of the string. The hanger shall be designed to withstand an ultimate tensile strength of 11.500 kg.

(a) For ground wires at suspension towers suitable 'U' Bolts strong enough to withstand the full designed loads shall be provided to accommodate the hook of the ground wire suspension clamps.

(b) At tension towers, horizontal strain plates of suitable dimensions on the underside of each power cross-arm tip and at the top ground wire peak shall be provided for taking the 'D' Shackles of the tension insulator strings or ground wire tension clamps, as the case may be. Full details of the attachments shall be submitted by the supplier for the employer's approval before commencing with mass fabrication.

3.4 Phase Plate: Phase plate shall be of mild steel of 16 gauge vitreous enameled at back and front, circular in shape and diameter 75 mm. One set of phase plate shall be consisting of 3 plates red, yellow and blue coloured accordingly to indicate the phase of the conductor. There shall be one fixing bolt on the plate. This shall conform to IS: 5613 (Part-II/Section01) of latest edition.

3.5 Number Plate: The number plate shall be mild steel vitreous enameled at back and

front, 200 mmx 150 mm, rectangular shape and inscribed thereon shall be the number of the tower location preceded by letter corresponding to the short name of the line and thetype of towers. There shall be two fixing bolts on both end of the plates. The dimension and details of the number plate shall be as per IS: 5613 (Part-II/Section1 & Section-2), 1985.

3.6 Danger Plate: These shall be of mild steel vitreous enameled at back and front 250 x 200 mm rectangular shape and inscribed thereon shall be in signal red the work 'DANGER' with its Oriya and Hindi translation and also with the inscription of Boneand Scull and voltage of the line. There shall be two holes on the plates for fixing. This shall conform to IS: 2551 (latest edition).

4.0 DETAILS TO TOWER FABRICATION WORKMANSHIP

4.1 Except where hereinafter modified details of fabrications shall confirm to IS: 802 (Part-II)-1978.

4.2 But splices shall generally be used such that the inside cleat angle and outsideplates are designed to transmit load. The inside cleat angle shall not be less than half the thickness of the connected heaviest member plus 2 mm. Lap splices may also be used for connecting members of unequal size in such a manner that the inside angle of the lap splice shall be rounded at the heel to fit the fillet of the outside angle. All splices shall develop full stress in the members connected through bolts. But as well as lap splicesshall be made as above and as close to and above the main panel point as far as possible.

4.3 Joints shall be so designed so as to avoid eccentricity. The use of gusset plates for joining tower members shall be avoided as far as possible. However, where connections are such that the elimination of the gusset plates would result in eccentric joints then gussets plates and spacer plates may be used in conformity with modern practices. The thickness of the gusset plate, required to transmit stress, shall not be less than that of the thinnest of connected member but not less than 5 mm in any case.

The use of filler in connection shall be avoided as far as possible. The diagonal web members in tension may be connected entirely to the gusset plate where necessary so asto avoid the use of filler and it shall be connected at the point of inter-section by one ormore bolts.

4.4 The tower structures shall be accurately fabricated to bolt together easily at site without any strain on the bolts.

4.4 No angle member shall have the two leg flanges brought together by closing the angle.

4.5 The diameter of the hole shall be equal to the diameter of bolt plus 1.5 mm.

4.6 The structure shall be designed such that all parts are accessible for inspection and cleaning. Drain holes shall be provided at all points where pockets of depressions are likely to hold water.

All similar parts shall be made strictly interchangeable. All steel sections before any work is done on them, shall be carefully leveled, straightened and made true to detailed drawings by methods which shall not injure the materials so that when assembled, the different matching surfaces are in close contact throughout. No rough edges shall be permitted anywhere in the structure.

5.0 DRILLING AND PUNCHING

(a) Before any cutting work is started, all steel sections shall be carefully straightened and trued by pressure and not by hammering. They shall again be trued after being punched and drilled.

(b) Holes for bolts shall be drilled of punched with a jig but drilled holes are preferred. The following maximum tolerance of accuracy of punched holes is permissible.

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

(iii) Holes must be square with the plates or angles and have their walls parallel.

(c) All burrs left by drills or punches shall be removed completely when the tower members are truly opposite to each other. Drilling or reaming to enlarge defective holes isnot permitted.

6.0 ERECTION MARK:

Each individual member shall have an erection mark conforming to the component number given to it in the fabrication drawings. This mark shall be done with marking dies of 16 mm size before galvanizing and shall be legible after galvanising. The erection mark shall be A-BB-CC-DDD where:
A: Employer code assigned to the supplied (alphabet)
BB: Supplier's mark (Numerical)
CC: Tower type (Alphabet)
DDD: Number mark to be assigned by the supplier(Numerical)

7.0 GALVANIZING

The super structure of all towers and stubs upto 150 mm below plinth level (Top of concrete pedestal) shall be galvanized. Galvanizing of tower members and stub shall be in conformity with IS: 4759-1984 and shall be done after all fabrication work has been completed except that the nuts may be tapped or return after galvanizing. Threads of bolts and nuts after galvanizing shall have a neat fit and shall be such that they can be turnedwith fingers throughout the length of the threads of bolts and they shall be capable of developing the full strength of the bolts. Spring washers shall be electro-galvanized as per Grade – 4 of IS: 1573 – 1986. Galvanizing for fasteners shall conform to IS: 1367 (Part-XIII) – 1978.

8.0 QUANTITIES AND WEIGHTS

8.1 The quantities stated in Annexure–I are only provisional. Final quantities will be informed by the employer to the supplier on completion of detailed survey. However, bidswill be evaluated based on quantities indicated in the Annexure – I.

8.2 The employer reserves the right to order for the final quantities at the rates quoted in the bid, which shall be valid throughout the pendency of the contract.

8.3 The unit weight of each type of tower stubs, super structure and extension befurnished by the Bidder. The weight of tower shall mean the weight of tower calculated by using the black section(non galvanized) weight of steel members including stubs, of the sizes indicated in the approved fabrication drawings and bills of materials, without takinginto consideration the reduction in weights due to holes, notches, cuts, etc. but taking into consideration the weight of special fittings.

9.0 TOWER DESIGNS SUPERSTRUCTURE

9.1 Wind Pressure

The wind pressure on towers, power conductors and earth wire shall be as per IS: 802(Part-I/Sec-I) – 1995. 280

9.2 Design Temperatures

The following temperature range for the power conductor and ground wires shall be adopted for the line design confirming to IS: 802 (Part –I/Sec – I) – 1995.

i) Minimum temperature: 50˚C. ii)Every day temperature: 32˚C

iii) Maximum temperature of Conductor: 75˚C [For ACSR Zebra/Panther]
90˚C [For AAAC Moose equivalent]

iv) Ground wire- 53˚C (exposed to Sun)

9.3 Factors of Safety & Span details

(a) Factory of safety: The factor of safety based on crippling strength of struts and elastic limit of tension members shall not be less than 2(two) under normal condition and 1.5 (one and a half) under broken wire conditions for all the members of the towers and their cross arms.

(b) Normal Span: The normal span of the line shall be 300metres for 220 kV and 250metres for 132 kV.

(c) Wind and weight spans: The wind and weight spans to be adopt in the design of the structures shall be as follows:

(i) Wind Span: The wind span is the sum of the two half spans adjacent to the support under consideration. In case of towers located on an perfectly horizontal terrain, this shall be the normal span. For design purposes the wind on conductor shall be calculated on at least 1.1 times the normal.

(ii) Weight Span: The weight span is the horizontal distance between the lowest point of the conductors on the two spans adjacent to the tower. All C and D type towers shall be designed for uplift spans (minimum) weight spans in the following table also. These are applicable both for pointed and square cross arms.

For details of cross arms and towers, the span limits given below shall prevail.

WEIGHT SPANS

Tower Type	Normal Condition		Broken wire condition		Normal Condition		Broken wire condition	
	Max	Min	Max	Min	Max	Min	Max	Min
A & B	525	100	300	100	488	100	195	100
C & D	600	100	300	100	576	100	195	100

9.4 Conductor and Ground wire Configuration: For single circuit towers the three phases shall be Delta formation. One number of ACSR/AAAC conductor shall be used for each phase. One galvanized steel wire shall be used as ground wire. The ground wire shall be continuous and shall be provided above the conductors at suitable elevation to offer effective shielding and safe clearances. For double circuit towers the phases shall be in vertical formation with phase to phase horizontal spacing of not less than 8.4 meters and vertical 4.9 meters for 220 kV.

9.5 Loads on Towers

(i) Transverse Loads: Transverse load due to wind on towers conductors and under broken wire earth wire shall be calculated in accordance with IS: 802(Part-I/Sec-I)-1995.
(ii)Longitudinal Loads: Longitudinal loads due to wind on towers conductors and shieldshall be calculated as per IS: 802 (Part-I/Sec-I)-1995.
(iii)Vertical Loads: The vertical load due to conductors and ground wire shall also include 150 kg ss weight of a Lineman with tools. These loads are in addition to the vertical loads due to insulator fittings and the dead weight of the structure. The weight of a Lineman with tool should not be considered in minimum vertical load calculation. An additional erection load of 3.5 KN shall also be considered for the design of the tower. The stringing procedure shall ensure that the above vertical loads are not exceeded. For calculating vertical loads the following insulator weights may be considered.

Type string	220 KV	132 KV
Each single suspension insulator string	160 kg	120 Kg
Each double suspension insulator string	320 kg	240 Kg
Each double tension insulator string	420 kg	320 Kg
Pilot string for 60˚ tower	160 kg	120 Kg

iv) Broken Wire condition
a) Suspension Tower Type A/DA: Breaking of any one power conductor in one phase only, resulting in instantaneous unbalance tension of 50% of conductor tension at 32˚C without wind or breaking of one earth wire resulting in an unbalance tension equal to the maximum tension of the ground wire whichever is more stringent is to be considered for design along with appropriate impact factor.

b) Tower Type B & C
Breakage of two phases on the same side and on the same span or breakage of any one phase and any one ground wire on the same span whichever combination is more stringent

along with appropriate impact factor for a particular member.

c) Tower Type D/DD

Breakage of all the three phases on the same side and on the same span or breakage oftwo phases and any one ground wire on the same span, whichever combination is more stringent along with appropriate impact factor for a particular member. Cross arms for angle tower shall be of equal length for both sides.

v) Design Load

Employer's requirement for design longitudinal and transverse loads shall confirm to IS: 802(Part-I/Sec-I)-1995. The Bidder shall furnish the details of design loads proposed to be adopted in the tower design in accordance with this specification. The design criteria and other special requirements as stipulated for special towers shall be applicable for river crossing/special towers.

9.6 Tower Steel Sections:

i) Tower steel sections: Steel sections of tested quality in conformity with IS: 2062 GRA are to be used in towers, extensions and stub setting templates. No individual members shall be longer than 6000 mm. For designing of towers only rationalized steel sections shall be used. During execution of the project, if any particular section is not available, the same shall be substituted by higher section at no extra cost. However, design approval for such substitution shall be obtained from the employer.

ii) Thickness of Members: The minimum thickness of angle sections used ion the design of towers, shall be kept not less than the following values:

a) Main corner leg members excluding the ground wire peak and main cross arm 6 mm.
b) For all other main members 5 mm.
c) Redundant members 4 mm.

iii) Bolt Arrangement: The minimum bolt spacing and rolled edge distance and sheared edge distances of sections from the centers of the bolt holes shall be provided as furnished in Table below.

Dia of Bolts (mm)	Hole Dia (mm)	Min. bolt Spacing (mm)	Min. rolled Distance (mm)	Min. Sheared Edge distance (mm)
12	13.5	30	16	19
16	17.5	40	20	23
20	21.5	50	25	27

Bolts sizes mentioned above shall only be used. The minimum width of flanges without bolt holes shall be 30 mm. For the purpose of calculating stress and bearing stress for bolts refer clause 14.4 and 14.5 of IS: 802 (Part-I/Sec-2)-1992.

iv) Allowable Stress: Structural steel angle section manufactured according to the latest ISL: 808(Part-V & VI) and tested according to the latest edition of IS:2062 and having its yield strength not less than 255 N/mm. sq. shall be used in the fabrication of tower members.

v) Axial Stress in tension: The estimated tensile stress in various members multiplied by

the appropriate factors of safety shall not exceed the value given by the formula specified in Clause 9.2.1 of IS:802(Part-I/Sec-2)-1992.

vi) Axial Stress in Compression: The estimated compressive stress in various members multiplied by the appropriate factors of safety shall not exceed the value given by the formula specified in Clause 9.2.1 of IS:802(Part-I/Sec-2)-1992.

vii) Slenderness ratio: Slenderness ratio for members shall be computed in accordance with IS:802(Part-I/Sec-2)-1992. Slenderness ratio for compression and tension members shall not exceed the values specified therein. The following maximum limits of the slenderness ratio shall be adopted i.e. the ratio of unsupported length of the section inany place to the appropriate radius of gyration.

a)	For main corner leg member including the corner members of earth wire peak and the lower corner members of the arms…	150
b)	For other members having calculated stresses….	200
c)	For redundant members….	250
d)	For members having tensile stress only….	375

viii) Erection Stress: Where erection stresses combined with other permissible co-existent stresses could produce a working stress in any member appreciably above the specified working stress, then additional materials shall be added to the member or such other provision made so as to bring the working stress within the specified limit. For the purpose of this clause the specified working stress shall be the ultimate stress divided by the factor of safety of 2.0.

ix) Design calculation and Drawings: The following design calculations and drawings are required to be furnished to the employer.

a) Along with the Bid: Detailed design calculations and drawing for each type of tower.

b) On award of Contract: The supplier shall submit design of tower extension, stub templates and loading/rigging arrangement of tower testing to enable the employer to make preliminary check regarding structural stability of tower tests. Upon successful testing of tower and subsequent approval of designs, drawings and bill of materials, the supplier shall furnish Photostat copies of the following in 6(six) copies to the employer for necessary distribution along with one copy of reproducible print.

a) Detailed design calculations along with drawings of towers and foundations.
b) Detailed structural drawings indicating section size, length of member. Sizes of plate along with hole to hole distances, joint details etc.
c) Bill of materials indicating cutting and bending details against each member.
d) Shop drawings showing all details relevant to fabrication.
e) All drawings for the tower accessories.

The supplier is required to submit four copies of the drawings with Photostat copies mentioned above for approval by the employer while submitting the designs, structural drawings, bill of materials & any other drawings pertaining to the subject transmission line. The supplier shall clearly indicate in each drawing the project code number, if any, specification no, name of transmission line, letter reference no. and date on which the submissions are made. The said procedure is to be followed while submitting the

distribution copies.

9.7 Statutory Clearances: This should be as per ISS.

(i) Ground Clearances: The minimum ground clearance from the bottom conductor shall not be less than 7.00 meters for 220 kV at the maximum sag conditions i.e. at maximum temperature and in still air. However, to achieve the above clearance the height of the tower shall be increased in the following manner:

(a) An allowance of 4% of the maximum sag shall be provided to account for errors in stringing.
(b) Conductor creep shall be compensated by over tensioning the conductor for a temperature of 26˚C lower than the stringing temperature. In case of rail track crossings the minimum height above rail level of the lowest portion of any conductor under conditions of maximum sag, in accordance with the regulations for Electrical Crossing of Railway Tracks are given in Table below.

Sl No	Type of work	Inside stn. Limits(mm)	Outside stn. Limits (mm)
a)	For un-electrified track and tracks electrified on 1500 V.DC		
	i) For metre/narrow gauge	10,000/17,600	
	ii) For broad gauge	11,200	8,800
b)	Tracks electrified on 25 kV AC for meter, narrow and broad gauge	15,400	13,400

Minimum clearance between the subject power line and any other power line crossing shall not be less than 7000 mm.

(ii) Live Metal Clearance: The minimum live metal clearance to be provided between the live parts and steel work of superstructure shall be as given in IS:5613 (Part-2/Sec-I). The Bidder may adopt separate cross arm design and length for 'D' type towers under dead end conditions provided adequate live metal clearance is available with at least 15˚ angleand also provided that all the other specified conditions of this specifications are fulfilled. In case pilot insulator strings are proposed to be used, the angle of swing to be considered shall be minimum of 15˚. In computing live metal clearances, the dimensions of suspension and tension string shall be taken as given in drawings attached herewith. The design of the towers shall be such that it should satisfy all the above conditions when clearances are measured from any live point of the insulator strings.

(iii) Angle Shielding: The angle shielding, defined as the angle formed by the line joining the center lines of the ground wire and outer conductor in still air, at tower supports, tothe vertical line through the center line of the ground wire shall not be more than 30˚. Thedrop of the ground wire clamp which is employer supplied item should be considered while calculating the minimum angle of protection. For estimating the minimum angle of protection the drop of ground wire suspension clamp along with U-bolt may be taken as 150 mm.

(iv) Midspan Clearance: The minimum vertical span clearance between any of the earth wire and the nearest power conductor under all temperatures and in still air condition in

the normal ruling span shall be 8.10 meters for 220 kV. Further the tensions of the earthwires and power conductors shall be so co-ordinated that the sag of earth wires shall beat least 10% less than that of the power conductors under all temperatures and loading conditions.

9.8 Packing: Angle sections shall be wire bundled, cleat angles, gusset plates, blackets, filler plates, hanger and similar other loose items shall be netted and bolted together in multiples or securely wired together through holes. Bolts, nuts, washers and other attachments shall be packed in double gunny bags, accurately tagged, in accordance with the contents. The packing shall be properly done to avoid losses/damages during transit. Each bundle or package shall be appropriately marked.

9.9 Special Towers:

(i) Special towers are to be used for Major River crossing requiring very long spans. These towers shall form part of the Bidder's scope. Unit rates for design, fabrication, galvanizing, testing and supply for such towers shall be quoted in the appropriate schedule of Volume IB. Anchoring of Major River crossing towers, shall be with 'D' or DD type towers. All the requirements as meant for standard towers shall apply for such special towers except those noted in the following clauses.

(ii) Shielding Angle: The shielding angle shall not be greater than 30˚.

(iii) Clearances: The minimum clearance of lowest point of power conductor from the highest flood level in navigable rivers for crossing towers shall be obtained from the navigation authority. The minimum electrical clearances between live parts and tower body and cross arm member shall be the same as for normal towers.

(iv) Stub location: The approximate height of foundation on which stub for river cross towers are to be set, over the highest flood level of the river shall be fixed only after employer's approval.

(v) Angle of Deviation: The minimum angle of deviation to be considered for special towers is 2˚ and all live material clearances are to be computed considering double suspension insulator strings as per drawing enclosed.

(vi) Factors of Safety:

(1) Towers:

The minimum factors of safety for towers shall be:

a) Under normal conditions 2.0

b) Under broken wire conditions 1.5

(2) Conductor and Earth wire: The minimum factor of safety for conductors and ground wire shall be 2.5 maximum tension corresponding to 2/3rd full wind pressure at minimum temperature or full wind pressure at the mean annual temperature such that the initial unloaded tension at the mean annual temperature do not exceed 30% of the ultimate strength of conductor and ground wire respectively.

(vii) Wind Loads: The procedure for wind load calculation on conductor and ground wire shall be the same as for normal structures.

(a)The wind pressure values on tower shall be based on IS:802(Part-I/Sec-I)-1995.

(viii) Longitudinal Loads:

a) The longitudinal loads due to power conductors and earth wires for suspension towers shall be nil under normal conditions and 100% of the maximum tension of bundled conductors or earth wire under broken wire conditions.

b) Under normal conditions, unbalanced longitudinal pull due to difference in tension in ruling span for river crossing towers on one side and span of the line on the other wise shall also be considered for the design of anchor towers.

10.0 TESTS

10.1 General

(a) All standard tests including quality control tests in accordance with IS:802 (Part-III)- 1978 shall be carried out.

(b) A galvanized tower of each type complete with 6 meters extension shall be subjected todesign and destruction test. The tower shall be tested with nuts and bolts of the same make and type which are proposed to be used on the line. The supplier shall submit to the employer for approval, a detailed programme and proposal for testing the towers showing the method of carrying out the tests and the manner of applying the loads. The supplier on receipt of such approval shall intimate the employer about carrying out of the tests at least 30 days in advance of the scheduled date of tests during which time the employer will arrange to depute his representatives to witness the tests. Six copies of thetest reports thereof shall be submitted to the employer for approval.

(c) In case of premature failure, the tower shall be retested and steel already used in the earlier test shall not be used again. The supplier shall provide facilities to the employer for inspection of materials during manufacturing stage and also during testing of the same.

(d) No part of any tower subject to test shall be allowed to be used in the work. The prices to be quoted for such type tests shall be after allowing rebate for the scrap value of thetested tower which is to be retained by the supplier.

(e) The supplier shall ensure that the specification of materials and workmanship of all towers actually supplied conform strictly to the towers which have successfully undergone the tests. In case any deviation is detected the supplier shall replace such defective towers free of cost of the employer. All expenditure incurred in erection, to and fro transportation, any other expenditure or losses incurred on this account shall be fully borne by the supplier. No extension in delivery time shall be allowed on this account. The employer, however, reserves the right to waive off the testing of the towers, provided the supplier had earlier successfully tested, erected and commissioned similar towers and certificates for such tests carried out earlier are furnished duly certified by the employer and is found acceptable.

(f) Each type of tower to be tested shall be a full scale prototype galvanized tower and shall be erected vertically on rigid foundation with the stub protruding above ground level as provided in the design/drawing between ground level and concrete level.

(g) The suspension tower to be tested shall be with hanger and 'U' Bolt as per approved design/drawings. The tension tower to be tested shall similarly be with the strain plate as per approved design/drawings.

(h) In case of any premature failure even during waiting period, the tower shall be retested with rectified members. However, if the failures are major in nature and considerable portion of tower is to be re-erected then in such cases all the tests which have been carried out earlier are to be re conducted to the entire satisfaction of the employer.

(i) The sequence of testing shall be at the discretion of the employer.

10.2 Test for Galvanization: Galvanization of the members of the tower shall withstand tests as per IS: 2633.

10.3 Inspection:

10.3.1 The supplier shall keep the employer informed well in advance of the commencement of manufacture, progress of manufacture thereof and fabrication of various tower parts at various stages. So that arrangements could be made for inspection by the employer.

10.3.2 The acceptance of any batch of items shall in no way relieve the supplier of any his responsibilities for meeting all the requirements and intent of this specification and shall not prevent subsequent rejection if any item of that batch is later found defective

10.3.3 The employer or his authorized representatives shall have free access at all reasonable time to all parts of the supplier's works connected with the fabrication of the material covered under the contract for satisfying them that the fabrication is being done in accordance with the provisions of this specification.

10.3.4 Unless specified otherwise, inspection shall be made at the place of manufacture prior to dispatch and shall be conducted so as not to interfere unnecessarily with the operation of the work.

10.3.4 Should any member of the structure be found not to comply with the approved design, it shall be liable for rejection. No member once rejected shall be resubmitted for inspection except in cases where the employer or his authorized representative considers that the defects can be rectified.

10.3.5 Defects which occur during fabrication shall be made good with the consent of and according to the procedure to be laid down by the employer.

10.3.6 All gauges and templates necessary to satisfy the employer for conducting tests shall be made available at the test site by the supplier.

10.3.7 The correct grade and quality of steel shall be used by the supplier. To ascertain the quality of steel the employer may at his discretion get the material tested at an approved laboratory.

10.4 Schedule of requirements:

10.4.1 The present schedule of requirements of different types of towers will be informed to the supplier at the time of lacing order. The suppler should ready to supply the future tower requirement of TPCODL for the rate contract period in very short notice.

10.4.2 The time frame for executing the work is also indicated in this schedule. The supplier has to match the supply and delivery of stubs, tower-parts etc. to complete thework within the time schedule desired by the employer. Generally the supplier should supply @400MT per month as per the requirement.

10.4.3 The supplier shall, as far as possible, despatch the tower material as completed towers in order to enable erection of complete tower structures at site. Payment for the compled towers shall only be released in case running bills are allowed.

10.5 Schedule of prices: The prices for supply of materials shall be furnished in the relevant schedule in the manner specified in annexure-I and Annexure-II.

1.0 ERECTION OF TOWER AND TOWER FOUNDATION

1.1 SCHEDULE OF ERECTION PROGRAMME

After due approval of the detailed and check survey, the contractor shall submit to the employer a complete detailed schedule of erection programme with a Bar-Chart for construction of the lines indicating therein the target date of completion.

1.1.1 DRAWINGS FOR TOWER AND FOUNDATIONSThe

same shall be supplied by the contractor.

1.1.2 TAKING OVER

Tower and tower accessories received at site stores are to be stored item-wise and mark-wise to facilitate joint inspection of the materials (with reference to packing list and detailed order).

If the materials/equipment or any part thereof is damaged or lost during the transit, the replacement of such materials shall be effected by the contractor timely so as to maintain programme of work. However, the line under erection shall be taken over by the purchaser only when the entire line is completed in all respect and made ready for commissioning at rated voltage. Partly erected line will not be taken over.

Taking over of the line shall be in no way relieve the contractor from his responsibility for satisfactory operation of the erected line in terms of the guarantee clause of the specification.

1.1.3 MATERIALS HANDLING AND INSURANCE

The contractor shall deliver all equipment/materials against this contract to his sitestores under cover of Transit Insurance to be taken in his name. Cost of such insurance is to be

borne by the contractor.

Cost of transportation of materials from contractor's store to the site of work shall be borne by the contractor irrespective of made of transportation and site condition.

The contractor has to bear the cost of premiums for all materials, tower accessories, total erection cost of the line including cement, torsteal for foundation.

It will be the responsibility of the contractor to report to the concerned Police Station about all incidents of thefts and lodge, pursue and settle all claims with Insurance Company in case of damage/loss due to theft, pilferage, flood and fire etc. and the employer of the work shall be kept informed promptly in writing about all such incidents. The loss, if any, on this account shall be recoverable from the contractor if the claims are not lodged and properly pursued in time or if the claims are not settled by the insurance company due to lapses on the part of the contractor. The contractor shall have to replenish promptly damaged, stolen tower members and accessories conductors, earth wire, hardwares etc. and repair/re-erect the damaged lines, free of cost to the employer so as to maintain the programme of work. The employer will not be responsible in any way for such loss of materials.

1.1.4 EXCAVATION FOR FOUNDATION PITS, DE-WATERING AND SHORING SETS

The contractor shall execute the open excavation job in the foundation pits in all type of soil including latterite and or bounder mixed soil as detailed abelow including removing, spreading and/or stacking the excess spils (as directed by the employer). The item includes the necessary trimming of the sides, leveling, dressing and ramming (as necessary) the bottom of the pits including bailing out water, dewatering by manual and/or mechanical means by emplying water pumps including removing of slushes from foundation pits and nominal open plank shoring with vertical poling boards placed at suitable intervals as directed with required runners, struts, battens for framing as required complete. While quoting the unit rate for foundation as per the activity schedule, the contractor shall include cost of design, all cost of labour, materials, tools, plants, incidentals for earth excavation, dewatering, cement, water, sand, coarse and find aggregates, steel reinforcement, steel angles, forms, mixing, finishing, protection and curing of concrete, back-filling with carried earth, if necessary, disposal of surplus,spoils, stub setting and template. The contractor shall also include in the quoted unit rate for foundation, all charges/costs for preparing the pit marking and foundation layout drawing, grounding of towers including supply of pipe/concrete pipe, earthing, measurement of ground resistance before often growing etc.

1.1.5 CEMENT CONCRETE :

A) Materials

All materials whether to be consumed in the work or used temporarily shall conform to relevant IS specification, unless stated otherwise, and shall be of the best approved quality.

B) Cement

Cement to be used in the work under the contract shall generally conform to IS:269/455-1989. Cement bags shall be stored by the contractor in a water tight well ventilated store sheds on raised wooden platform/dunnage (raised at least 150 mm above ground level) in such a manner as to prevent deterioration due to moisture or intrusion of foreign matter. Sub-standard or partly set cement shall not be used and shall be removed from the site by the contractor at his cost on receipt of approval from the Engineer.

C) Coarse Aggregates Stone chips or stone ballast

D) Reinforcement : Different size of reinforcement(MS ROD-FE-500) as per latest IS.

Remarks: All foundation of tower shall be of RCC: M20 Grade (1:1.5:3)nominal mix

C. 1 - Span Lengths

		132Kv
Normal span	m	300
Tower design spans:		
Wind spans: Suspension towers		
Tension towers Maximum weight spans:	mm	300
Suspension towersTension towers		300
Minimum weight spans: Suspension towers Tension towers	mm	450
(uplift net)	mm	450
		100
		-200

C . 2 - Line Conductor (33 kV Construction)

Complete line conductor:		
Actual area (total) per single conductor	mm^2	288.3
Number of conductors per phase		ONE
Horizontal distance between conductor centres of one phase	mm	-
Each single conductor:		
Equivalent to ACSR conductor of code name		ACSR PANTHER
IEC STANDARD No		IEC 1089
INDIAN STANDARD No		IS 398 (Pt 4) 1994
Material of conductor		Aluminium
Number and diameter of wires: Aluminium	No./mm	30/3.0
Total area of conductor	mm^2	261.5
Overall diameter of stranded conductor	mm	21
Mass of conductor per kilometre	kg	974
Ultimate strength of conductor	Newton	89670
Assumed equivalent modulus of elasticity of Conductor	N/mm^2	81580
Assumed equivalent coefficient of linear expansion of conductor	per °C	$17.8x\ 10^{-6}$
Maximum length of conductor supplied on one Drum	km	2.4+/-5%

****ALL THE CONDUCTORS ARE ACSR CONDUCTORS HAVING 7 STRANDS OF GISTEEL WIE**

5 - Earth Wire (33KV Constructions)

		GSW
Complete earth conductor:		
Appropriate Indian Standard No		398(Part-2)
Appropriate British Standard No		183
Material of conductor		galvanised steel
Number and diameter of wires	No./m	7/3.15
	m	
Overall diameter of conductor	mm	9.45
Mass of conductor per kilometre	kg	428
Ultimate strength of conductor	Newto	56000
	n	
Lay length	mm	160 +/- 15
Direction of the lay of the outer layer		Right hand
Chemical composition of the steel wire	%	
Carbon		not more than 0.55
Manganese		0.4 to 0.9
Phosphorous		not more than 0.04
Sulphur		not more than 0.04
Silicon		0.15 to 0.35
Purity of Zinc for galvanising	%	99.95
Galvanising after stranding		
a) Minimum weight of Zinc coating per sq. m. of the	gms	240
uncoated wire surface		
b) Minimum no. of one minute dips that the		3 and 1/2
galvanised wire can withstand in Standard Preece		
Test		
Maximum length of conductor on drum #	km	4 +/- 5%
D.C. resistance at 20 °C	ohms/k	3.375
	m	

C . 28 - Foundation Design Particulars

Assumed density of Plain Cement Concrete (PCC) for foundation in dry soil	kg/m^3	2240
Assumed density of Plain Cement Concrete (PCC) for foundation in presence of sub-soil water	kg/m^3	1240
Assumed density of Re-inforced Cement Concrete (RCC) for foundation in dry soil	kg/m^3	2400
Assumed density of Re-inforced Cement Concrete (RCC) for foundation in presence of sub-soil water	kg/m^3	1400
28 day concrete cube strength (characteristic strength for M-20 concrete)	N/mm^2	20
28 day concrete cube strength (characteristic strength for M-15 concrete)	N/mm^2	15
Minimum proportion of stub load to be allowed for in the design of stub cleats	%	100
Density of all type of soils :		
1) under dry conditions	kg/m^3	1440
2) in presence of surface water	kg/m^3	1440
3) in presence of sub-soil water	kg/m^3	840
Ultimate bearing capacity of the soil :		
1) normal soil under dry condition	kN/m^2	214
2) normal soil in presence of surface as well as sub-soil water	kN/m^2	107
3) wet black cotton soil	kN/m^2	107
4) fissured rock (both for dry and wet)	kN/m^2	400
5) hard rock	kN/m^2	750
Angle of repose for :		
1) dry soil	Degree	30
2) wet soil due to presence of surface/ sub-soil Water	Degree	15
3) wet black cotton soil	Degree	0
4) dry fissured rock	Degree	20
5) wet fissured rock	Degree	10
Ultimate bond between steel and concrete	kN/m^2	0.147

Note : All the soil parameters furnished above are subject to verification by actual soil investigations. The Contractor shall be required to carry-out field test for each type of foundation, as per the quoted rates in Price Schedules, to prove the design parameters considered.

The foundation classification criteria shall be as given below, depending upon type of soil and sub-soil water level / presence of surface water :

Normal Dry : To be used for locations where normal dry cohesive or non-cohesive soils are met without encountering sub-soil water table within the depth of foundation.

Wet : To be used for locations,

a) where sub-soil water is met at 1.5 m. or more below the ground level;

b) which are in surface water for long periods with water penetration not exceeding onemetre below the ground level e.g. , the paddy field.

Partially Submerged : To be used for the locations where sub-soil water table is met between 0.75 to 1.5 m. below the ground level;

Fully Submerged : To be used for locations where sub-soil water table is met at less than 0.75 m. below the ground level;

Black Cotton Type : To be used at locations where soil is clayey type, not necessarily black in colour, which shrinks when dry and swells when wet, resulting in differential movement. For designing the foundation for such locations, the soil is to be considered as fully submerged.

Fissured Rock : To be used at locations where decomposed or fissured rock, hard gravel, kankar, lime-stone, laterite or any other soil of similar nature is met. Under-cut type foundation is to be used for such locations.

In case of fissured rock locations where water table is met at 1.5 m. or more below ground level, wet type fissured rock foundations shall be adopted.

Hard Rock : To be used for the locations where chiselling, drilling or blasting is required for excavation . For these locations rock anchoring is to be provided to resist the uplift forces

PILE FOUNDATION

SCOPE- The work involved is to take up the pile foundation work of including stub setting of special type tower. The detailed survey, soil investigation and the design has to be done bidder and the design is to be approved by **TPCODL**, which shall be strictly followed by the contractor. The contractor shall cast the foundation including stub setting as per the design, the schedule of quantities enclosed and direction of engineer in charge.

a) 1. The pile foundation shall be of RCC, Cast-in-situ bored piles as per IS:2911 . Pile boring shall be done using Rotary Hydraulic Rigs. Two stage flushing of pile bore shall be ensured by airlift technique duly approved by the Employer

2. Minimum diameters of piles shall be 450/500mm (for under reamed piles)/ 600 mm (for bored cast in situ piles).

3. Only straight shaft piles shall be used. Minimum cast length of pile above cutoff level shall be 1.0 m.

4. The bidder shall furnish design of piles (in terms of rated capacity, length, diameter, termination criteria to locate the founding level for construction of pile in terms of measurable parameter, reinforcement for job as well as test piles, locations of initial test piles etc.) for Engineer's approval.

5. The piling work shall be carried out in accordance with IS:2911 (Relevant part) and accepted construction methodology. The construction methodology shall be submitted by the Contractor for Engineer's approval.

6. Number of initial load tests to be performed for each diameter and rated capacity of pile shall be subject to minimum as under.

Vertical
Lateral : Minimum of 2 Nos. in each mode
Uplift

7. The initial pile load test shall be conducted with test load upto three times the estimated pile capacity. In case of compression test (initial test) the method of loading shall be cyclic as per IS:2911 (relevant part).

8. Load test shall be conducted at pile cut of level (COL). If the water table is above the COL the test pit shall be kept dry through out the test period by suitable de-watering methods. Alternatively the vertical load test may be conducted at a level higher than COL. In such a case,an annular space shall be created to remove the effect of skin friction above COL by providingan outer casing of suitable diameter larger than the pile diameter

9. Number of routine pile load tests to be performed for each diameter/allowable capacity of pile shall be as under :
   (i) Vertical : 0.5% of the total number of piles provided.
   (ii) Lateral : 0.5% of the total number of piles provided.

10. The routine tests on piles shall be conducted upto test load of one and half times the allowable

pile capacity. Piles for routine load tests shall be approved by the Employer.

11. In case, routine pile load test shows that the pile has not achieved the desired capacity or pile(s) have been rejected due to any other reason, then the Contractor shall install additional pile(s) as required and the pile cap design shall accordingly be reviewed and modified, if required.

12. Testing of piles and interpretation of pile load test results shall be carried out as per IS:2911 (Part-4). Contractor shall ensure that all the measuring equipment and instruments are properly calibrated at a reputed laboratory / institute prior to their use. Settlement / movement of the pile top shall be made by Linear Variable Differential Transducers (LVDT) having a least count of 0.01mm.

13. The test load on initial test piles shall be applied by means of reaction from anchor piles / rock anchors alone or combination of anchor piles / rock anchors and kentledge.

14. Low Strain Pile Integrity test shall be conducted on all test piles and job piles. This test shall be used to identify the routine load test and not intended to replace the use of static load test. This test is limited to assess the imperfection of the pile shaft and shall be undertaken by anindependent specialist agency. The test equipment shall be of TNO or PDI make or equivalent. The process shall confirm to ASTM.

15. Contribution of frictional resistance of filled up soil if any, shall not be considered for computation of frictional resistance of piles.

16. The following shall be adhered to **PILE FOUNDATION**:

i) The pile foundation shall be of under reamed piles as per IS: 2911 part III or bored cast in situ piles as per IS 2911 part I sec2

ii) The minimum diameter of pile shall be 500 mm in case of under reamed piles and 600 mm in case of bored cast in situ piles.

iii) Under reamed piles shall be adopted only in case of clay black cotton soil or medium dense sandy soil is encountered. Design of under reamed shall be done strictly as per IS 2911 part III.

iv) The bidder shall furnish design of piles (in terms of rated capacity, length, diameter, termination criteria to locate the founding level for construction of pile in terms of measurable parameter, reinforcement for job as well as test piles, locations of initial test piles etc.) for Engineer's approval.

v) The piling work shall be carried out in accordance with IS:2911 (Relevant part) and accepted construction methodology. The construction methodology shall be submitted by the Contractor for Engineer's approval.

vi) Number of initial load tests to be performed for each diameter and rated capacity of pile shall be subject to minimum as under.

Vertical

Lateral Minimum of 2 Nos. in each mode.

Uplift

vii) The initial pile load test shall be conducted with test load upto three times the estimated pile capacity. In case of compression test (initial test) the method of loading shall be cyclic as per IS:2911 (part IV).

viii) Load test shall be conducted at pile cut of level (COL). If the water table is above the COL the test pit shall be kept dry through out the test period by suitable de-watering methods. Alternatively the vertical load test may be conducted at a level higher than COL. In such a case, an annular space shall be created to remove the effect of skin friction above COL by providing an outer casing of suitable diameter larger than the pile diameter.

ix) Number of routine pile load tests to be performed for each diameter/allowable capacity ofpile shall be as under :

i) Vertical : 0.5% of the total number of piles provided.

ii) Lateral : 0.5% of the total number of piles provided.

x) The routine tests on piles shall be conducted upto test load of one and half times the allowable pile capacity. Piles for routine load tests shall be approved by the Employer.

xi) In case, routine pile load test shows that the pile has not achieved the desired capacity or pile(s) have been rejected due to any other reason, then the Contractor shall install additional pile(s) as required and the pile cap design shall accordingly be reviewed and modified, if required.

xii) Testing of piles and interpretation of pile load test results shall be carried out as per IS:2911 (Part-4). Contractor shall ensure that all the measuring equipment and instruments areproperly calibrated at a reputed laboratory / institute prior to their use. Settlement / movementof the pile top shall be made by Linear Variable Differential Transducers (LVDT) having a least count of 0.01mm.

xiii) The test load on initial test piles shall be applied by means of reaction from anchor piles / rock anchors alone or combination of anchor piles / rock anchors and kentledge.

xiv) Contribution of frictional resistance of filled up soil if any, shall not be considered for computation of frictional resistance of piles.

a) MATERIALS- Contractor shall supply cement, steel rod and stubs and all other materials required. All coarse aggregates, fine aggregates are to be of very good quality and tobe approved by the engineer in charge.

b) Watch and Ward- The cost of watch and ward, site store, making of Islanding/platform for the pile boring, stabilization of bore hole and all other activities incidentalto successful construction of the pile foundation are to be included in the cost of the tender and no additional cost shall be paid separately on any additional component.

The cement, steel shall be supplied to the contractor at the nearest store and the contractor shall have to receive the same at designated stores and transport to site at his own cost.

The piling shall be done in presence of the engineer in charge and due certification to be done atthe spot only.

Standard followed and to be followed-

Indian Standards(IS)	Title	International and Internationally Recognize Standard/Code
IS:1080-1990	Codes of Practicefor Design and Construction of Simple Spread Foundations	
IS: 1498-1992	Classification and Identification of Soils for General Engineering Purposes.	ASTM D 2487/ ASTM D 2488
IS: 1892-1992	Code of PracticeFor Design and Construction of Foundation in Soils : General Requirements.	
IS: 2131-1992	Method of Standard Penetration Soils	ASTM D 1586
IS: 2132-1992	Code of PracticeFor Thin Walled Sampling of Soils	ASTM D 1587
IS: 2720-1992	Method of Test For Soils (Rele-vant Parts.	ASTM D 420

IS: 2809-1991	Glossary of Terms And symbols Relating to Soil Engineering	ASTM D 653

Indian Standards(IS)	Title	International and Internationally Recognize Standard/Code
IS: 2911-1980	Code of PracticeFor Design and Construction of Pile Foundations (Relevant Parts).	
IS: 3025	Methods of Sampling And Testing (Physical And Chemical) for Water used in industry.	
IS: 3043-1991	Code or Practice for Indexing and StorageOf Drill Cores.	
IS: 4091-1987	Code of Practice for Design and Construction Of Foundations for Transmission Line Towersand Poles.	
IS: 4434-1992	Code of Practice for in-situ Vane Shear Test for Soils.	ASTM D 2573/ ASTM D 4648
IS: 4453-1992	Code of Practice	

	for Exploration by Pits, Trenches, Drifts andShafts.
IS: 4464-1990	Code of Practice for Presentation of Drilling Information and core Description in Foundation Investigation
IS: 4968 - Subsurface(Part-II) – 1992	Method for sounding for soils, dynamic method using cone and Bentonite slurry
IS: 5313-1989	Guide for Core DrillingObservations.

Indian Standards(IS)	Title	International and Internationally Recognize
		Standard/Code
IS:6403-1990	Code of Practice for Diamond Core Drillingfor Site Investigation for River Valley Projects.	
IS: 6935-1989	Method of Determinationof water level in a Bore Hole.	
IS: 7422-1990	Symbols and Abbreviationsfor use in Geological Maps Sections and subsurface Exploratory Logs (RelevantParts).	

IS:8009 (Part-I)-1993	Code of Practice for Calculation of Settlementsof Foundations (Shallow Foundations subjected to symmetrical VerticalLoads).	
IS:8764-1991	Method of Determinationof Point Load Strength Index of Rocks.	
IS: 9179-1991	Method of Determination of Unconfined compressiveStrength of Rock Materials.	ASTM D 2938
IS: 9179-1991	Method of Preparation of Rock Specimen forLaboratory Testing.	ASTM D 4543
IS: 9259-1992	Specification for Liquid Limit apparatus.	ASTM D 4318
IS: 9640-1992	Specification for Split Spoon Sampler	ASTM D 1586
IS: 10050-1992	Method of Determination of Slake Durability Indexof Rocks.	ASTM D 4644
IS: 11315-Discontinuities(Part-II)-1991	Description of in Rock Mass-Core Recovery	

TESTS

Tests as indicated in this specification and as may be requested by the Owner, shall be conducted. There tests shall include but may not be limited to the following :

a) Tests of undisturbed and disturbed samples

- Visual and engineering classification;
- Sleeve analysis and hydrometric analysis;

- Liquid, plastic and shrinkage limits;
- Specific gravity;
- Chemical analysis
- Swell pressure and free swell index determination
- Proctor compaction test.

b) Tests of undisturbed samples:

- Bulk density and moisture content;
- Relative density (for sand),
- Unconfined compression test;
- Box shear test (for sand);
- Tri-axial shear tests (depending on the type of soil and field conditions on undisturbed or remoulded samples):

i) Unconsolidated untrained;
ii) Consolidated drained test;

- Consolidation.

c) Tests on rock samples

- Visual classification:
- Moisture content, porosity and density:
- Specific gravity;
- Hardness
- Stake durability;
- Unconfined compression test (both saturated and at in-situ water content;
- Point load strength index;
- Deformability test (both saturated and dry samples)

Tentative Bill of Material

Materials for Construction of New 33 KV D/C Line for River crossing with GI UR+6 Tower - Span -550Mtr		**Unit**	**Qty**
1	Detail Survey, Land schedule, Profile Plotting And Tower Spotting, Levelling, Design, Engg. to prepare required land.	LS	2
2	Supply & erection GI UR +6 mtrs tower (D type) with stub, foundation bolts and all type GI nuts & bolts (Unit Wt - 18.000 MT) (For span length 550 in River Bed)	Set	2
3	Supply & DP Structure with 14 Mtr Long DP Structure Using GI- H-Pole (by using 2 Nos 200 x 75 x 7.5 mm Channel) with GI Channel, GI Angle for Bracing, etc -100x50X6 mm (Total Wt of DP Structure - 2.0104 MT) (For river connecting line from Tower to DP)	Set	4
4	14 Mtr Long DP Structure Using GI- H-Pole (by using 2 Nos 200 x 75 x 7.5 mm Channel) with GI Channel, GI Angle for Bracing, etc (Total Wt of DP Structure - 1.6276 MT) (Anchoring DP)	Set	2
5	Supply & erection Insulator set 120 KN (Double tension) (12No's per Tower + 6No's per DP (With Polymer insulator)	No's	48
6	Supply & Installation of Insulator set 70 KN (double tension) (6 Nos per tower) (With Polymer insulator)	No's	12
7	Supply & Installation of 33KV Polymer Insulator	Set	12
8	Supply & Installation of Compression Type Single Tension H/W fitting for 232 sq.mm. AAAC. (for DP)	No.	24
9	Supply & Installation Compression Type Double Tension H/W fitting for 232 sq.mm. AAAC. (For Tower)	No.	24
10	Supply & Installation H.T. stay set complete with stay insulator, HT Stay clamp (50x8 mm GI Flat) (Wt of one stay clamp- 0.00195 MT) & GI HT stay wire (7 / 10) Max. 0.015 MT per Stay Set)	No.	16
11	Supply & Installation 3 mtrs. Long Heavy duty GI Perforated Pipe of ID=40mm & OD=50mm with 3000mm long for DP Structure	No.	12
12	Supply & Installation 50 x 6 mm GI flat for earthing (0.02 Metric Ton for each earthing)	Metric Ton	0.16
13	Supply & Installation of Wedge connector for 232 mm ² AAAC	No.	72
14	Supply & Installation of 232 mm ² AAAC	Km.	3.80
15	Supply & Installation of 7/3.15 mm GI Earth wire	Km.	0.60
16	Supply & installation of Compression type tension hardware fitting for earth wire a	No.	2
17	Supply & Installation Danger plate for each tower & DP	No.	6
18	Supply & Installation of (GI) Anticlimbing device with barbed wire for H-pole	Set	8
19	Supply& Installation of (GI) Anticlimbing device with barbed wire for UR+6 tower	Kg	300
20	Supply & Installation of Vibration damper suitable for 7/3.15 mm GI Earth wire	No	2
21	Supply & Installation 25x500 mm flexible Cu. Earth bond.	No	4

22	Supply & Installation of Vibration Damper suitable for232 mm^2 AAAC	No	12
23	Supply & Installation of Phase plate	No	12
24	Supply & Installation of loop connector	No's	24
25	Supply & Installation of Bird gurad	No's	12
26	Supply & Installation of circuit plate	No's	4
27	Supply & Installation of Tower Number plate	No	4
28	Civil foundation, Including Soil Investigation, excavation, PCC, RCC, Pile foundation etc for erection of UR+6 Tower in Riverbed. All civil material including transport, manpower, T&P is in the scope of bidder	No's	2
29	Civil foundation, excavation, PCC, RCC, Pile foundation etc for erection of 14 Meter H- Pole DP in Riverbed. All civil material including transport, manpower, T&P is in the scope of bidder	No's	4