Tender Notification for

Supply & Installation of 66 KV & 33 KV Monopoles on Single point responsibility basis at New Delhi

NIT NO CMC/BR/21-22/RB/KG/949 DT 04.09.2021

Due Date for Submission: 24.09.2021 1530HRS

BSES RAJDHANI POWER LTD (BRPL)
Corporate Identification Number: **U74899DL2001PLC111527**
Telephone Number: +91 11 3009 9999
Fax Number: **+**91 11 2641 9833
Website: **www.bsesdelhi.com**

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SECTION – I: REQUEST FOR QUOTATION

1.00 **Event Information**

BRPL invites sealed tenders in 2 envelopes for following scope of work:

Sl. No.	Description	Estimated Cost (Rs.)	Qty.	Delivery & Installation at
1	Supply & Installation of 66 KV & 33 KV Monopoles on Single point responsibility basis at New Delhi	1.9 Crores	As per BOQ Attached	Delhi, Sites

The bidder must qualify the requirements as specified in clause 2.0 stated below.

All envelopes shall be duly super scribed "Supply & Installation of 66 KV & 33 KV Monopoles on Single point responsibility basis at New Delhi NIT NO CMC/BR/21-22/RB/KG/949"

1.01 The schedule of specifications with detail terms & conditions can be obtained from address given below against submission of non-refundable demand draft of **Rs.1180/-** drawn in favour of BSES Rajdhani Power Ltd, payable at Delhi. The tender documents & detail terms and conditions can also be downloaded from the website **"www.bsesdelhi.com --> Tenders --> BSES Rajdhani Power Ltd --> Open Tenders"**.
In case tender papers are downloaded from the above website, then the bidder has to enclose a demand draft covering the cost of bid documents.

1.02 Bids will be received up to 24/09/2021 1530 HRS at the address given at 3.01 below. Part A of the Bid shall be opened on 24/09/2021 1600 HRS.

Part B of the Bid will be opened in case of Techno-Commercially qualified Bidders and the date of opening of same shall be intimated in due course. It is the sole responsibility of the bidder to ensure that the bid documents reach this office on or before the last date.

1.03 BSES Rajdhani Power Ltd reserves the right to accept/reject any or all Tenders without assigning any reason thereof in the event of following

I. Earnest Money Deposit (EMD) of value **Rs 3,80,000/-** is not deposited in shape of Demand Draft/Pay Order/Banker's Cheque /Bank Guarantee drawn in favour of BSES Rajdhani Power Ltd, payable at Delhi.
II. The offer does not contain prices indicating break-up towards all taxes & duties in prescribed format
III. Complete Technical details are not enclosed.
IV. Tender is received after due date and time.
V. Technical offer contains any prices
VI. Prices are not FIRM and subject to Price Variation

2.0 **Qualification Criteria:-**

Technical

The prospective bidder must qualify all of the following requirements to be eligible to participate in the bidding. Bidders who meet following requirements will be considered as successful bidder and management has a right to disqualify those bidders who do not meet these requirements.

Technical

a) Bidder must have designed, supplied, installed & commissioned various 33KV or higher rating Monopole including civil work on turnkey basis in last 5 years from the date of Bid opening. The list of such installations shall be furnished along with documentary evidence.

b) Bidder shall procure monopoles as per enclosed specification and for major equipments, line items, accessories etc shall be procured from BRPL approved Vendor.

c) The Bidder must furnish valid Type Test Certification carried out at CPRI/ERDA/NABL/ other reputed international institutions for all major equipments. The Test Certificate should not be more than five year old.
In case type test reports are older than five (5) years from the date of bid opening, bidder shall submit the undertaking that- "since the last type test, the product has not undergone any change in design and the material used and the dimensions of the product are the same as the one on which the type test was conducted".
Non submission of type test reports will lead to rejection of the offer. In any case, Type test report older than ten (10) years shall not be acceptable and bid is liable for rejection.

Commercial

a) Bidder must provide proof of having solvency of an amount equal to Rs. 50 Lacs from any nationalized/ scheduled commercial bank. (Not older than 1st April 2021)

b) Bidder must provide proof of having average annual turnover of Rs. 3 Crores during the last three financial years, duly certified CA certificate to be submitted. Balance Sheet of 3 financial years also to be provided.

c) Certification on client Letterhead/ performance certificate as proof of services provided for the last 3 financial years needs to be submitted.

d) Bidder should have valid Registration No. of GST

e) Bidder should have PAN No & should fulfill all statutory compliances like PF, ESI registration

f) Bidder should have a valid Electrical License issued by Delhi Govt. for doing electrical works in Delhi region. In case bidder is not having this license, Bidder has to give the undertaking that it will be obtained by them before the start of the work at site where copy of valid license shall be submitted to BRPL before the award of the PO.

g) The bidder shall submit all necessary documentary evidence, performance certificate / WO copies to establish that the Bidder meets the above qualifying requirements.

h) The bidder shall submit an undertaking (self-certificate) that it has not been blacklisted/debarred by any central/state government institution including electricity boards

Please Note:

a) Firms who are debarred/ blacklisted in other utilities in India will not be considered.
b) Bids received from Joint Ventures / consortium shall not be considered
c) Company reserves the right to carry out capability assessment of the Bidders and company's decision shall be final in this regard.

Also, the Bidder shall furnish the following commercial & technical information along with the tender:
a) Latest balance sheet
b) Details of constitution of the company (Proprietary/ Limited. Along with details)
c) Memorandum & Articles of Association of the Company
d) Organization Chart of the company
e) Experience details with credentials

Note: All reference dates shall be taken as the date of technical bid opening

Notwithstanding anything stated above, BRPL reserves the right to assess bidder's capability to perform the contract, assess the capability and installed capacity of the Bidder for carrying out the supplies, should the circumstances warrant such assessment in the overall interest of the purchaser. BRPL also reserves the right to evaluate the bidder based on performance of past supplies/projects executed in BRPL. In this regard the decision of the purchaser is final.

3.00 Bidding and Award Process

Bidders are requested to submit their offer strictly in line with this tender document. **NO DEVIATION IS ACCEPTABLE**. BRPL shall response to the clarifications raised by various bidders and the will be distributed to all participating bidders through website.

3.01 BID SUBMISSION

The bidders are required to submit the bids in 2 (two) parts to the following address

Head of Department
Contracts & Material Department
BSES Rajdhani Power Ltd
1st Floor, C Block
BSES Bhawan, Nehru Place
New Delhi 110019

PART A: TECHNICAL **BID** comprising of following (1 original + 1 copy)

- EMD in prescribed format
- Non-refundable demand draft for Rs 1180/- in case the forms are downloaded from website
- Documentary evidence in support of qualifying criteria
- Technical Details / Filled in GTP/Type test report etc
- Qualified Manpower available & Organization Chart
- Testing Facilities
- Copies of Orders, Execution /Performance Certificate & Other Documents to support the QC as per clause 2.0
- Original Tender documents duly stamped & signed on each page as token of acceptance

- Acceptance to Commercial Terms and Conditions viz Delivery schedule/period, Payment terms, PBG etc

PART B: FINANCIAL **BID** comprising of (1 original only)

- Price strictly in the Format enclosed indicating Break up of basic price, taxes & duties, transportation etc

3.02 **TIME SCHEDULE**

The bidders should complete the following within the dates specified as under:

S. No.	Steps	Date
1	Date of sale of bid documents	04.09.2021
2	Pre-Bid meeting	20.09.2021 1430 HRS
3	Pre-Bid meeting ink	https://bsesbrpl.webex.com/meet/rakesh.bansal
4	Last date of Queries, if any	21.09.2021
5	Last date of receipt of bid documents	24.09.2021 1530HRS
6	Date & time of opening of tender – Part A	24.09.2021 1600HRS

This is a two part bid process. Bidders are to submit the bids in 2(two) parts

Both these parts should be furnished in separate sealed covers super scribing NIT no. DUE DATE OF SUBMISSION, with particulars as **PART-A TECHNICAL BID & COMMERCIAL TERMS & CONDITIONS** and **Part-B FINANCIAL BID** and these sealed envelopes should again be placed in another sealed cover which shall be submitted before the due date & time specified.

Part – A: Technical Bid should not contain any cost information whatsoever and shall be submitted within the due date.

PART B: This envelope will be opened after techno-commercial evaluation and only of the qualified bidders.

REVERSE AUCTION: Purchaser reserves the right to use **REVERSE AUCTION** through SAP-SRM as an optional tool as an integral part of the entire tendering process. All techno-commercially qualified bidders shall participate in this event

Notwithstanding anything stated above, the Purchaser reserves the right to assess bidder's capability to perform the contract, should the circumstances warrant such assessment in the overall interest of the purchaser. In this regard the decision of the purchaser is final.

In case RA is not concluded/conducted for any reasons, a "final no regret" financial bid in a sealed envelope will be called for from all qualified bidders

BIDS RECEIVED AFTER DUE DATE AND TIME SHALL BE LIABLE TO REJECTION

4.00 **Award Decision**

4.01 Purchaser intends to award the business on a lowest bid basis, so suppliers are encouraged to submit the bid competitively. The decision to place purchase order/LOI solely depends on purchaser on the cost

competitiveness across multiple lots, quality, delivery and bidder's capacity, in addition to other factors that Purchaser may deem relevant.

4.02 In the event of your bid being selected by purchaser (and / or its affiliates) and you subsequent DEFAULT on your bid; you will be required to pay purchaser (and / or its affiliates) an amount equal to the difference in your bid and the next lowest bid on the quantity declared in NIT/RFQ.

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

4.04 Qty Variation: The purchaser reserves the rights to vary the quantity by (+/-) 30% of the tender quantity.

5.00 Market Integrity

We have a fair and competitive marketplace. The rules for bidders are outlined in the Terms & Conditions. Bidders must agree to these rules prior to participating. In addition to other remedies available, we 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 Terms & Condition. A bidder who violates the marketplace rules or engages in behavior that disrupts the fair execution of the marketplace shall be restricted from bidding 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 the terms of the published in Request for Quotation/NIT.

6.00 Confidentiality

All information contained in this RFQ is confidential and shall not be disclosed, published or advertised in any manner without written authorization from BRPL. This includes all bidding information submitted.

All RFQ documents remain the property of BRPL and all bidders are required to return these documents to BRPL upon request.

Bidders who do not honor these confidentiality provisions will be excluded from participating in future bidding events.

7.00 Contact Information

Technical or Commercial clarifications, if any, as regards this RFQ shall be sought in writing and sent by mail to following address. The same shall not be communicated through phone.

	Technical	Commercial
Contact Person	Mr. Sheshadri Krishnapura(HOD-TSG)	Mr. Pankaj Goyal
Address	BSES Rajdhani Power Ltd , 2nd Floor, B Block, BSES Bhawan, Nehru Place, New Delhi 110019	BSES Rajdhani Power Ltd , 1st Floor, C Block, BSES Bhawan, Nehru Place, New Delhi 110019
Email	sheshadri.krishnapura@relianceada.com abhinav.r.srivastava@relianceada.com	pankaj.goyal@relianceada.com kumar.ga.gaurav@relianceada.com

SECTION – II: INSTRUCTION TO BIDDERS

1.00 GENERAL

BSES Rajdhani Power Ltd, hereinafter referred to as "The Company " are desirous of awarding work for "Supply & Installation of 66 KV & 33 KV Monopoles on Single point responsibility basis at New Delhi". Bidders are requested to visit the site to understand the scope of work, site conditions and requirements prior to Bidding. Hence, no price/time escalation shall be admissible on these accounts.

2.00 SCOPE OF WORK

The scope of the work is as per BOQ in the tender.

3.00 DISCLAIMER

This Document includes statements, which reflect various assumptions, which may or may not be correct .Each Bidder shall conduct its own estimation and analysis and should check the accuracy, reliability and completeness of the information in this Document and obtain independent advice from appropriate sources in their own interest.

Neither Purchaser nor its employees will have any liability whatsoever to any Bidder or any other person under the law or contract, the principles of restitution or unjust enrichment or otherwise for any loss, expense or damage whatsoever which may arise from or be incurred or suffered in connection with anything contained in this Document, any matter deemed to form part of this Document, provision of Services and any other information supplied by or on behalf of Purchaser or its employees, or otherwise a rising in any way from the selection process for the Supply.

Though adequate care has been taken while issuing the Bid document, the Bidder should satisfy itself that Documents are complete in all respects. Intimation of any discrepancy shall be given to this office immediately.

This Document and the information contained herein are Strictly Confidential and are for the use of only the person(s) to whom it is issued. It may not be copied or distributed by the recipient to third parties (other than in confidence to the recipient's professional advisors).

4.00 COST OF BIDDING

The Bidder shall bear all cost associated with the preparation and submission of its Bid and the company will be in no case be responsible or liable for those costs.

5.00 BIDDING DOCUMENTS

The Scope of Work, Bidding Procedures and Contract Terms are described in the Bidding Documents. In addition to the covering letter accompanying Bidding Documents, the Bidding Documents include:

Request for Quotation (RFQ) - Section - I
Instructions to Bidders (ITB) - Section – II
Special Terms and Condition - Section –III
General Terms and Condition Supply (GCC-Supply) - Section –IV
Price Format Supply- Section V
General Terms and Condition Erection, Testing & Commissioning (GCC-ETC) - Section –VI
Price Format Erection, Testing & Commissioning - Section VII

Grand Summary of the Quoted Price – Section VIII
Vendor Code of Conduct - Section IX
Technical Specifications - Annexure I

The Bidder is expected to examine the Bidding Documents, including all Instructions, Forms, Terms and Specifications. Failure to furnish all information required by the Bidding Documents or submission of a Bid not substantially responsive to the Bidding Documents in every respect will may result in the rejection of the Bid.

6.00 AMENDMENT OF BIDDING DOCUMENTS

At any time prior to the deadline for submission of Bids, the Company may for any reasons, whether at its own initiative or in response to a clarification requested by a prospective Bidder, modify the Bidding Documents by amendment.

The Amendment shall be part of the Bidding Documents, pursuant to Clause 5.00, and it will be notified in web site **www.bsesdelhi.com**, and will be binding on them.

In order to afford prospective Bidders reasonable time in which to take the Amendment into account in preparing their Bids, the Company may, at its discretion, extend the deadline for the submission of Bids. The same shall be published as a corrigendum in website **www.bsesdelhi.com.**

Purchaser shall reserve the rights to following

- extend due date of submission
- modify tender document in part/whole
- cancel the entire tender

Bidders are requested to visit website regularly for any modification/clarification/ corrigendum/addendum of the bid documents

7.00 LANGUAGE OF BID

The Bid prepared by the Bidder, and all correspondence and documents relating to the Bid exchanged by the Bidder and the Purchaser 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 English translation, in which case, for purposes of interpretation of the Bid, the English translation shall govern.

8.00 DOCUMENTS COMPRISING THE BID

The Bid prepared and submitted by the Bidder shall comprise the following components:

- Bid Form, Price & other Schedules (STRICTLY AS PER FORMAT) and Technical Data Sheets completed in accordance with Technical Specification
- All the Bids must be accompanied with the required EMD as mentioned in the Section-I against each tender.
- Tender documents duly stamped and signed on each page by authorized signatory

9.00 BID FORM

9.01 The Bidder shall submit one ”Original” and one ”Copy” of the Un-priced Bid Form, Price Schedules & Technical Data Sheets duly filled in as per attached specification/BOM etc enclosed.

9.02 **EMD**

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

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

(a) Banker's Cheque / Demand Draft/Pay Order drawn in favour of BSES Rajdhani Power Ltd, payable at Delhi.

(b) Bank Guarantee valid for One hundred Twenty (120) days after due date of submission or amended due date of submission drawn in favour of BSES Rajdhani Power Ltd, BSES Bhawan, Nehru Place, New Delhi 110019

The EMD may be forfeited in case of:

(a) The Bidder withdraws its bid during the period of specified bid validity

OR

(b) In the case of a successful Bidder, if the Bidder does not

(i) Accept the Purchase Order/ Work Order, or

(ii) Furnish the required performance security BG.

10.00 **BID PRICES**

10.01 Bidders shall quote for the entire Scope of Supply/Work with a break-up of prices for individual items and Taxes & Duties. The total Bid Price shall also cover all the Supplier's obligations mentioned in or reasonably to be inferred from the Bidding Documents in respect of Design, Supply, Transportation to site, Erection, testing & commissioning all in accordance with the requirement of Bidding Documents The Bidder shall complete the appropriate Price Schedules included herein, stating the Unit Price for each item & total Price with taxes, duties & freight upto destination.

10.02 The prices offered shall be inclusive of all costs as well as Duties, Taxes and Levies paid or payable during execution of the supply work, breakup of price constituents, should be there. The Bidder is required, at his expense, to obtain all the information he may require to enable him to submit his tender including necessary visits to the site to ascertain the local conditions, procurement of necessary materials, labour, etc., requirements of the local/government/public authorities in such matters.

10.03 Prices quoted by the Bidder shall be **"Firm"** and not subject to any price adjustment during the performance of the Contract. **A Bid submitted with an adjustable price/ Price Variation Clause will be treated as non -responsive and rejected.**

11.00 **BID CURRENCIES**

Prices shall be quoted in Indian Rupees Only**.**

12.00 **PERIOD OF VALIDITY OF BIDS**

12.01 Bids shall remain valid for 120 days from the due date of submission of the Bid & subsequent corrigendum/amendment/extension of due date of submission.

12.02 Notwithstanding Clause 12.01 above, the Purchaser may solicit the Bidder‟s consent to an extension of the Period of Bid Validity. The request and the responses thereto shall be made in writing and sent by post/courier.

13.00 **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.

14.00 **FORMAT AND SIGNING OF BID**

14.01 The original Bid Form and accompanying documents, clearly marked "Original Bid" and "copy" must be received by the Purchaser at the date, time and place specified pursuant to Clauses 15.0 and 16.0. In the event of any discrepancy between the original and the copy, the original shall govern.

14.02 The original and copies of the Bid shall be typed or written in indelible ink and shall be signed by the Bidder or a person or persons duly authorized to sign on behalf of the Bidder. **Such authorization shall be indicated by written Power-of-Attorney accompanying the Bid.**

14.03 The Bid shall contain no interlineations, erasures or overwriting except as necessary to correct errors made by the Bidder, in which case such corrections shall be initialed by the person or persons signing the Bid.

15.00 **SEALING AND MARKING OF BIDS**

15.01 Bid submission: One original & one Copy (hard copies) of all the Bid Documents shall be sealed and submitted to the Purchaser before the closing time for submission of the bid.

15.02 The Technical Documents and the EMD shall be enclosed in a sealed envelope and the said envelope shall be super scribed with —"Technical & EMD". The price bid shall be inside another sealed envelope with super scribed "Financial Bid ". Both these envelopes shall be sealed inside another big envelope. All the envelopes should bear the Name and Address of the Bidder and marking for the Original and Copy. The envelopes should be super scribed with —"Tender Notice No. & Due date of opening".

15.03 The Bidder has the option of sending the Bids in person. Bids submitted by Email/Telex/Telegram /Fax will be rejected. No request from any Bidder to the Purchaser to collect the proposals from Courier/Airlines/Cargo Agents etc shall be entertained by the Purchaser.

16.00 **DEADLINE FOR SUBMISSION OF BIDS**

16.01 The original Bid, together with the required copies, must be received by the Purchaser at the address specified earlier.

16.02 The Purchaser may, at its discretion, extend the deadline for the submission of Bids by amending the Bidding Documents, in which case all rights and obligations of the Purchaser and Bidders previously subject to the deadline will thereafter be subject to the deadline as extended.

17.00 **ONE BID PER BIDDER**

Each Bidder shall submit only one Bid by itself. **No Joint Venture is acceptable**. A Bidder who submits or participates in more than one Bid will cause all those Bids to be rejected.

18.00 **LATE BIDS**

Any Bid received by the Purchaser after the deadline for submission of Bids prescribed by the Purchaser, pursuant to Clause 16.0, will be declared "Late" and shall be rejected and returned unopened to the Bidder.

19.00 **MODIFICATIONS AND WITHDRAWAL OF BIDS**

19.01 The Bidder is not allowed to modify or withdraw its Bid after the Bid's submission.

20.00 **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 Purchaser's processing of Bids or award decisions may result in the rejection of the Bidder's Bid.

21.00 **CLARIFICATION OF BIDS**

To assist in the examination, evaluation and comparison of Bids, the Purchaser may, at its discretion, ask the Bidder for a clarification of its Bid. 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.

22.0 **PRELIMINARY EXAMINATION OF BIDS / RESPONSIVENESS**

22.01 Purchaser 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. Purchaser may ask for submission of original documents in order to verify the documents submitted in support of qualification criteria.

22.02 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.

22.03 Prior to the detailed evaluation, Purchaser 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.

22.04 Bid determined as not substantially responsive will be rejected by the purchaser and/or the Purchaser and may not subsequently be made responsive by the Bidder by correction of the non - conformity.

23.00 **EVALUATION AND COMPARISON OF BIDS**

The evaluation of Bids shall be done based on the delivered cost competitiveness basis.

23.01 The evaluation of the Bids shall be a stage-wise procedure. The following stages are identified for evaluation purposes: In the first stage, the Bids would be subjected to a responsiveness check. The Technical Proposals and the Conditional ties of the Bidders would be evaluated.

23.02 Subsequently, the Financial Proposals along with Supplementary Financial Proposals, if any, of Bidders with Techno-commercially Acceptable Bids shall be considered for final evaluation.

23.03 The Purchaser's evaluation of a Bid will take into account, in addition to the Bid price, the following factors, in the manner and to the extent indicated in this Clause:

- Delivery Schedule
- Conformance to Qualifying Criteria
- Deviations from Bidding Documents

Bidders shall base their Bid price on the terms and conditions specified in the Bidding Documents.

The cost of all quantifiable deviations and omissions from the specification, terms and conditions specified in Bidding Documents shall be evaluated. The Purchaser will make its own assessment of the cost of any deviation for the purpose of ensuring fair comparison of Bids.

23.04 Any adjustments in price, which result from the above procedures, shall be added for the purposes of comparative evaluation only to arrive at an "Evaluated Bid Price". Bid Prices quoted by Bidders shall remain unaltered.

24.00 **CONTACTING THE PURCHASER**

24.01 If any Bidder wishes to contact the Purchaser on any matter related to the Bid, from the time of Bid opening to the time of contract award, the same shall be done in writing only.

24.02 Any effort by a Bidder to influence the Purchaser‘s decisions in respect of Bid evaluation, Bid comparison or Contract Award, will result in the rejection of the Bidder‘s Bid.

25.00 **THE PURCHASER ’S RIGHT TO ACCEPT ANY BID AND TO REJECT ANY OR A LL BIDS**

The Purchaser reserves the right to accept or reject any Bid and to annul the Bidding process and reject all Bids at any time prior to award of Contract, without thereby incurring any liability to the affected Bidder or Bidders or any obligation to inform the affected Bidder or Bidders of the grounds for the Purchaser‘s action.

26.00 **AWARD OF CONTRACT**

26.01 The Purchaser will award the Contract to the successful Bidder whose Bid has been determined to be the lowest-evaluated responsive Bid, provided further that the Bidder has been determined to be qualified to satisfactorily perform the Contract. Purchaser reserves the right to award order to other bidders in the tender, provided it is required for timely execution of project & provided he agrees to come to the lowest rate.

26.02 The Purchaser intends to issue separate Purchase/Work Orders viz
a) Purchase Order for Supply
b) Work Order for Installation, Testing & Commissioning

27.00 **THE PURCHASER ’S RIGHT TO VARY QUANTITIES**

The Purchaser reserves the right to vary the quantity i.e. increase or decrease the numbers/quantities without any change in terms and conditions during the execution of the Order.

28.00 **LETTER OF INTENT/ NOTIFICATION OF AWARD**

The letter of intent/ Notification of Award shall be issued to the successful Bidder whose bids have been considered responsive, techno-commercially acceptable and evaluated to be the lowest (L1). The successful Bidder shall be required to furnish a letter of acceptance within 7 days of issue of the letter of intent /Notification of Award by Purchaser. The date of LOI/PO shall be treated as Start date of work.

29.00 **CONTRACT PERFORMANCE BANK GAURANTEE**

Within 15 days of the receipt of Notification of Award/ Letter of Intent/PO from the Purchaser, the successful Bidder shall furnish the Performance Bank Guarantee towards faithful performance of Contract for an amount of 10% (Ten percent) of the Contract Price. The Performance Bond shall be valid up to completion period/handing over, whichever is earlier plus 3 months claim period. Upon submission of the performance security, the EMD shall be released. 2 (two) nos. separate CPBG's shall be submitted against Supply, ETC.

30.00 **CORRUPT OR FRADULENT PRACTICES**

30.01 The Company requires that the Bidders observe the highest standard of ethics during the procurement and execution of the Project. In pursuance of this policy, the Company:

(a) Defines, for the purposes of this provision, the terms set forth below as follows:

"Corrupt practice" means behavior on the part of officials in the public or private sectors by which they improperly and unlawfully enrich themselves and/or those close to them, or induce others to do so, by misusing the position in which they are placed, and it includes the offering, giving, receiving, or soliciting of anything of value to influence the action of any such official in the procurement process or in contract execution; and

"Fraudulent practice" means a misrepresentation of facts in order to influence a award process or the execution of a contract to the detriment of the Company, and includes collusive practice among Bidders (prior to or after Bid submission) designed to establish Bid prices at artificial non -competitive levels and to deprive the Company of the benefits of free and open competition.

(b) Will reject a proposal for award if it determines that the Bidder recommended for award has engaged in corrupt or fraudulent practices in competing for the contract in question ;

(c) Will declare a firm ineligible, either indefinitely or for a stated period of time, to be awarded a contract if it at any time determines that the firm has engaged in corrupt or fraudulent practices in competing for, or in executing, a contract.

30.02 Furthermore, Bidders shall be aware of the provision stated in the Terms and Conditions of Contract.

31.00 **COMPLETION PERIOD**

10 Weeks from the date of PO for PART-A of the BOQ i.e. 33kV Monopoles

24 Weeks from the date of PO for PART-B of the BOQ i.e. 66kV Monopoles

Section III

SPECIAL TERMS AND CONDITIONS OF CONTRACT

1.1. The scope of this tender includes supply , survey , design , engineering , manufacturer , shop testing ,inspection , packing , dispatch , loading , unloading and storage at site, storage and construction insurance , assembly , erection ,structural , complete pre-commissioning checks , testing and commissioning at site , obtaining statutory clearance and handing over to owner on single point responsibility basis.

1.2. The scope includes supply of all barricading, free issued materials (including installation, transportation, loading & unloading), dewatering, watch and ward and transportation of scrap (generated at Site), balance free-issued material, dismantled material from site to BRPL store including loading & unloading and no additional charges shall be paid against these activities. Used barricading material will be taken back by bidder soon after job is handed over or as directed by BRPL Engineer-In-Charge (E-I-C). No additional cost for these items will be paid to the Bidder. Any leakage, pilferage and damage of the material shall be in vendor's scope.

1.3. Prices for all the activities shall be FIRM till the actual completion of the job. Statutory variation will be allowed for direct supplies only wherever breakup of Taxes & Duties are available in Price Bid. In case bidder has not submitted any price breakup, no variation on account of statuary variation shall be paid extra by BRPL.

1.4. Wherever BRPL specifications are not available relevant IS/IEC to be followed. All Drawings mentioned in the Tender Specification and other required for the completeness of the tender shall be submitted. Drawing submission process shall not be deemed complete if all the requirements are not complied during the submission of the same.

1.5. The Bidder should have own Safety equipment like Neon Tester, Portable Earth, Earthing discharge rod etc. along with Calibration Certificates of all the equipment.

1.6. The Bidder should have all major tools and tackles required for installation, testing & commissioning works.

1.7. Bidder has to submit the item wise price bifurcation in bid. Un-priced copy must be attached with the Part A. Reverse Auction will be carried out on Lump sum Basis/Total Landed Cost i.e. Supply + ETC

1.8. Any other material not specifically mentioned above but required for successful commissioning and operation is in the scope of bidder. Prior approval shall be taken from central engineering department before execution. Commercial approval shall be taken from C&M Department before execution.

1.9. Successful bidder has to adhere to the statutory compliance.

1.10. Successful Bidder has to depute the safety officer and quality officer separately at site for whole duration and they have to submit the safety report and quality report to BRPL E-I-C on weekly basis.

1.11. Successful bidder has to send the weekly progress report to BRPL EIC.

1.12. In case of any major deviation, deletion or addition which bidder may feel is relevant to this project & for its safe operation and completion of works; Bidder may clearly highlight and communicate the same to the purchaser with his bid.

1.13. **Guarantee period/Defect Liability period:**

The Guarantee Period will be equipment/service/work specific and shall be as specified in the Technical Specifications for the equipment/material/service/work and where Technical specifications are not part of contract documents or guarantee period is not specified in the Technical specifications, the guarantee period shall be as per the Special Terms and Conditions of the Contract. In case of no mention of the guarantee period in Technical specifications, Defect liability period will be 24 Months from the Date of Commissioning or 30 months from the date of delivery of final lot of supplies made, whichever is later.

If during the defects liability period any materials / items are found to be defective, these shall be replaced or rectified by the bidder at his own cost within 30 days from the date of receipt of intimation

1.14. **Failure during Guarantee Period:**

If the equipment and material supplied/service or work rendered under the contract fails to perform its due, rated & intended quality performance, during the Guarantee period, the bidder is liable to undertake repair/rectify/replace the equipment and material supplied/service or work rendered under the contract within time frame as specified below at bidder's cost to make the equipment and material supplied/service or work rendered under the contract of performing its due, rated and intended quality performance. If bidder fails to repair/rectify/replace the equipment or material supplied/service or work rendered under the contract, failed in Guarantee Period, purchaser will be at liberty to get the same done at bidder's risks and costs and recover all such expenses plus the purchaser own charges (@ 15% of expenses incurred), from the bidder or from the "Performance Bank Guarantee" as the case may be.

If during the Warranty/ Guarantee period some parts of the supplies are replaced owing to the defects/ damages under the Warranty, the Warranty period for such replaced parts shall be until the expiry of twelve months from the date of such replacement or renewal or until the end of original Guarantee period, whichever is later.

a) Service Engineer Availability to Attend, Identify & Restore Defects (Minor) of materials/Equipment's under Guarantee Period within 48 Working Hours (Exclusion of Material Support Cases)

b) Spare Material Delivery for rectification of defect (Major) Under Guarantee Period within Two Weeks. Bidder must keep Requisite Inventory of Critical Spares & Other Equipments Covered in Guarantee Period to Restore Equipment within Two Weeks.

c) In Case Of Complete Replacement of material, within a Period of 4 Weeks.

1.15. All the bay equipment (i.e- LA, CT, PT, Disc Insulator, String, Suspension Insulator, Bushing etc.) shall be Polymeric type in the place of porcelain with creepage 31mm/kV. Rest of the parameter to be followed as per tech spec.

1.16. **PROJECT INFORMATION & COMPLETION**

The contractor shall be fully responsible to complete the project in time. It is desired that the project should be completed as per the schedule from the date of LOI or purchase order whichever is earlier. The detailed completion schedule shall be prepared by vendor and shall be submitted at the time of detailed engineering for approval. Vendor has to submit the progress report fortnightly with this tender/as asked by the Purchaser.

1.17. **PROJECT IMPLEMETATION & EXECUTION CONTROL**

The bidders are requested to submit the following along with the bid, about the project implementation & execution methodology.

a) Write up/overview of project Plan
b) Implementation Methodology
c) Project Organization Chart for Representatives, Project Office & site office teams along with the functions.
d) Bar Chart & Network Diagram (with critical path) for various activities to achieve scheduled completion.

SECTION IV
GENERAL TERMS AND CONDITIONS - SUPPLY

1.01 All the Bids shall be prepared and submitted in accordance with these instructions.

1.02 Bidder shall bear all costs associated with the preparation and delivery of its Bid, and the Purchaser will in no case shall be responsible or liable for these costs.

1.03 The Bid should be submitted by the Bidder in whose name the bid document has been issued and under no circumstances it shall be transferred /sold to the other party.

1.04 The Purchaser reserves the right to request for any additional information and also reserves the right to reject the proposal of any Bidder, if in the opinion of the Purchaser, the data in support of RFQ requirement is incomplete.

1.05 The Bidder is expected to examine all instructions, forms, terms & conditions and specifications in the Bid Documents. Failure to furnish all information required in the Bid Documents or submission of a Bid not substantially responsive to the Bid Documents in every respect may result in rejection of the Bid. However, the Purchaser's decision in regard to the responsiveness and rejection of bids shall be final and binding without any obligation, financial or otherwise, on the Purchaser.

2.0 Definition of Terms

2.01 "Purchaser" shall mean BSES Rajdhani Power Limited, on whose behalf this bid enquiry is issued by its authorized representative / officers.

2.02 "Bidder" shall mean the firm who quotes against this bid enquiry issued by the Purchaser. "Supplier" or "Supplier" shall mean the successful Bidder and/or Bidders whose bid has been accepted by the Purchaser and on whom the "Letter of Acceptance" is placed by the Purchaser and shall include his heirs, legal representatives, successors and permitted assigns wherever the context so admits.

2.03 "Supply" shall mean the Scope of Contract as described.

2.04 "Specification" shall mean collectively all the terms and stipulations contained in those portions of this bid document known as RFQ, Commercial Terms & Condition, Instructions to Bidders, Technical Specifications and the Amendments, Revisions, Deletions or Additions, as may be made by the Purchaser from time to time.

2.05 "Letter of Acceptance" shall mean the official notice issued by the Purchaser notifying the Supplier that his proposal has been accepted and it shall include amendments thereto, if any, issued by the Purchaser. The "Letter of Acceptance" issued by the Purchaser shall be binding on the "Supplier" The date of Letter of Acceptance shall be taken as the effective date of the commencement of contract.

2.06 "Month" shall mean the calendar month and "Day" shall mean the calendar day.

2.07 "Codes and Standards" shall mean all the applicable codes and standards as indicated in the Specification.

2.08 "Offer Sheet" shall mean Bidder's firm offer submitted to BRPL in accordance with the specification.

2.09 "Contract" shall mean the "Letter of Acceptance/Purchase Order" issued by the Purchaser.

2.10 "Contract Price" shall mean the price referred to in the "Letter of Acceptance/Purchase Order".

2.11 "Contract Period" shall mean the period during which the "Contract" shall be executed as agreed between the Supplier and the Purchaser in the Contract inclusive of extended contract period for reason beyond the control of the Supplier and/or Purchaser due to force majeure.

2.12 "Acceptance" shall mean and deemed to include one or more of the following as will be stipulated in the specification:

a) The written acceptance of material by the inspector at suppliers works to ship the materials.
b) Acceptance of material at Purchaser site stores after its receipt and due inspection/ testing and release of material acceptance voucher.
c) Where the scope of the contract includes supplying, acceptance shall mean issue of necessary equipment / material takeover receipt after installation & commissioning and final acceptance.

3.0 Contract Documents & Priority

Contract Documents: The terms and conditions of the contract shall consist solely of these RFQ conditions and the offer sheet. The several documents forming the Contract are to be taken as mutually explanatory of one another, but in case of ambiguities or discrepancies, the same shall be explained and adjusted by the Purchaser, who shall thereupon issue to the Contractor, instructions thereon. In such event, unless otherwise provided in the Contract, the priority of the documents forming the Contract shall be as follows:

1. Any amendments to Contract
2. Commercial Terms & Conditions of the Contract
3. Clarifications/addendum/corrigendum to Tender
4. Terms & Conditions of the Tender

4.0 Scope of Supply -General

4.01 The "Scope of Supply" shall be on the basis of Bidder's responsibility, completely covering the obligations, responsibility and supplies provided in this Bid enquiry whether implicit or explicit.

4.02 Bidder shall have to quote for the Bill of quantities as listed elsewhere.

4.03 All relevant drawings, data and instruction manuals.

5.0 Quality Assurance and Inspection

5.01 Immediately on award of contract, the bidder shall prepare detailed quality assurance plan/test procedure identifying the various stages of manufacture, quality checks performed at each stage, raw material inspection and the Customer hold points. The document shall also furnish details of method of checking, inspection and acceptance standards / values and get the approval of Purchaser before proceeding with manufacturing. However, Purchaser shall have right to review the inspection reports, quality checks and results of suppliers in house inspection department which are not Customer hold points and the supplier shall comply with the remarks made by purchaser or his representative on such reviews with regards to further testing, rectification or rejection, etc. In case of standard items, BRPL shall forward the standard QAP which is to be followed by vendor during manufacturing.

5.02 Witness and Hold points are critical steps in manufacturing, inspection and testing where the supplier is obliged to notify the Purchaser in advance so that it may be witnessed by the Purchaser. Final inspection is a mandatory hold point. The supplier can proceed with the work past a hold point only after clearance by purchaser or a witness waiver letter from BRPL.

5.03 The performance of waiver of QA activity by Purchaser at any stage of manufacturing does not relieve the supplier of any obligation to perform in accordance with and meet all the requirements of the procurement

documents and also all the codes & reference documents mentioned in the procurement document nor shall it preclude subsequent rejection by the purchaser.

5.04 On completion of manufacturing the items can only be dispatched after receipt of dispatch instructions issued by the Purchaser.

5.05 All in-house testing and inspection shall be done without any extra cost. The in-house inspection shall be carried out in presence of BRPL/BRPL authorized third party inspection agency. Cost of Futile/abortive visit(s) shall be debited from the invoices

5.06 Purchaser reserves the right to send any material being supplied to any recognized laboratory for testing, wherever necessary and the cost of testing shall be borne by the Bidder. In case the material is found not in order with the technical requirement / specification, the charges along with any other penalty which may be levied is to be borne by the bidder. To avoid any complaint the supplier is advised to send his representative to the stores to see that the material sent for testing is being sealed in the presence of bidder's representative.

6.0 Packing, Packing List & Marking

6.01 **Packing:** Supplier shall pack or shall cause to be packed all Commodities in crates/boxes/drums/containers/cartons and otherwise in such a manner as shall be reasonably suitable for shipment by road or rail to BRPL, Delhi/New Delhi stores/site without undue risk of damage in transit.

6.02 **Packing List:** The contents of each package shall be itemized on a detailed list showing the exact weight, extreme outside dimensions (length, width & weight) of each container/box/drum/carton, Item SAP Code, PO No & date. One copy of the packing list shall be enclosed in each package delivered.

7.01 Price basis for supply of materials

Bidder has to quote their prices on Landed Cost Basis and quote separate price for each item.

FIRM prices for supply to BRPL Delhi/New Delhi stores inclusive of packing, forwarding, loading at manufacturer's premises, payment of all taxes, GST, Freight, any other local charges etc.

The above supply prices shall also include unloading at BRPL Delhi/New Delhi stores/site.

Transit insurance will be arranged by bidder.

8.0 Terms of payment and billing – SUPPLY

a) 80% pro-rata of supply value shall be payable against R/A bills for supply of equipment and materials within 30 days against receipt of material at site and submission of following documents duly certified by BRPL Project-in-charge:

i. Consignee copy of LR
ii. Detailed invoice showing commodity description, qty, unit & total price,
iii. Original certificate issued by BRPL confirming receipt of material at site & acceptance
iv. Dispatch clearance & inspection report issued by the inspection authority
v. Packing List, Test Reports
vi. Guarantee Certificate.

b) 10% pro-rata after installation/erection of equipment duly certified by BRPL Project-in-charge

c) 10% pro-rata after completion of successful acceptance testing, commissioning and Handing Over of the entire Installation and duly certified by BRPL Project-in-charge and submission of PBG of 10% of contract value valid up to Defect Liability period i.e. 12 months from the date of Handing over of entire Installation Plus 3 months towards Claim period.

9.0 Price Validity

9.01 All bids submitted shall remain valid, firm and subject to unconditional acceptance by BRPL Delhi for 120 days from the due date of submission & subsequent corrigendum/amendment/extension of due date of submission. For awarded suppliers/contractors, the prices shall remain valid and firm till contract completion.

10.0 Performance Guarantee

10.01 Bank guarantee shall be drawn in favour of "BSES Rajdhani Power Ltd" as applicable. The performance Bank guarantee shall be in the format as specified by BRPL.

10.02 Contract performance bank guarantee of total 10% of the contract price shall be submitted within 15 days of award of contract with the validity till completion of the contract period.

10.03 Contractor shall submit the performance bank guarantee equivalent to the 10% of the contract value at the time of claiming the last payment as per clause no. 8.0(C) (Terms of payment and billing – SUPPLY), with the validity of the bank guarantee till Defect Liability Period plus 3 months towards Claim period.

11.0 Forfeiture

11.01 Each Performance Bond established under Clause 10.0 shall contain a statement that it shall be automatically and unconditionally forfeited without recourse and payable against the presentation by BRPL of this Performance Bond, to the relevant bank referred to above, together with a simple statement that supplier has failed to comply with any term or condition set forth in the Contract.

11.02 Each Performance BG established under will be automatically and unconditionally forfeited without recourse if BRPL at its sole discretion determines that supplier has failed to comply with any term or condition set forth in the contract.

12.0 Release

All Performance Bonds will be released without interest within seven (7) days from the last date up to which the Performance Bond has to be kept valid (as defined in Clause 10.0) except for the case set forth in Clause 21.0.

13.0 Guarantee of Performance

The bidder shall stand guarantee that the equipment and material supplied/service or work rendered under the contract is free from design, manufacturing, material, construction, erection & installation and workmanship & quality defects and is capable of its due, rated and intended quality performance, as an integrated product delivered under the contract for a specific period termed as Guarantee Period. The bidder should also guarantee that the equipment/material is new and unused except for the usage required for the tests and checks required as part of quality assurance.

14.0 Guarantee Period/Defects Liability Period

The Guarantee Period will be equipment/service/work specific and shall be as specified in the Technical Specifications for the equipment/material/service/work and where Technical specifications are not part of contract documents or guarantee period is not specified in the Technical specifications, the guarantee period shall be as per the Special Terms and Conditions of the Contract. In case of no mention of the guarantee period in Technical specifications, Defect liability period will be 12 Months from the Date of Commissioning.

If during the defects liability period any materials / items are found to be defective, these shall be replaced or rectified by the bidder at his own cost within 30 days from the date of receipt of intimation.

Cost of repairs on failure in Guarantee Period:

The cost of repairs/rectification /replacement, apart from the actual cost of repairs/rectification/replacement is also inclusive of all bidder costs of required transportation, site inspection /mobilization/dismantling and re-installation costs as applicable, to be borne by the bidder. The bidder has to ensure that the interruption in the usage of intended purpose of the equipment is minimized to the maximum extent In lieu of the time taken for repairs/rectification/replacement.

15.0 Latent Defect:

Hidden defects in manufacturing or design of the product supplied and which could not be identified by the tests conducted but later manifested during operation of the equipment are termed as latent defects. Bidder shall further be responsible for 'free replacement' for another period of FIVE years from the end of the guarantee period for any 'Latent Defects' if noticed and reported by the Purchaser.

16.0 Support beyond the Guarantee Period

The Bidder shall ensure availability of spares and necessary support for a period of at least 10 years post completion of guarantee period of equipment /technology supplied against this contract. BRPL shall be duly intimated by the Vendor of End of Life Support for the product /technology supplied at least 12 months in advance.

17.0 Return, Replacement or Substitution

BRPL shall give Supplier notice of any defective Commodity promptly after becoming aware thereof. BRPL may at its discretion elect to return defective Commodities to Supplier for replacement, free of charge to BRPL, or may reject such Commodities and purchase the same or similar Commodities from any third party. In the latter case BRPL shall furnish proof to Supplier of the cost of such substitute purchase. In either case, all costs of any replacement, substitution, shipping, labour and other related expenses incurred in connection with the return and replacement or for the substitute purchase of a Commodity hereunder should be for the account of Supplier. BRPL may set off such costs against any amounts payable by BRPL to Supplier. Supplier shall reimburse BRPL for the amount, if any, by which the price of a substitute Commodity exceeds the price for such Commodity as quoted in the Bid.

18.0 Effective Date of Commencement of Contract:

The date of the issuance of the Letter of Acceptance/Purchase Order shall be treated as the effective date of the commencement of Contract.

19.0 Time – The Essence of Contract

The time and the date of completion of the "Supply"" as stipulated in the Letter Of Acceptance / Purchase order issued to the Supplier shall be deemed to be the essence of the "Contract". The Supply has to be completed not later than the aforesaid Schedule and date of completion of supply.

20.0 The Laws and Jurisdiction of Contract:

The laws applicable to this Contract shall be the Laws in force in India. To the best of their ability, the parties hereto shall endeavor to resolve amicably between themselves all disputes arising in connection with this work order. If the same remain unresolved within thirty (30) days of the matter being raised by either party, either party may refer the dispute for adjudication by arbitration. The arbitration shall be undertaken by the sole arbitrator jointly appointed by the parties. In case the parties fail to arrive at consensus to appoint the sole arbitrator, either party may approach the Court for appointing an arbitrator under Section 11 of the Arbitration and Conciliation Act, 1996 and the award of the said sole arbitrator, shall be final and binding upon the parties. The arbitration proceeding shall be conducted in accordance with this provisions of the Indian Arbitration & Conciliation Act, 1996 (as amended up to date) and the venue of such arbitration shall be the city of New Delhi only. The Arbitration shall be conducted in English language only. The courts at Delhi shall have the exclusive jurisdiction over the subject matter of Arbitration/dispute. The cost of the Arbitration shall be equally shared by the parties as per directions of the Sole Arbitrator.

21.0 Events of Default

21.01 Events of Default. Each of the following events or occurrences shall constitute an event of default ("Event of Default") under the Contract:

(a) Supplier fails or refuses to pay any amounts due under the Contract;

(b) Supplier fails or refuses to deliver Commodities conforming to this RFQ/ specifications, or fails to deliver Commodities within the period specified in P.O. or any extension thereof

(c) Supplier becomes insolvent or unable to pay its debts when due, or commits any act of bankruptcy, such as filing any petition in any bankruptcy, winding-up or reorganization proceeding, or acknowledges in writing its insolvency or inability to pay its debts; or the Supplier's creditors file any petition relating to bankruptcy of Supplier;

(d) Supplier otherwise fails or refuses to perform or observe any term or condition of the Contract and such failure is not remediable or, if remediable, continues for a period of 30 days after receipt by the Supplier of notice of such failure from BRPL.

22.0 Consequences of Default

(a) If an Event of Default shall occur and be continuing, BRPL may forthwith terminate the Contract by written notice.

(b) In the event of an Event of Default, BRPL may, without prejudice to any other right granted to it by law, or the Contract, take any or all of the following actions;

(i) present to Bank for forfeiture to the relevant bank the Performance Bond;

(ii) Purchase the same or similar Commodities from any third party; and/or

(iii) Recover any losses and/or additional expenses BRPL may incur as a result of Supplier's default.

23.0 Liquidated Damages

23.01 If supply of items / equipment is delayed beyond the supply schedule as stipulated in LOI/PO, then the Supplier shall be liable to pay the Purchaser for delay a sum of 0.5% (half percent) of the total price for every week of delay or part thereof for undelivered units.

23.02 The total amount for delay under the contract will be subject to a maximum of ten percent (10%) of the total contract value.

23.03 The Purchaser may, without prejudice to any method of recovery, deduct the amount for such damages from any amount due or which may become due to the Supplier or from the Performance Bond or file a claim against the supplier. The levy payment or deduction of such damages shall not relieve the Contractor from his obligation to complete the Supply on time or from any other part of his obligation and liabilities under the Contract. Once the maximum is reached, the Company reserves the right for termination of contract without any liabilities to the Company.

In the event of an extension of time being granted by the EIC, in writing for the Completion of the works, this clause shall be applicable after the expiry of such an extended period.

24.0 Statutory variation in Taxes and Duties

The total order value shall remain **FIRM** within stipulated delivery period and shall not be adjusted on account of any price increase/variations in commodities & raw materials. However Statutory Taxes, duties and Levies imposed by Competent Authorities by way of fresh notification(s) within the stipulated delivery period shall be borne by BRPL on submission of necessary documents claiming such variation. The variation will be applicable only on such value wherever price breakup of same is submitted by vendor/available in PO/WO

25.0 Force Majeure

25.01 General

An ”Event of Force Majeure" shall mean any event or circumstance not within the reasonable control directly or indirectly, of the Party affected, but only if and to the extent that:

(i) Such event or circumstance materially and adversely affects the ability of the affected Party to perform its obligations under this Contract, and the affected Party has taken all reasonable precautions, due care and reasonable alternative measures in order to prevent or avoid the effect of such event on the affected party's ability to perform its obligations under this Contract and to mitigate the consequences thereof.

(ii) For the avoidance of doubt, if such event or circumstance would not have materially and adversely affected the performance of the affected party had such affected party followed good industry practice, such event or circumstance shall not constitute force majeure.

(iii) Such event is not the direct or indirect result of the failure of such Party to perform any of its obligations under this Contract.

(iv) Such Party has given the other Party prompt notice describing such events, the effect thereof and the actions being taken in order to comply with above clause.

25.02 Specific Events of Force Majeure subject to the provisions of above clause, Events of Force Majeure shall include only the following to the extent that they or their consequences satisfy the above requirements:

(i) The following events and circumstances:

a) Effect of any natural element or other acts of God, including but not limited to storm, flood, earthquake, lightning, cyclone, landslides or other natural disasters.

b) Explosions or fires

(ii) War declared by the Government of India, provided that the ports at Mumbai are declared as a war zone.

(iii) Dangers of navigation, perils of the sea.

25.03 Notice of Events of Force Majeure If a force majeure event prevents a party from performing any obligations under the Contract in part or in full that party shall:

i) Immediately notify the other party in writing of the force majeure events within 7(seven) working days of the occurrence of the force majeure event

ii) Be entitled to suspend performance of the obligation under the Contract which is affected by force majeure event for the duration of the force majeure event.

iii) Use all reasonable efforts to resume full performance of the obligation as soon as practicable

iv) Keep the other party informed of all such efforts to resume full performance of the obligation on a regular basis.

v) Provide prompt notice of the resumption of full performance or obligation to the other party.

25.04 Mitigation of Events of Force Majeure Each Party shall:

(i) Make all reasonable efforts to prevent and reduce to a minimum and mitigate the effect of any delay occasioned by an Event of Force Majeure including recourse to alternate methods of satisfying its obligations under the Contract;

(ii) Use its best efforts to ensure resumption of normal performance after the termination of any Event of Force Majeure and shall perform its obligations to the maximum extent practicable as agreed between the Parties; and

(iii) Keep the other Party informed at regular intervals of the circumstances concerning the event of Force Majeure, with best estimates as to its likely continuation and what measures or contingency planning it is taking to mitigate and or terminate the Event of Force Majeure.

25.05 Burden of Proof In the event that the Parties are unable in good faith to agree that a Force Majeure event has occurred to an affected party, the parties shall resolve their dispute in accordance with the provisions of this Agreement. The burden of proof as to whether or not a force Majeure event has occurred shall be upon the party claiming that the force majeure event has occurred and that it is the affected party.

25.06 Termination for Certain Events of Force Majeure. If any obligation of any Party under the Contract is or is reasonably expected to be delayed or prevented by a Force Majeure event for a continuous period of more than 3 months, the Parties shall promptly discuss in good faith how to proceed with a view to reaching a solution on mutually agreed basis. If a solution on mutually agreed basis cannot be arrived at within a period of 30 days after the expiry of the period of three months, the Contract shall be terminated after the said period of 30 days and neither Party shall be liable to the other for any consequences arising on account of such termination.

25.07 The Purchaser may terminate the contract after giving 7(seven) days notice if any of following occurs:

a) Contractor fails to complete execution of works within the approved schedule of works, terms and conditions

b) In case the contractor commits any Act of Insolvency, or adjudged insolvent

c) Has abandoned the contract

d) Has failed to commence work or has suspended the progress of works

e) Has failed to proceed the works with due diligence and failed to make such due progress

25.08 Limitation of Force Majeure event. The Supplier shall not be relieved of any obligation under the Contract solely because cost of performance is increased, whether as a consequence of adverse economic consequences or otherwise.

25.09 Extension of Contract Period due to Force Majeure event The Contract period may be extended by mutual agreement of Parties by way of an adjustment on account of any period during which an obligation of either Party is suspended due to a Force Majeure event.

25.10 Effect of Events of Force Majeure. Except as otherwise provided herein or may further be agreed between the Parties, either Party shall be excused from performance and neither Party shall be construed to be in default in respect of any obligations hereunder, for so long as failure to perform such obligations shall be due to an event of Force Majeure."

26.0 Transfer and Sub-Letting

The Supplier shall not sublet, transfer, assign or otherwise part with the Contract or any part thereof, either directly or indirectly, without prior written permission of the Purchaser.

27.0 Recoveries

When ever under this contract any money is recoverable from and payable by the bidder, the purchaser shall be entitled to recover such sum by appropriating in part or in whole by detecting any sum due to which any time thereafter may become due from the supplier in this or any other contract. Should the sum be not sufficient to cover the full amount recoverable the bidder shall pay to the purchaser on demand the remaining balance.

28.0 Waiver

Failure to enforce any condition herein contained shall not operate as a waiver of the condition itself or any subsequent breach thereof.

29.0 Indemnification

Notwithstanding contrary to anything contained in this RFQ, Supplier shall at his costs and risks make good any loss or damage to the property of the Purchaser and/or the other Supplier engaged by the Purchaser and/or the employees of the Purchaser and/or employees of the other Supplier engaged by the Purchaser whatsoever arising out of the negligence of the Supplier while performing the obligations under this contract.

30.0 Documentation:

The Bidder's shall procure all equipment from BRPL approved sources as per attached specifications. The Bidder's shall submit 5 copies of Material/Type Test Certificates, O&M Manuals, and Approved & As-built drawings. The Bidder's shall ensure for the strict compliance to the specifications and Field Quality Procedures issued by BRPL Engineer in-charge.

31.0 Commissioning Spares

Commissioning Spares shall be deemed to be included in the quoted prices

32.0 Limitation on Liability

Notwithstanding anything to the contrary in the Purchase Order but subject to clause 33 Consequential Damages, the aggregate liability of either Party to the other Party in respect of all claims for Liabilities arising under the Purchase Order shall not exceed the aggregate value of the Purchase Order(s) under which the Liabilities arose except that such limitation shall not apply to the Contractor's indemnification obligations in accordance with clause 29 Indemnification herein.

33.0 Consequential Damages

Notwithstanding anything to the contrary in the Purchase Order, except for breach of obligations under Non-disclosure and except as expressly provided in a Purchase Order, in no event, as a result of breach of contract or breach of warranty or otherwise, shall either Party hereto or either Party's Affiliates or sub Contractors, be liable under the Purchase Order to the other Party for any consequential, special, indirect, exemplary or incidental damages, and/or for any lost profits, goodwill or revenues of such Party, howsoever arising, before or after Acceptance of the Goods and whether or not such damages are foreseeable.

SECTION V

PRICE FORMAT – SUPPLY

PART-A - 33kV MONOPOLES

Shifting of 33KV Tower O/H line from Kilokari to AIIMS and Kilokari to RK Puram at Ring road T point to Kilokari on the request of PWD.								
S.No.	**Description of Material (Supply part) for 33 KV**	**UoM**	**Qty.**	**Basic (Rs)**	**Freight (Rs)**	**GST (Rs)**	**Unit Landed (Rs)**	**Total Landed Cost (Rs)**
1	33kV PA (90d)_BXA-15M - Monopole	EA	1					
2	Number plate	EA	1					
3	Danger Plate	EA	1					
4	Phase Plate in Set of red Blue & Yellow	SETS	1					
5	Anti Climbing Device	SETS	1					
6	Pipe type earthing material	EA	2					
7	ACSR Wolf Conductor	KM	0.9					
8	7/3.15 Sq mm Earth wire	KM	0.2					
9	Single Suspension Fitting	EA	1					
10	Single Suspension Pilot	EA	3					
11	Single Tension Fitting	EA	3					
12	Double Tension	EA	12					
13	Mid span joint	EA	12					
14	Vibration dampers	EA	12					
15	Repair Sleeve	EA	5					
16	PA Rod	EA	3					
17	Composite Silicon-Rubber Insulator string Suitable for Tension Fittingof 70 KN	EA	27					
18	Tension Clamp earth wire	EA	2					
19	Mid span joint Earth wire	EA	2					
20	Earth Bond	EA	2					
21	Vibration Damper for Earth wire	EA	2					

PART-B - 66kV MONOPOLES AT GOYALA KHURD

S.No.	Description of Material	UoM	Qty.	Basic (Rs)	Freight (Rs)	GST (Rs)	Unit Landed (Rs)	Total Landed Cost (Rs)
1	Mono Poles PB+3 Type	NOS	2					
2	Hardware Fitting Single Tension Compression Type for ACSR Goat	NOS	24					
3	Fittings for Earth wire 7/3.15 mm	NOS	2					
4	INSLTR,DSC;CER;11KV;ANTIFOG TYP;120KN	NOS	156					
5	Vibration Damper for ACSR Goat	NOS	24					
6	CLMP,PARRL GROV,ACSR GOAT CNDCTR	NOS	24					
7	Earth Wire 7/3.15 mm	KG	300					
8	Anticlimbing Devices	NOS	2					
9	ACSR Goat Conductor	M	1500					

BOQ shall be read in conjunction with the Tender Document & General Design Criteria

Appendix- I

COMMERCIAL TERMS AND CONDITIONS - SUPPLY

Sl No	Item Description	AS PER BRPL	BIDDER'S CONFIRMATION
1	Validity	120 days from the due date of submission or amended due date of submission	
2	Price basis	a) **Firm**, FOR Delhi store basis. Prices shall be inclusive of all taxes & duties, freight up to Delhi stores. b)Unloading at stores - in vendor's scope c) Transit insurance in Bidder scope	
3	Payment terms	a. 80 % against R/A bills within 30 days against receipt of material at site. b. 10% pro-rata after installation/erection of equipment c. 10% pro-rata after completion of successful acceptance testing, commissioning and Handing Over of the entire Installation and duly certified by BRPL Project-in-charge and submission of BG of 10% of contract value valid up to Defect Liability period i.e. 12 months from the date of Handing over of entire Installation Plus 3 months towards Claim period	
4	Completion time	Part A: 10 Weeks from date of LOI/Order Part B: 24 Weeks from date of LOI/Order	
5	Defect Liability period	12 months from the date of Handing over of entire Installation.	
6	Liquidated damages	0.5% of total price for every week delay subject to maximum of 10% of total contract value	
7	Contract Performance Bank Guarantee	10% (Ten percent) of the Contract Price valid up to completion period/handing over.	
8	Performance Bank Guarantee	10% (Ten percent) of the Contract Price valid up to Defect Liability Period plus 3 months towards claim period.	

SECTION VI

GENERAL TERMS & CONDITIONS - ERECTION, TESTING & COMMISSIONING

1. DEFINITIONS and INTERPRETATION

The following terms shall have the following meanings:

1.1 "Company": means BSES Rajdhani Power Ltd, a company incorporated under the Companies Act 1956 and having its office at BSES Bhawan, Nehru Place, New Delhi 110 019, which expression shall include its authorized representatives, agents, successors and assigns.
1.2 "Contractor": shall mean the successful Bidder / vendor to whom the contract has been awarded
1.3 "Rate": The unit rates for the work to be carried out at site shall be as per finalized unit rates through tender. The finalized rates shall be firm for the entire duration of work to be carried out by the Contractor under the work order and are not subject to escalation for any reason whatsoever.
1.4. Contract Specification: The terms "Contract Specification" shall mean the Technical specification of the work as agreed by you and description of work as detailed in Annexure-I enclosed herewith and all such particulars mentioned directly/referred to or implied as such in the contract.
1.5 SITE: The terms "Site" shall mean the working location in BRPL area. Under this tender, working location shall be as mentioned elsewhere.
1.6 ENGINEER IN CHARGE: "Engineer In-charge" means the Company's authorized representative for the purpose of carrying out the work.

2. EXAMINATION OF SITE AND LOCAL CONDITIONS:

The contractor is deemed to have visited the site of the work and ascertained therefore all site conditions and information pertaining to his work. The company shall not accept any claim whatsoever arising out of the difficult site/terrain/local conditions, if any.

3. LANGUAGE AND MEASUREMENT:

The Contract issued to the contractor by the company and all correspondence and documents relating to the Contract placed on the Bidder shall be written in English language.

Metric System shall be followed for all dimension, units etc.

4. SCOPE OF WORK:

The scope includes survey , design , engineering , manufacture , shop testing ,inspection , packing , dispatch , loading, unloading and storage at site, storage and construction insurance , assembly , erection ,structural , complete pre-commissioning checks and handing over to owner after successful testing & Commissioning on single point responsibility basis. Schedule of work shall be as per BOQ attached herewith.

All the labour, cranes, tool and tackles, and technical supervision etc. are including in your scope of work. Adequate number of engineers, supervisors and laborers shall be posted at site and the list of the same along with certificate of Qualification of technical staff should be submitted by the Bidder to the Engineer In Charge for checking the adequacy immediately (within seven days) after award of contract.

The Bidder shall also make his own arrangement for the accommodation/conveyance requirements for its staff at site. Company will be provided at site the adequate open space for Bidder's site store for storing the materials, tools, tackles etc. The entire Bidder's storage will be within the site premises. All the incoming and outgoing materials, equipment, tools, tackles and any other items related to said work shall be entered into the register kept for this purpose and shall

be in the custody of Bidder, however company does not hold any responsibility for any loss or damage of Bidder's material etc.

All loading/unloading, of materials at work-site shall be Bidder's responsibility. Involvement of Crane/Hydra/Tractor/Trailer for this type of work shall be in your scope. Adequate weather protection shall be provided by the Bidder to keep the materials safe from sun & rain by providing covered storage space as well as using tarpaulins.

The Bidder at his own shall arrange Water and Electricity Power at his cost.

Special Instruction:-

a. All Erection tools and tackles and testing equipment shall be available with Bidder in event of order.

b. Penalty clause shall be incorporated in case any of workmen of Bidder is found violating safety protocol as per GCC-ETC LD Clause no 15.

Any additional work beyond the scope enumerated in the work order above shall be carried out as per the instructions of Engineer-In Charge. The company shall not entertain any claim or increase in the Work Order value due to execution of such additional work if the same is not approved by Engineer in Charge.

5. RATES:

The rates finalized for this order shall be firm for the entire duration of work carried out by the Bidder under the order and are not subject to any variation and escalation for any reason whatsoever.

The cost of insurance during loading/unloading of materials/ equipments during its storage and handling/erection at site for installation is included in the Bidder's scope and value shall be included in the unit rates finalized.

The unit rates finalized is also inclusive of barricading and watch & ward during execution and no separate charges shall be paid for the same.

6. TAXES AND DUTIES:

Prices are inclusive of all taxes and duties including GST as applicable. However, IT as per applicable rate will be deducted from your bills as Tax Deduction at Source (TDS).

The total order value shall remain **FIRM** within stipulated delivery period and shall not be adjusted on account of any price increase/variations in labour. However Statutory Taxes, duties and Levies imposed by Competent Authorities by way of fresh notification(s) within the stipulated delivery period shall be borne by BRPL on submission of necessary documents claiming such variation. The variation will be applicable only on such value wherever price breakup of same is submitted by vendor/available in PO/WO.

7. TERMS OF PAYMENT (Erection, Testing & Commissioning)

Payment shall be made as under:

i) 80% pro-rata of total installation value shall be payable against R/A bills payable within 45 days after installation / erection of material at site duly certified by Engineer in charge.

ii) 10% pro-rata of total installation value shall be payable against R/A bills payable within 30 days after testing & commissioning of material at site.

iii) 10% of contract value payable after completion of successful acceptance testing, commissioning and handing over of complete systems duly certified by Engineer in charge, submission of Electrical Inspector Clearance Certificate & submission of Performance Bank Guarantee of 10% of contract value valid up to defect liability period i.e. 12 months from the date of Handing over of entire Installation Plus 3 months towards Claim period.

All the Bank guarantees shall be submitted as per Company's format (Appendix I) and from any scheduled Bank approved by Company.

Company shall make payments of the bills either; By crossed cheque or by electronic transfer directly to Bidder's designated bank account.

8. Guarantee of Performance

The bidder shall stand guarantee that the equipment and material supplied/service or work rendered under the contract is free from design, manufacturing, material, construction, erection & installation and workmanship & quality defects and is capable of its due, rated and intended quality performance, as an integrated product delivered under the contract for a specific period termed as Guarantee Period. The bidder should also guarantee that the equipment/material is new and unused except for the usage required for the tests and checks required as part of quality assurance.

9. Guarantee period/Defect Liability period:

The Guarantee Period will be equipment/service/work specific and shall be as specified in the Technical Specifications for the equipment/material/service/work and where Technical specifications are not part of contract documents or guarantee period is not specified in the Technical specifications, the guarantee period shall be as per the Special Terms and Conditions of the Contract. In case of no mention of the guarantee period in Technical specifications, Defect liability period will be 12 Months from the Date of Commissioning.

If during the defects liability period any materials / items are found to be defective, these shall be replaced or rectified by the bidder at his own cost within 30 days from the date of receipt of intimation.

10. Performance Guarantee

10.01 Bank guarantee shall be drawn in favour of "BSES Rajdhani Power Ltd" as applicable. The performance Bank guarantee shall be in the format as specified by BRPL.

10.02 Contract performance bank guarantee of total 10% of the contract price shall be submitted within 15 days of award of contract with the validity till completion of the contract period.

10.03 Bidder shall submit the performance bank guarantee equivalent to the 10% of the contract value at the time of claiming the last payment as per clause no. 7.0 (iii) (TERMS OF PAYMENT (Erection, Testing & Commissioning)), with the validity of the bank guarantee till Defect Liability Period i.e. 24 months from the date of Handing over of entire Installation plus 3 months.

11. COMPLETION PERIOD

You are required to mobilize your manpower and Tools & Tackles and furnish a list of equipments to be used for erection and commence the execution activity as per instructions of Engineer In-charge. The entire Erection, Testing & Commissioning work should be completed within 02 months for Part-A & 06 Months for Part-B from the date of issue of LOI/WO. The detailed schedule and milestone completion dates would be as per the contract schedules given from time to time by Engineer In-charge at site. You shall submit a weekly progress report to Engineer In charge.

12. CLEANLINESS

All debris shall be removed and disposed of at assigned areas on daily basis. Surplus excavated earth shall be disposed of in an approved manner. In short, you shall be fully responsible for keeping the work site clean at all times. In case of non- compliance, company shall get the same done at Bidder's risk and costs.

13. COMMISSIONING & ACCEPTANCE TEST:

After completion of the work, the Bidder shall conduct trial run/ operation in the presence of Engineer In charge. During such trial run the system shall be operated under the supervision of the Bidder. If any rectification/modification required during this period the Bidder shall do all necessary measures.
On satisfactory completion of above, the system shall be deemed to have energized and placed in commercial operation. The Engineer-in-Charge will issue an acceptance certificate.

14. WORK COMPLETION CERTIFICATION, HANDING OVER.

The work carried out by the Bidder under this order has to be certified by Engineer In-charge for satisfactory completion of work allotted to the Bidder with respect to specifications / Field Quality Procedures as per applicable standards. In case of modification/correction to be carried out, Bidder shall carry out the said modifications/correction without additional cost. The Bidder shall remain in close contact with Engineer In-Charge at site to report the general findings of the fieldwork during the initial as well as later stage of the work at site.

The Bidder shall be solely responsible for any shortage or damage of materials issued to them handling of and / or in storage and erection at site and cost of the same will be recovered from the Bidder as certified by Engineer In-Charge. Bidder must submit a periodical material reconciliation statement in the approval format with every Running Bill raise by him or end of every month whichever is earlier. The Bidder shall maintain an accurate and exhaustive record detailing out the list of all items received by him for the purpose of erection and keep such record open for the inspection of the company.

15. PENALTY AND LIQUIDATED DAMAGES

15.1 Liquidated Damages: In the event of any delay in completion of the work beyond the stipulated time given by in order due to reasons solely attributable to the Bidder, the Bidder shall pay to the Company liquidated damages.

If the Bidder failed perform the services within the time period specified in the order, the Company shall, without prejudice to its other remedies under the contract, deduct liquidated damages a sum equivalent to 0.5 % of the total order value for each week or part there of delay until the actual date of completion up to a maximum deduction of 10% of total order value. The levy payment or deduction of such damages shall not relieve the Bidder from his obligation to complete the Works on time or from any other part of his obligation and liabilities under the Contract. Once the maximum is reached, the Company reserves the right for termination of contract without any liabilities to the Company.

In the event of an extension of time being granted by the EIC, in writing for the Completion of the works, this clause shall be applicable after the expiry of such an extended period.

Engineer In charge should specifically mention the amount of LD levied on the bill of Bidder.

18. SAFETY REGULATIONS & SAFETY CODE:

The Bidder shall indemnify the Company from any consequence arising due to Bidder's failure in respect to safety compliance.

First Aid facilities at easily accessible place shall be provided by the Bidder at his own cost as per provisions of Labor act or as advised by the Company wherever works are carried out.

All critical injuries shall be reported promptly to the Company. The report shall cover type, nature, cause, physician's report and actions for prevention of those types again.

To ensure effective enforcement of the rules and regulations relating to safety precautions, arrangements made by the Bidder shall be open to inspection by the Company.

The cost so incurred by the Bidder in providing for safety standards and requirements as above shall be deemed to be included in the rates quoted for various items under the scope of Contract and no extra amounts shall be payable to the Bidder on this account.

The Bidder shall furnish to the Company within seven days from issue of Work Order whichever is earlier, for approval of Company, the proposed safety program on how it intends to implement the safety procedures and precautions to ensure that the site is accident free.

The Bidder shall ensure adequate safety precautions at site as required under the law of the land and shall be entirely responsible for the complete safety of their workman as well as other workers at site and premises. The Bidder shall not deploy any worker below the age of 18 years.

The Bidder shall observe the safety requirements as laid down in the contract and in case of sub-contract (only after written approval of company), it shall be the responsibility of main Bidder that all safety requirements are followed by the employees and staff of the sub-vendor.

The Bidder employing two hundred employees or more, including contract workers, shall have a safety coordinator in order to ensure the implementation of safety requirements of the contract and a Bidder with lesser number of employees, including contract workers, shall nominate one of his employees to act as safety coordinator who shall liaise with the safety officer on matters relating to safety and his name shall be displayed on the notice board at a prominent place at the work site.

The Bidder shall be responsible for non-compliance of the safety measures, implications, injuries, fatalities and compensation arising out of such situations or incidents.

In case of any accident, the Bidder shall immediately submit a statement of the same to the owner and the safety officer, containing the details of the accident, any injury or causalities, extent of properly damage and remedial action taken to prevent recurrence and in addition, the Bidder shall submit a monthly statement of the accidents to the owner at the end of each month.

17. STATUTORY OBLIGATIONS:

The Bidder shall take all steps as may be necessary to comply with the various applicable laws/rules including the provisions of contract labour (Regulation & Abolition Act) 1970 as amended, minimum wages Act, 1984, Workman

Compensation Act, ESI Act, PF Act, Bonus Act and all other applicable laws and rules framed there under including any statutory approval required from the Central/State Govt. Ministry of Labour. Broadly, the compliance shall be as detailed below, but not limited to:

a) An Electrical license issued by Govt.of Delhi.
b) PF Code No. and all employees to have PF A/c No. under PF every Act, 1952.
c) All employees to have a temporary or permanent ESI Card as per ESI Act.
d) ESI Registration No.
e) PAN No.
f) Work Contract Tax Registration Number/ GSTN Registration.
g) Labour License under Contract Labour Act (R & A) Act 1970

(The Bidder shall provide BRPL Engineer-in-charge a copy of Labour License responsible for execution of the job before start of the work.)

The Bidder must follow:

a) Third party Insurance Policy before start of work.
b) To follow Minimum Wages Act prevailing in the state.
c) Salary / Wages to be distributed in presence of representative of Company's representative not later than 7th of each month.
d) To maintain Wage- cum - Attendance Register.
e) To maintain First Aid Box at Site.
f) Latest P.F. and E.S.I. challans pertaining to the period in which work was undertaken along with a certificate mentioning that P.F. and E.S.I. applicable to all the employees has been deducted and deposited with the Authorities within the time limits specified under the respective Acts.
g) Workman Compensation Policy. {If applicable}
h) Labour license before start of work. {If applicable}

18. <u>WORKMAN COMPENSATION</u>:

The Contactor shall take insurance policy under the Workman Compensation Act to cover such workers who are not covered under ESI and PF by the Bidder however engaged to undertake the jobs covered under this order and a copy of this insurance policy will be given to Company for reference and records. This insurance policy shall be kept valid at all times. In case there are no worker involve other than those who are covered under ESI and PF by the Bidder, the Bidder shall certify for the same.

The Bidder shall keep the company indemnified at all times, against all claims of compensation under the provision of Workmen Compensation Act 1923 and as amended from time to time or any compensation payable under any other law for the time being workman engaged by the Bidder/sub-contractor/sub-agent in carrying out the job involved under this work order and against costs and expenses, if any, incurred by the company in connection therewith and without prejudice to make any recovery.

The company shall be entitled to deduct from any money due to or to become due to the Bidder, moneys paid or payable by way of compensation as aforesaid or cost or expenses in connection with any claims thereto and the Bidder shall abide by the decision of the Company as to the sum payable by the Bidder under the provisions of this clause.

19. <u>STAFF AND WORKMAN</u>

It shall be responsibility of Bidder

(a) To obtain Contract Labour License from the concerned authorities and maintain proper liaison with them. Necessary Forms for obtaining Labour License would be issued by the company. However you will bear all expenses for obtaining

Labour license and registration in PF Department for your scope of work. You will deposit PF of your staff/laborer each month and all related documents should be furnished to us.

b) To obtain workman insurance cover against deployment of workers etc.

(II) To maintain, proper records relating to workmen employed, in the form of various Registers, namely,

a) Register of workmen.
b) Register of muster roll.
c) Register of overtime.
d) Register of wages.
e) Any other register as per latest amendment Labour Act.

The records shall be in the prescribed formats only.

(III) To disburse monthly wages to your workers/ supervisors in time and in the presence of Company representatives or as directed by the Labour authorities.

(IV) To maintain proper liaison with the Project authorities, local police and all other government and local bodies.

(V) To pay your workmen at least not less than the minimum prescribed wages as per state/Central Labour laws as may be, applicable. The Bidder shall, be responsible for compliance of all the provisions of minimum Wages Act, PF, ESIC Act workmen Compensation Act and Contract Labour Regulation & Abolition Act the rules made there under. In case of non-compliance of the statutory requirements, the company would take necessary action at the risk and cost of the Bidder.

(VI) To employ required number of skilled/semi-skilled and unskilled workmen as per site requirement to complete the entire project as per schedule. To provide safety shoes, safety helmets, safety belts, gloves etc. to your worker/staff as per requirement during erection work.

(VII) To employ necessary engineering and supervisory staff for completion of the Project in time. While day-to-day management of the site and supervision of the works shall be the responsibility of your Engineer - In charge, he will report to the Engineer in charge to assist him to discharge the overall responsibility of the execution of the project.

20. INSURANCE

a) THIRD PARTY INSURANCE

Before commencing the execution of the work the Bidder shall take third party insurance policy at his own cost to insure against any damage or loss or injury which may occur to any property/public property or to any person or any employee or representative of any outside Agency / the company engaged or not engaged for the work of the company, by or arising out of the execution of the work or temporary work or in carrying out of this Agreement. For third party insurance policies, the Bidder shall be responsible for settlement of claims with the underwriters without any liability on the purchaser / owner and will arrange replacements / rectification expeditiously without awaiting settlement by insurance claim at Bidders own cost.

b) ACCIDENTAL INSURANCE POLICY FOR LIFE COVER:

Before commencing the execution of the work, the Bidder shall take Accidental insurance policy for the staff engaged by him for this work to insure against any loss of life which may occur during the contract for the work of the Company. The policy shall have coverage of Rs. 10 Lacs (Table C- Death + Permanent Total Disability +

Partial permanent Disability due to external accidents). The Bidder shall be responsible for on the spot same day claim settlement with the victim' s legal heirs without waiting for settlement by insurance claim without any liability on BRPL. The premium amount for such life cover policy shall be borne by the Bidder. The Bidder shall furnish copy of policy when demanded by BRPL.

c) INSURANCE FOR MAN, MATERIAL & MACHINERY DEPLOYED AT SITE

Bidder shall be responsible for the insurance for his own man, material and machinery deployed at site for the package awarded. Bidder shall furnish the copy of this insurance policy to the purchaser, prior start of work.

21. SECURITY

Adequate number of trained Security Guards shall be deployed both at the storage yard and stores as well as places of work to prevent theft and pilferage of material and accessories and various other materials. All security rules and safety rules enforced at site by company shall be strictly observed.

22. ENVIRONMENTAL, HEALTH & SAFETY PLAN:

Bidder will make ensure that the Environment, Health & Safety (EHS) requirements are clearly understood and faithfully implemented at all levels at site as per instruction of Company. Bidders must comply with these requirements:

a) Comply with all of the elements of the EHS Plan and any regulations applicable to the work

b) Comply with the procedures provided in the interests of Environment, Health and Safety

c) Ensure that all of their employees designated to work are properly trained and competent

d) Ensure that all plant and equipment they bring on to site has been inspected and serviced in accordance with legal requirement and manufacturer's or suppliers' instructions

e) Make arrangements to ensure that all employees designated to work on or visit the site present themselves for site induction prior to commencement of work

f) Provide details of any hazardous substances to be brought onsite

g) Ensure that a responsible person accompanies any of their visitors to site

All Bidders staffs are accountable for the following:

1. Use the correct tools and equipment for the job and use safety equipment and protective clothing supplied, e.g. helmets, goggles, ear protection, etc. as instructed
2. Keep tools in good condition
3. Report to the Supervisor any unsafe or unhealthy condition or any defects in plant or equipment
4. Develop a concern for safety for themselves and for others
5. Prohibit horseplay
6. Not to operate any item of plant unless they have been specifically trained and are authorized to do so.

23. TEST CERTIFICATE & QUALITY ASSURANCE:

The Bidder shall procure all equipment from genuine sources as approved by the Company and as per Company specifications. The Bidder shall submit all the test certificates and joint inspection reports related to major equipment wherever applicable. The Bidder shall ensure for the strict compliance to the specifications and Field Quality Procedures issued by company / Engineer in-charge.

24. SUB-CONTRACTING / SUBLETTING:

BIDDER shall not assign or transfer the whole or any part of this Work Order or any other benefits accruing there from nor shall it subcontract / sublet the whole or any part of the Works without the prior written consent of COMPANY.

In the event the Bidder assigns this work order, Bidder's assignees shall be bound by the terms and conditions of this work order and shall , if deemed necessary by COMPANY at the time of such assignment, undertake in writing to be so bound by this Work Order.

Notwithstanding the subletting / subcontracting of any portion of the works, Bidder shall remain wholly responsible for the carrying out, completion and satisfactory execution of Works in all respects in accordance with this Work Order, specification, approved drawings and data sheets.

25. INDEMNITY:

Bidder shall indemnify and save harmless COMPANY against and from any and all liabilities, claims, damages, losses or expenses arising due to or resulting from:

A. Any breach non-observance or non-performance by Bidder or its employees or agents of any of the provisions of this Work Order.
B. Any act or omission of Bidder or its employees or agents.
C. Any negligence or breach of duty on the part of Bidder, its employees or agents including any wrongful use by it or them of any property or goods belonging to or by COMPANY or any other third party at site including adjoining neighbors.

Bidder shall at all times indemnify COMPANY against all liabilities to other persons, including the employees or agents of COMPANY or Bidder for bodily injury, damage to property or other loss which may arise out of or in consequence of the execution or completion of Works and against all costs charges and expenses that may be occasioned to COMPANY by the claims of such person.

26. EVENTS OF DEFAULTS:

COMPANY may, without prejudice to any of its other rights or remedies under the Work Order or in law, terminate the whole or any part of this Work Order by giving written notice to the Bidder, if in the opinion of COMPANY, Bidder has neglected to proceed with the works with due diligence or commits a breach of any of the provisions of this work order including but not limited to any of the following cases:

a) Failing to complete execution of work within the terms specified in this work order.
b) Failing to complete works in accordance with the approved schedule of works.
c) Failing to meet requirements of specifications, drawings, and designs as approved by COMPANY.
d) Failing to comply with any reasonable instructions or orders issued by COMPANY in connection with the works.
e) Failing to comply with any of the terms or conditions of this work order.

In the event COMPANY terminates this work order, in whole or in part, on the occurrence of any event of default, COMPANY reserves the right to engage any other sub-vendor agency to complete the work or any part thereof, and in addition to any other right COMPANY may have under this work order or in law including without limitation the right to penalize for delay under clause 15.0 of this tender, the contractor shall be liable to COMPANY for any additional costs that may be incurred by COMPANY for the execution of the Work.

27. RISK & COST:

If the Contractor of fails to execute the work as per specification / as per the direction of Engineer's In-change within the scheduled period and even after the extended period, the contract shall got cancel and company reserves the right to get the work executed from any other source at the Risk & Cost of the Contractor. The Extra Expenditure so incurred shall be debited to the Contractor.

28. ARBITRATION:

To the best of their ability, the parties hereto shall endeavor to resolve amicably between themselves all disputes arising in connection with this LOA. If the same remain unresolved within thirty (30) days of the matter being raised by either party, either party may refer the dispute for settlement by arbitration. The arbitration is to be undertaken by two arbitrators, one each to be appointed by either party. The arbitrators appointed by both the parties shall mutually nominate a person to act as presiding arbitrator before entering upon the reference in the event of a difference between the two arbitrators and the award of the said presiding arbitrator in such a contingency shall be conducted in accordance with this provisions of the Indian Arbitration & Conciliation Act, 1996 and the venue of such arbitration shall be in the city of New Delhi only.

29. FORCE MAJEURE:

29.1 General:

An "Event of Force Majeure" shall mean any event or circumstance not within the reasonable control, of the Party affected, but only if and to the extent that:

(i) Such event or circumstance, despite the exercise of reasonable diligence, could not have been prevented, avoided or reasonably foreseen by such Party;

(ii) Such event or circumstance materially and adversely affects the ability of the affected Party to perform its obligations under this Contract, and the affected Party has taken all reasonable precautions, due care and reasonable alternative measures in order to prevent or avoid the effect of such event on the affected parties ability to perform its obligations under this Contract and to mitigate the consequences thereof. For the avoidance of doubt, if such event or circumstance would not have materially and adversely affected the performance of the affected party had such affected party followed good industry practice, such event or circumstance shall not constitute force majeure.

(iii) Such event is not the direct or indirect result of the failure of such Party to perform any of its obligations under this Contract; and

(iv) Such Party has given the other Party prompt notice describing such events, the effect thereof and the actions being taken in order to comply with above clause

29.2 Specific Events of Force Majeure:

Subject to the provisions of above clause, Events of Force Majeure shall include only the following to the extent that they or their consequences satisfy the above requirements:
The following events and circumstances:

a) Effect of any natural element or other acts of God, including but not limited to storm, flood, earthquake, lightning, cyclone, landslides or other natural disasters, and

b) Explosions or fires

c) Declaration of the Site as war zone.

d) Any order, regulation, directive, requirement from any Governmental, legislative, executive or judicial authority.

29.3 Notice of Events of Force Majeure
If a force majeure event prevents a party from performing any obligations under the Contract in part or in full, that party shall:

(i) Immediately notify the other party in writing of the force majeure events within 2 working days of the occurrence of the force majeure event

(ii) Be entitled to suspend performance of the obligation under the Contract which is affected by force majeure event for the duration of the force majeure event

(iii) Use all reasonable efforts to resume full performance of the obligation as soon as practicable

(iv) Keep the other party informed of all such efforts to resume full performance of the obligation on a regular basis

(v) Provide prompt notice of the resumption of full performance or obligation to the other party.

29.4 Mitigation of events of force majeure:

The Bidder shall:

(i) Make all reasonable efforts to prevent and reduce to a minimum and mitigate the effect of any delay occasioned by an Event of Force Majeure, including applying other ways in which to perform the Contract;

(ii) Use its best efforts to ensure resumption of normal performance after the termination of any Event of Force Majeure and shall perform its obligations to the maximum extent practicable as agreed between the Parties; and Keep the Company informed at regular intervals of the circumstances concerning the event of Force Majeure, with best estimates as to its likely continuation and what measures or contingency planning it is taking to mitigate and or terminate the Event of Force Majeure.

29.5 Burden of proof:
In the event that the Parties are unable in good faith to agree that a Force Majeure event has occurred to an affected party, the parties shall resolve their dispute in accordance with the provisions of this Contract. The burden of proof as to whether or not a force majeure event has occurred shall be upon the party claiming that the force majeure event has occurred and that it is the affected party.

29.6 Terminations for certain events of force majeure:

If any obligation of any Party under the Contract is or is reasonably expected to be delayed or prevented by a Force Majeure event for a continuous period of more than 1 (one) month during the Term of the Contract the Contract shall be terminated at the discretion of the Company and neither Party shall be liable to the other for any consequences arising on account of such termination.

30. <u>SECRECY CLAUSE</u>:

The technical information, drawing and other related documents forming part of work order and the information obtained during the course of investigation under this work order shall be the Company's executive property and shall not be used for any other purpose except for the execution of the work order. The technical information drawing, records and other document shall not be copied, transferred, or divulged and/ or disclosed to third party in full/part, not misused in any form whatsoever except to the extent for the execution of this work order.

This technical information, drawing and other related documents shall be returned to the Company with all approved copies and duplicates including drawing/plans as are prepared by the Bidder during the executions of this work order, if any, immediately after they have been used for agreed purpose.
In the event of any breach of this provision, the Bidder shall indemnify the Company against any loss, cost or damage or claim by any party in respect of such breach.

31. TERMINATION

"During the course of the execution, if at any time BRPL observe and form an opinion that the work under the order is not being performed in accordance with the terms of this Agreement, BRPL reserves its right to cancel this Agreement giving 15 days notice mentioning the reason for the termination of the agreement and BRPL will recover all damages including losses occurred due to loss of time from Bidder.

32. QUALITY

Bidder shall ensure that strict quality is maintained and execution of works under the Work Order and Works are executed in conformity with the Specification.

All tools, tackles, instruments and other equipments used in the execution of the Works shall be duly calibrated as required and Bidder shall maintain proper records of such tools, tackles, instruments and / or equipment.

33. LIABILITY OF BIDDERS

Subject to the due discharge of its obligations under the Contract and except in case of gross negligence or willful misconduct on the part of the Bidder or on the part of any person acting on behalf of the Bidder, with respect to any loss or damage caused by the Bidder to the Employer's property or the Site, the Bidders shall not be liable to the Employer for the following:

a) For any indirect or consequential loss or damage; and
b) For any direct loss or damage that exceeds:

(i) The total payments made and expected to be made to the Bidder under the Contract including reimbursements, if any; or
(ii) The insurance claim proceeds which the Bidder may be entitled to receive from any insurance purchased by the Bidder to cover such a liability, whichever is higher.
This limitation of liability shall not affect the Bidder's liability, if any, for damage to any third party, caused by the Bidder or any Person or firm acting on behalf of the Bidder in executing the Works.
Notwithstanding anything contained in the Contract, the Bidder shall not be liable for any gross negligence or willful misconduct on the part of the Employer or any of its affiliates, any Bidder, or any party, other than Bidder and/or, its directors, officers, agents or representatives or its affiliates, or Sub-vendor, or the Bidder or any third party engaged by it.
Notwithstanding anything contained in the Contract, including but not limited to approval by the Employer of any drawings, documents, Bidder list, supply of information or data or the participation of the Employer in any meeting and/or discussion or otherwise, shall not absolve the Bidder from any of its liabilities or responsibilities arising in relation to or under the Contract.

SECTION VII

PRICE FORMAT – ERECTION, TESTING & COMMISSIONING

PART A: 33 kV Monopoles

Shifting of 33KV Tower O/H line from Kilokari to AIIMS and Kilokari to RK Puram at Ring road T point to Kilokari on the request of PWD.							
Sr. No.	**Item Discription (Service) For 33 KV**	**Unit**	**Quantity**	**Basic (Rs)**	**GST (Rs)**	**Unit Landed (Rs)**	**Total Landed Cost (Rs)**
1	Survey including preparation of final tower schedule of martial, marking of location (Route length) and super impose the GPS coordinates of diverted locations on elevated road plan to get the clearance from building etc before start the work.	KM	0.4				
2	Check survey & final peg marking (Route length)	KM	0.4				
3	Foundation of Monopole 33kV PA (90d)_BXA-15M	NOS	1				
4	Erection of Following type of monopoles and extensions wherever required including all work above ground level.33kV PA (90d)_BXA-15M	NOS	1				
5	Tack welding of all the bolts at Base Plate of Monopole.	NOS	31				
6	Laying, tensioning, Stringing, Clamping, Jointing etc complete with ACSR Wolf DC including hoisting of insulators fitting of all necessary hardware & accessories etc.	KM	0.4				
7	Laying, tensioning, Stringing, Clamping, jointing etc complete with ground wire including hoisting of all necessary hardware & acessories for 01 No. 7/3.15 SWG G.S Earthwire.	KM	0.4				
8	Ground work including earth material for pipe type earthing.	NOS	2				
9	Design Validation from IIT	NOS	1				
10	Dismentaling of ACSR WOLF Conductor, Earthwire, Insulator & Hardware Fittings i.e.Single Tension String Insulator fittings for WOLF conductor,Single Suspension String Insulator fittings for WOLF conductor with drop/tension clamp,Single Suspension String	KM	0.4				

11	Dismantling MS structure for different equipment like isolator, C.T.'s, P.T.'s, CVT, LA's etc, cable supporting structure including supply of nuts and bolts, consumables , welding electrode, hacksaw blades etc.	MT	3.7				
12	Transportation of various electrical equipment / material from various BRPL / BYPL Store / any site to the site of work in the Union Territory of Delhi including loading and unloading at both ends manually / by using suitable T&P for safe loading/ unloading.The material transported at site should be placed inyard where ever required. by Manually.	TRP	2				
13	Transportation of various electrical equipment / material from various BRPL / BYPL Store / any site to the site of work in the Union Territory of Delhi including loading and unloading at both ends manually / by using suitable T&P for safe loading/ unloading.The material transported at site should be placed inyard where ever required. by Using Crane.	TRP	3				

PART B: 66 kV Monopoles

S.NO.	Item Description	Unit	Quantity	Basic (Rs)	GST (Rs)	Unit Landed (Rs)	Total Landed Cost (Rs)
1	Route Srvey & Profiling	Km	0.25				
2	Soil Investigation for SBC	EA	2				
3	Design of D/C Line with Monopoles (Detailed BOQ)	Job	1				
4	Design of Foundation for Monopoles (Detailed BOQ)	Job	1				
5	Construcion of Foundations for Monopoles	EA	2				
6	Installation of Monopoles at site	EA	6				
7	Stringing of Insulator string and ACSR Conductor (double sircuit) with one earthwire	Ckt Km	0.25				
8	Earthing of Poles and Earth Wire	Job	1				
9	Testing & Commissioning	Job	1				
10	Transportation of Material	LS	1				

11	Providing and Fixing of number plates .	EA	8.00				
12	Providing and Fixing of Phase plates .	EA	12.00				
13	Providing and Fixing of circuit plates .	EA	8.00				

Appendix-II

COMMERCIAL TERMS AND CONDITIONS – E/T/C

Sl No	Item Description	AS PER BRPL	BIDDER'S CONFIRMATION
1	Validity	120 days from the due date of submission or amended due date of submission	
2	Price basis	**Firm**. Prices shall be inclusive of all taxes & duties.	
3	Payment terms	a) 80% pro-rata of total installation value shall be payable against R/A bills payable within 45 days after installation/erection of material at site duly certified by Engineer in charge. b) 10% pro-rata of total installation value shall be payable against R/A bills payable within 30 days after testing & commissioning of material at site duly certified by Engineer in charge. c) 10% of contract value payable after completion of successful acceptance testing, commissioning and handing over of complete systems duly certified by Engineer in charge, submission of Electrical Inspector Clearance Certificate & submission of Bank Guarantee of 10% of contract value valid up to defect liability period i.e. 12 months from the date of Handing over of entire Installation Plus 3 months towards Claim period.	
4	Completion time	Part A: 10 Weeks from date of LOI/Order Part B: 24 Weeks from date of LOI/Order	
5	Defect Liability period	12 months from the date of Handing over of entire Installation.	
6	Liquidated damages	0.5 % of the order value for each week or part there of delay until the actual date of completion up to a maximum deduction of 10% of total order value	
7	Contract Performance Bank Guarantee	10% (Ten percent) of the Contract Price valid up to completion period/handing over.	
8	Performance Bank Guarantee	10% (Ten percent) of the Contract Price valid up to Defect Liability Period i.e. 24 months from the date of Handing over of entire Installation plus 3 months towards claim period.	

SECTION VIII

GRAND SUMMARY OF THE QUOTED PRICE

Sr. Nos.	SCHEME DESCRIPTION		Total price for supply F.O.R site inclusive all duties taxes	Total for Erection, Testing & Commissioning inclusive all Taxes(INR)	Grand Total(INR)
1	Supply & Installation of 66 KV & 33 KV Monopoles on Single point responsibility basis at New Delhi	Part-A 33 kV Monopoles			
		Part-B 66 kV Monopoles			
TOTAL Package Cost					
In words :					

We declare that the following are our quoted prices in INR for the entire project/schemes.

Date: Bidder Name:

Place: Bidders Address:

Name & Signature …….

Designation: ……

Common Seal:…….

APPENDIX IV

BID FORM

To

Head of Department
Contracts & Material Deptt.
BSES Rajdhani Power Ltd
New Delhi 110019

Sir,

1 We understand that BRPL is desirous of execution of ……(Name of work)

2 Having examined the Bidding Documents for the above named works, we the undersigned, offer to deliver the goods in full conformity with the Terms and Conditions and technical specifications for the sum indicated in Price Bid or such other sums as may be determined in accordance with the terms and conditions of the contract .The above amounts are in accordance with the Price Schedules attached herewith and are made part of this bid.

3 If our Bid is accepted, we undertake to deliver the entire goods as) as per delivery schedule mentioned in Section IV from the date of award of purchase order/letter of intent.

4 If our Bid is accepted, we will furnish a performance bank guarantee for an amount of 10% (Ten)percent of the total contract value for due performance of the Contract in accordance with the Terms and Conditions.

5 We agree to abide by this Bid for a period of 120 days from the due date of bid submission & subsequent corrigendum/amendment/extension of due date of submission. It shall remain binding upon us and may be accepted at any time before the expiration of that period.

6 We declare that we have studied the provision of Indian Laws for supply of equipments/materials and the prices have been quoted accordingly.

7 Unless and until Letter of Intent is issued, this Bid, together with your written acceptance there of, shall constitute a binding contract between us.

8 We understand that you are not bound to accept the lowest, or any bid you may receive.

9 There is provision for Resolution of Disputes under this Contract, in accordance with the Laws and Jurisdiction of Contract.

Dated this..... day of..... 20…..

Signature..... In the capacity of

……duly authorized to sign for

and on behalf of

(IN BLOCK CAPITALS).....

Appendix V

ACCEPTANCE FORM FOR PARTICIPATION IN REVERSE AUCTION EVENT

(To be signed & stamped by the bidder along-with bid)

BSES Rajdhani Power Ltd (BRPL) intends to use reverse auction through SAP-SRM tool as an integral part of entire tendering process. All techno-commercially qualified bidders shall participate in the reverse auction.

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

1. In case of bidding through Internet medium, bidders are advised to ensure availability of all associated infrastructure as required to participate in the reverse auction event. Inability to bid due to telephone glitch, internet response issues, software & hardware hangs/failures, power failures or any other reason shall not be the responsibility of BRPL.
2. In case bidder fails to participate in the reverse auction event due to any reason whatsoever, it shall be presumed that the bidder has no further discounts to offer and the initial bid submitted by them as a part of tender shall be considered as bidder's Final No Regret offer. Any off-line price bids received from a bidder in lieu of non-participation in the reverse auction event shall be rejected by BRPL.
3. The bidder is advised to understand the auto bid process t safeguard themselves against any possibility of non-participation in the reverse auction event.
4. The bidder shall be prepared with competitive price quotes during the day of reverse auction event.
5. The prices quoted by bidder in reverse auction event shall be on FOR Landed cost BRPL Store/site basis inclusive of all relevant taxes, duties, levies, transportation charges etc.
6. The prices submitted by the bidder during reverse auction event shall be binding on the Bidder.

7. The bidder agrees to non-disclosure of trade information regarding bid details e.g. purchase, Identity, bid process/technology, bid documentation etc.

8. BRPL will make every effort to make the bid process transparent. However award decision of BRPL will be final and binding on the bidder.

9. The prices submitted during reverse auction event shall be binding on the bidder.

10. No request for Time extension of the reverse auction event shall be considered by BRPL.

11. BRPL 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.

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 reverse auction event for arriving at contract amount

APPENDIX VI

FORMAT FOR EMD BANK GUARANTEE

(To be issued in a Non Judicial Stamp Paper of Rs.50/-purchased in the name of the bank)

Whereas [*name of the Bidder*] (herein after called the "Bidder") has submitted its bid dated [*date of submission of bid*] for the supply of [*name and/or description of the goods*] (here after called the "Bid").

KNOW ALL PEOPLE by these presents that WE [name of bank] at [*Branch Name and address*],having our registered office at[*address of the registered office of the bank*](herein after called the "Bank"),are bound unto BSES Rajdhani Power Ltd., with it's Corporate Office at BSES Bhawan Nehru Place, New Delhi -110019 ,(herein after called —the "Purchaser")in the sum of Rs. ……/- (Rupees …….. only) for which payment well and truly to be made to the said Purchaser, the Bank binds itself, its successors, and assigns by these presents.

Sealed with the Common Seal of the said Bank this_____ day of_____ 20____.

THE CONDITIONS of this obligation are:

1 If the Bidder withdraws its Bid during the period of bid validity specified by the Bidder on the Bid Form ; or

2. If the Bidder, having been notified of the acceptance of its Bid by the Purchaser during the period of bid validity:
   (a) Fails or refuses to execute the Contract Form, if required; or
   (b) Fails or refuses to furnish the performance security, In accordance with the Instructions to Bidders/ Terms and Conditions;

We undertake to pay to the Purchaser up to the above amount upon receipt of its first written demand, without the Purchaser having to substantiate its demand, provided that is its demand the purchaser will note that amount claimed by it is due to it, owing to the occurrence of one or both of the two condition(s), specifying the occurred condition or condition(s).

This guarantee will remain in force up to and including One Hundred Twenty (120) days after the due date of submission bid, and any demand in respect thereof should reach the Bank not later than the above date.

(Stamp & signature of the bank)

Signature of the witness

APPENDIX - VII

LITIGATION HISTORY

Year	Name of client	Details of contract & date	Cause of Litigation/ arbitration and dispute	Disputed amount

APPENDIX - VIII

CURRENT CONTRACT COMMITMENTS/ WORK IN PROGRESS

Year	Name of client	Details of contract & date	Value of outstanding work	Estimated completion date

APPENDIX - IX

FINANCIAL DATA

(Duly Certified by Chartered Accountant)

	FY 18-19	FY 17-18	FY 16-17
Total assets			
Current assets			
Total Liability			
Current Liability			
Profit before taxes			
Profit after taxes			
Sales Turnover			

APPENDIX X

CHECK LIST

Sl No	Description	Compliance
1	INDEX	YES/NO
2	COVERING LETTER	YES/NO
3	BID FORM (UNPRICED) DULY SIGNED	YES/NO
4	BILL OF MATERIAL (UNPRICED)	YES/NO
5	DOCUMENTS IN SUPPORT OF QUALIFICATION CRITERIA	YES/NO
6	TECHNICAL BID	YES/NO
7	ACCEPTANCE TO COMMERCIAL TERMS AND CONDITIONS	YES/NO
8	FINANCIAL BID (IN SEALED ENVELOPE)	YES/NO
9	EMD IN PRESCRIBED FORMAT	YES/NO
10	DEMAND DRAFT OF RS 1000/- DRAWN IN FAVOUR OF BSES RAJDHANI POWER LTD	YES/NO
11	POWER OF ATTORNEY/AUTHORISATION LETTER FOR SIGNING THE BID	YES/NO
12	FINANCIAL DATA IN TABULAR FORMAT	YES/NO
13	LIST OF CURRENT COMMITMENTS/ WORK IN PROGRESS	YES/NO
14	BANK SOLVENCY CERTIFICATE	YES/NO
15	NO LITIGATION CERTIFICATE	YES/NO

APPENDIX-XI
FORMAT FOR PERFORMANCE BANK GUARANTEE

(TO BE ISSUED ON RS 1OO/- STAMP PAPER)

Bank Guarantee No.

Place:

Date:

To
BSES Rajdhani Power Limited

Whereas BSES RAJDHANI POWER LTD (hereinafter referred to as the "Purchaser", which expression shall unless repugnant to the context or meaning thereof include its successors, administrators and assigns) has awarded to M/s. with its Registered/ Head Office at

(Hereinafter referred to as the "Supplier" which expression shall unless repugnant to the context or meaning thereof, include its successors administrators, executors and assigns), a contract no. Dated (the Contract);

And whereas the value of the Contract is Rs. (The Contract Value).

And whereas it is a condition of the Contract that the Supplier shall provide a Performance Bank Guarantee for the due and faithful performance of the entire Contract for a sum equivalent to - % of the Contract Value to the Purchaser on or before

And whereas the Bank under instructions from the Supplier has agreed to guarantee dIe due performance of the Contract.
Now it is agreed as follows:

1. we (Name of the Bank) having its Head Office at
(hereinafter referred to as the Bank, which expression shall unless repugnant to the context or meaning thereof, include its successors, administrators, executors and assigns) 5hall indemnify and keep indemnified the Purchaser for, and guarantee and undertake to pay to the Purchaser immediately on written demand, a sum equivalent to % of the Contract Value
as aforesaid at any time upto (day/month/year) without any demur, reservation,
contest, recourse or protest and/or without any reference to the Supplier, against all losses, damages, costs and expenses that may be caused to or suffered by the Purchaser by reason of any default on the pall of the Supplier in performing and observing any and all the terms and conditions of the Contract or breach on the part if the Supplier of terms or conditions of the Contract.

2. The demand shall consist only of an original letter issued by Purchaser stating that the Supplier has failed to fulfill its obligations under the Contract. Such demand made by the Purchaser on the Bank shall be conclusive and binding notwithstanding any difference or dispute between the Purchaser and the Supplier or any difference or dispute pending before any Court, Tribunal, Arbitrator or any other authority.

3. The Bank undertakes not to revoke this guarantee during its currency without previous written consent of the Purchaser and further agrees that the guarantee herein contained shall continue to be enforceable during the period that would be taken for satisfactory performance and fulfillment in all respects of the Contract or in the event of any dispute between the Purchaser and Supplier until the dispute is settled (provided that d1e claim! demand under this guarantee is lodged /referred during the currency of this guarantee) or till the Purchaser discharges this guarantee whichever is earlier.

4. The Purchaser shall have the fullest liberty without affecting in any way the liability of the Bank under this guarantee from time to time to extend the time for performance of the Contract by tbe Supplier. The Purchaser shall have the fullest liberty, without affecting the liability of the Bank under this guarantee, to postpone from time to time the exercise of any powers vested in them or of any right which they might have against the Supplier, and to exercise the same at any time in any manner, and either to enforce or to forbear to enforce any covenants, contained or implied, in the Contract. or any other course or remedy or security available to the Purchaser. The Bank shall not be released of its obligations under these presents by any exercise by the Purchaser of its liberty with reference: to the matters aforesaid or any of them or by reason of any other act or forbearance or other acts of omission or commission on the part of the Purchaser or any other indulgence shown by the Purchaser of by any other matter or thing whatsoever which under law would, but for this provision, have the effect of relieving the Bank.

5. The Bank agrees that the Purchaser and its option shall be entitled to enforce this guarantee against the Bank as a principal debtor, in the first instance without proceeding against the Supplier and notwithstanding any security or other guarantee that the Purchaser may hive in relation to the Supplier's liabilities.

6. Notwithstanding anything contained hereinabove the liability of the Bank under this guarantee is restricted to a sum equivalent to % of the Contract Value ie. Rs.(Rupees) and it shall remain in force upto and including .Unless a demand to enforce a claim under this guarantee is made against the Bank within 3 months from the the above date of expiry i.e. up to all the rights of the Purchaser under the said guarantee shall be forfeited and the Bank shall be released and discharged from all liabilities thereafter.

7. This Performance Bank Guarantee shall be governed by the laws of India.

Dated this Witness

day of 20……. at

1. For Bank

2. Signature
Name Power of Attorney No:

Banker's Seal

SECTION IX

VENDOR CODE OF CONDUCT

Bidder shall agree to comply with Vendor code of Conduct as mentioned in BRPL Website. Purchaser is committed to conducting its business in an ethical, legal and socially responsible manner. To encourage compliance with all legal requirements and ethical business practices, Purchaser has established this Vendor Code of Conduct (the "Code") for Purchaser's Vendors. For the purposes of this document, "Vendor" means any company, corporation or other entity that sells, or seeks to sell goods or services, to Purchaser, including the Vendor's employees, agents and other representatives. Fundamental to adopting the Code is the understanding that a business, in all of its activities, must operate in full compliance with the laws, rules and regulations of the countries in which it operates. This Code encourages Vendors to go beyond legal compliance, drawing upon internationally recognized standards, in order to advance social and environmental responsibility.

I. Labour and Human Rights

Vendors must uphold the human rights of workers, and treat them with dignity and respect as understood by the international community.

- Fair Treatment - Vendors must be committed to a workplace free of harassment. Vendors shall not threaten workers with or subject them to harsh or inhumane treatment, including sexual harassment, sexual abuse, corporal punishment, mental coercion, physical coercion, verbal abuse or unreasonable restrictions on entering or exiting company provided facilities.
- Antidiscrimination - Vendors shall not discriminate against any worker based on race, colour, age, gender, sexual orientation, ethnicity, disability, religion, political affiliation, union membership, national origin, or marital status in hiring and employment practices such as applications for employment, promotions, rewards, access to training, job assignments, wages, benefits, discipline, and termination. Vendors shall not require a pregnancy test or discriminate against pregnant workers except where required by applicable laws or regulations or prudent for workplace safety. In addition, Vendors shall not require workers or potential workers to undergo medical tests that could be used in a discriminatory way except where required by applicable law or regulation or prudent for workplace safety.
- Freely Chosen Employment - Forced, bonded or indentured labour or involuntary prison labour is not to be used. All work will be voluntary, and workers should be free to leave upon reasonable notice. Workers shall not be required to hand over government-issued identification, passports or work permits as a condition of employment.

- Prevention of Under Age Labour - Child labour is strictly prohibited. Vendors shall not employ children. The minimum age for employment or work shall be 15 years of age, the minimum age for employment in that country, or the age for completing compulsory education in that country, whichever is higher. This Code does not prohibit participation in legitimate workplace apprenticeship programs that are consistent with Article 6 of ILO Minimum Age Convention No. 138 or light work consistent with Article 7 of ILO Minimum Age Convention No. 138.
- Juvenile Labour - Vendors may employ juveniles who are older than the applicable legal minimum age for employment but are younger than 18 years of age, provided they do not perform work likely to jeopardize their heath, safety, or morals, consistent with ILO Minimum Age Convention No. 138.
- Minimum Wages - Compensation paid to workers shall comply with all applicable wage laws, including those relating to minimum wages, overtime hours and legally mandated benefits. Any disciplinary wage deductions are to conform to local law. The basis on which workers are being paid is to be clearly conveyed to them in a timely manner.
- Working Hours - Studies of good manufacturing practices clearly link worker strain to reduced productivity, increased turnover and increased injury and illness. Work weeks are not to exceed the maximum set by local law. Further, a work week should not be more than 60 hours per week, including overtime, except in emergency or unusual situations. Workers should be allowed at least one day off per seven-day week.
- Freedom of Association - Open communication and direct engagement between workers and management are the most effective ways to resolve workplace and compensation issues. Vendors are to respect the rights of workers to associate freely and to communicate openly with management regarding working conditions without fear of reprisal, intimidation or harassment. Workers' rights to join labour unions, seek representation and or join worker's councils in accordance with local laws should be acknowledged.

II. Health and Safety Vendors must recognize that in addition to minimizing the incidence of work-related injury and illness, a safe and healthy work environment enhances the quality of products and services, consistency of production and worker retention and morale. Vendors must also recognize that ongoing worker input and education is essential to identifying and solving health and safety issues in the workplace.

The health and safety standards are:

- Occupational Injury and Illness - Procedures and systems are to be in place to prevent, manage, track and report occupational injury and illness, including provisions to: a) encourage worker reporting; b) classify and record injury and illness cases; c) provide necessary medical treatment; d) investigate cases and implement corrective actions to eliminate their causes; and e) facilitate return of workers to work.

- Emergency Preparedness - Emergency situations and events are to be identified and assessed, and• their impact minimized by implementing emergency plans and response procedures, including: emergency reporting, employee notification and evacuation procedures, worker training and drills, appropriate fire detection and suppression equipment, adequate exit facilities and recovery plans.
- Occupational Safety - Worker exposure to potential safety hazards (e.g., electrical and other energy sources, fire, vehicles, and fall hazards) are to be controlled through proper design, engineering and administrative controls, preventative maintenance and safe work procedures (including lockout/tagout), and ongoing safety training. Where hazards cannot be adequately controlled by these means, workers are to be provided with appropriate, well-maintained, personal protective equipment. Workers shall not be disciplined for raising safety concerns.
- Machine Safeguarding - Production and other machinery is to be evaluated for safety hazards. Physical guards, interlocks and barriers are to be provided and properly maintained where machinery presents an injury hazard to workers.
- Industrial Hygiene - Worker exposure to chemical, biological and physical agents is to be identified, evaluated, and controlled. Engineering or administrative controls must be used to control overexposures. When hazards cannot be adequately controlled by such means, worker health is to be protected by appropriate personal protective equipment programs.
- Sanitation, Food, and Housing - Workers are to be provided with ready access to clean toilet facilities, potable water and sanitary food preparation, storage, and eating facilities. Worker dormitories provided by the Participant or a labour agent are to be maintained clean and safe, and provided with appropriate emergency egress, hot water for bathing and showering, and adequate heat and ventilation and reasonable personal space along with reasonable entry and exit privileges.
- Physically Demanding Work - Worker exposure to the hazards of physically demanding tasks,• including manual material handling and heavy or repetitive lifting, prolonged standing and highly repetitive or forceful assembly tasks is to be identified, evaluated and controlled.

III. Environmental

Vendors should recognize that environmental responsibility is integral to producing world class products. In manufacturing operations, adverse effects on the environment and natural resources are to be minimized while safeguarding the health and safety of the public.

The environmental standards are:

- Product Content Restrictions - Vendors are to adhere to applicable laws and regulations regarding prohibition or restriction of specific substances including labeling laws and regulations for recycling and disposal. In addition, Vendors are to adhere to all environmental requirements specified by Purchaser.

- Chemical and Hazardous Materials -Chemical and other materials posing a hazard if released to the environment are to be identified and managed to ensure their safe handling, movement, storage, recycling or reuse and disposal.
- Air Emissions - Air emissions of volatile organic chemicals, aerosols, corrosives, particulates, ozone depleting chemicals and combustion by-products generated from operations are to be characterized, monitored, controlled and treated as required prior to discharge.
- Pollution Prevention and Resource Reduction -Waste of all types, including water and energy, are to be reduced or eliminated at the source or by practices such as modifying production, maintenance and facility processes, materials substitution, conservation, recycling and re-using materials.
- Wastewater and Solid Waste - Wastewater and solid waste generated from operations, industrial processes and sanitation facilities are to be monitored, controlled and treated as required prior to discharge or disposal.
- Environmental Permits and Reporting - All required environmental permits (e.g. discharge• monitoring) and registrations are to be obtained, maintained and kept current and their operational and reporting requirements are to be followed.

IV. Ethics

Vendors must be committed to the highest standards of ethical conduct when dealing with workers, Vendors, and customers.

- Corruption, Extortion, or Embezzlement - Corruption, extortion, and embezzlement, in any form, are strictly prohibited. Vendors shall not engage in corruption, extortion or embezzlement in any form and violations of this prohibition may result in immediate termination as an Vendor and in legal action.
- Disclosure of Information - Vendors must disclose information regarding its business activities, structure, financial situation, and performance in accordance with applicable laws and regulations and prevailing industry practices.
- No Improper Advantage - Vendors shall not offer or accept bribes or other means of obtaining undue or improper advantage.
- Fair Business, Advertising, and Competition - Vendors must uphold fair business standards in• advertising, sales, and competition.
- Business Integrity - The highest standards of integrity are to be expected in all business interactions. Participants shall prohibit any and all forms of corruption, extortion and embezzlement. Monitoring and enforcement procedures shall be implemented to ensure conformance.

- Community Engagement - Vendors are encouraged to engage the community to help foster social and economic development and to contribute to the sustainability of the communities in which they operate.
- Protection of Intellectual Property - Vendors must respect intellectual property rights; safeguard customer information; and transfer of technology and know-how must be done in a manner that protects intellectual property rights.

V. Management System

Vendors shall adopt or establish a management system whose scope is related to the content of this Code. The management system shall be designed to ensure (a) compliance with applicable laws, regulations and customer requirements related to the Vendors' operations and products; (b) conformance with this Code; and (c) identification and mitigation of operational risks related to this Code. It should also facilitate continual improvement.

The management system should contain the following elements:

- Company Commitment - Corporate social and environmental responsibility statements affirming Vendor's commitment to compliance and continual improvement.
- Management Accountability and Responsibility - Clearly identified company representative[s] responsible for ensuring implementation and periodic review of the status of the management systems.
- Legal and Customer Requirements - Identification, monitoring and understanding of applicable laws, regulations and customer requirements.
- Risk Assessment and Risk Management - Process to identify the environmental, health and safety and labour practice risks associated with Vendor's operations. Determination of the relative significance for each risk and implementation of appropriate procedural and physical controls to ensure regulatory compliance to control the identified risks.
- Performance Objectives with Implementation Plan and Measures - Areas to be included in a risk assessment for health and safety are warehouse and storage facilities, plant/facilities support equipment, laboratories and test areas, sanitation facilities (bathrooms), kitchen/cafeteria and worker housing /dormitories. Written standards, performance objectives, targets and implementation plans including a periodic assessment of Vendor's performance against those objectives.
- Training - Programs for training managers and workers to implement Vendor's policies, procedures and improvement objectives.
- Communication - Process for communicating clear and accurate information about Vendor's performance, practices and expectations to workers, Vendors and customers.

- Worker Feedback and Participation - Ongoing processes to assess employees' understanding of• and obtain feedback on practices and conditions covered by this Code and to foster continuous improvement.
- Audits and Assessments - Periodic self-evaluations to ensure conformity to legal and regulatory• requirements, the content of the Code and customer contractual requirements related to social and environmental responsibility.
- Corrective Action Process - Process for timely correction of deficiencies identified by internal or• external assessments, inspections, investigations and reviews.
- Documentation and Records - Creation of documents and records to ensure regulatory compliance• and conformity to company requirements along with appropriate confidentiality to protect privacy.

The Code is modelled on and contains language from the Recognized standards such as International Labour Organization Standards (ILO), Universal Declaration of Human Rights (UDHR), United Nations Convention against Corruption, and the Ethical Trading Initiative (ETI) were used as references in preparing this Code and may be useful sources of additional information.

ANNEXURE-I

TECHNICAL SPECIFICATIONS

TECHNICAL SPECIFICATION

for

SUPPLY OF MATERIAL AND ERECTION, TESTING & COMMISSIONING FOR

66 KV MONOPOLE

Specification No.: GN101-03-SP-171-00

Prepared by		Checked by		Approved by		Rev	Date
Name	Sign	Name	Sign	Name	Sign		
Seema Shekhawat		Abhinav Srivastava		K. Sheshadri		00	20-June-19

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SECTION-1
GENERAL REQUIREMENT

1.0 SCOPE OF WORK:

The scope covers the requirement of Erection, Testing and Commissioning of 66 kV Double Circuit Line Monopole with associated works including supply of all equipment/ materials. Detailed scope shall be as below:

1. Route Survey, Profiling and Monopole spotting and submission of detailed drawing.
2. IIT validation of Design calculation of Monopole and its Foundation.
3. Design, manufacture, testing at manufacturer's works (before dispatch), supply of Monopoles and its associated accessories as specified.
4. Supply of Other Line items/ Accessories such as ACSR Goat, Insulator strings, vibration dampers, hardwares, earthing material, earth wire with accessories etc. Bidder shall supply this material from BRPL approved vendors.
5. Erection of supplied steel tubular transmission monopoles (including civil work) along with all related accessories as per the approved Monopole spotting/ alignment.
6. Erection of other Line items/ accessories such as ACSR Goat, Insulator strings, vibration dampers, hardwares, earthing material, earth wire with accessories etc.
7. Provision of Earthing of monopole and earth wire.
8. Testing and commissioning of 66 kV lines on rated voltage.
9. Dismantling of existing Tower line structure and transport to scrap store of BRPL.

Any item, which may not have been mentioned herein, but necessary for the satisfactory operation of the above items shall be deemed to be part of the requirements. The material shall have all essential features prescribed in relevant IS/International or equivalent Standards referred in this specification.

2.0 STANDARDS:

Indian Standards

IS 5613- for determining the clearance diagrams for the pole
IS 802 - for sag tension and loading calculation
IS 875- CEA Safety Regulation 2010

ASTM – American Society for Testing and Materials

A 36 / 36 M Standard Specification for Structural Steel, Book 01.04
A 123. Specification for Zinc (Hot-Dip Galvanized) Coatings on iron and Steel Products, Book 01.06, 15.08.
A 153. Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware, Book 01.06.15.08.
A 572/572M Specification for High-Strength Low Alloy Columbium Vanadium Steels of Structural Quality.
A 780 Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

AWS – American Welding Society

D1.1-92 Structural Welding Code – Steel. Specification for Carbon Steel Covered Arc- Welding Electrodes.
A5.17-89. Specification for Carbon Steel Electrodes and Fluxes for Submerged Arc- Welding

ASCE – American Society of Civil Engineers

ASCE SEI 48-05 - Design of Steel Transmission Pole Structures.

ISO – International Standards Organization

ISO 9001. Quality System Model for Quality Assurance in Design/Development, Manufacture and Testing.
ISO 9002. Quality System Model for Quality Assurance in Production, I installation and Servicing.

Full scale testing

IEC 60652 – 2002

These codes and standards set forth the minimum requirements which may be exceeded by Contractor if, in Contractor's judgment and with PURCHASERS acceptance, superior designs and materials are available
for successful and continuous operation of equipment as required by this specification.

3.0 ATMOSPHERIC CONDITIONS:

S. No.	Particulars	Data
1	Average Grade of Atmosphere	Heavily Polluted, Dry
2	Maximum Altitude above Sea Level	1000 M
3	Ambient Temperature	Max. 50 Deg. C, Min. 0 Deg. C Average 40 Deg. C
4	Relative Humidity	100%
5	Seismic Zone	4
6	Rain Fall	750 mm concentrated in four months

4.0 Electrical System Data:

S. No.	Particulars	Data
1	Nominal Voltage	66 kV
2	Highest System Voltage	72.5 kV
3	Power Frequency Withstand Voltage	170 kV rms
4	Basic Insulation Level (Impulse)	350 kV peak
5	Short Circuit Level	40 kA for 3 Sec.
6	Nominal Frequency	50 Hz

5.0 CIRCUIT DETAILS:

S. No.	Particulars	Data
1	Name of the circuit	66 kV Line
2	Circuit Configuration	Double Circuit, Vertical Configuration
3	Conductor	ACSR Goat
4	No. of Conductors	3-phase per circuit, One conductor per phase
5	Earth Wire	One 7/3.15 mm

6	Shielding Angle	<=30 degree
7	Minimum Ground Clearance	7.4 M
8	Nominal Span	200 M
9	Basic Wind Speed	47/Sec. as per IS – 875 Part – 3

6.0 TESTING AND INSPECTION:

All routine & acceptance tests shall be witnessed by the purchaser/his authorized representative.

6.1 Routine Test:

The bidder shall provide material wise routine test report conducted at, their work along with the standards application in their bid.

6.2 Acceptance tests:

Acceptance test shall be carried out as per technical specification and relevant standard. Following compulsory acceptance test shall be carried out on all items before the supply of material:

a) Visual Inspection
b) Physical verification
c) Dimensional checks

6.3 TYPE TEST CERTIFICATES

The bidder shall furnish the type test certificates from CPRI/ERDA for Monopoles, as per relevant standards and specification.
The bidder shall furnish the type test certificates from CPRI/ERDA/NABL for ACSR Goat, Earth wires , Insulators and All hardware fittings and other accessories as per relevant standards and Technical specification.
Type tests should have been conducted in certified Test laboratories not exceeding 5 years from the date of opening the bid, In the event of any discrepancy In the test reports, i.e. any test report not acceptable, same shall be carried out without any cost implication to the Purchaser.

7.0 DRAWINGS, DATA & MANUALS

7.1	Documents	copy of signed documents also shall be part of entire soft file (e-file) or CD.)
7.2	Along with the Bid	Vendor shall submit signed 3 sets (plus 1 set of soft copy) of following documents: a) GTP (duly filled-in) (as per Annexure - A). b) Cross-sectional drawings for components Assembly c) Type Test Certificates d) Complete Catalogue and Instructions. e) Any other document.
7.3	After Award of Contract	Vendor shall submit signed 2 sets (plus 1 set of soft copy) of above mentioned documents within 15 days, for Purchaser's approval.
7.4	"As-Built" documents	Final signed "As-built" documents for the equipment in 3 sets (hardcopy), 1 no. soft copy and 1 no. CD. These documents shall include signed Routine & Acceptance Test Certificates also.

7.5	Packing, Marking, Shipping, Handling and Storage	Every component/kit/box shall be properly sealed/ packed for protection against damage.
7.6	Transit damage	The seller shall be responsible for any transit damage due to improper packing.

8.0 Quality Assurance (QA)

8.1	Vendor's Quality Plan (QP)	To be submitted for Purchaser's approval as well along the bid.
8.2	Sampling Method	Sampling Method for quality checks shall be as per manufacturer's standard practice / ESI guidelines and Purchaser's prior approval shall be taken for the same.
8.3	Inspection Hold-Points	To be mutually identified, agreed and approved in Quality Plan.

9.0 Deviations

9.1	Deviations	A) Deviations from this specification can· be acceptable, only where the Seller has listed in his quotation the requirements he cannot, or does not, wish to comply with and which deviations the Buyer has agreed to in writing, before any order is placed. B) In the absence of any list of deviations from the Seller, it will be assumed by the Buyer that the Seller complies with the Specification fully

SECTION-2
TECHNICAL SPECIFICATION OF MONOPOLE

1.0 SCOPE

The designs of multi circuit and double circuit steel monopole towers and their extensions should be conforming to the design parameter specified herein. The scope of supply of towers also includes supply of design calculations and test reports for towers and extensions including detailed structural/shop drawings of towers, extensions and stub-setting templates and design and drawings of foundations in various types of soil, sag templates, sag tension chart for conductor and ground wire etc.

The fabricated steel poles shall include base plate with its required accessories, monopole body (including extensions, if required), Cross Arms. Monopole shall be joined with friction clip or Flanged joint. Cross Arms shall be also Polygonal with structural jointing arrangement. The accessories shall include strain plates, D-shackles with nuts, bolts and washers, U-Bolts with nuts and washers, space washers, links for providing attachment to the Earth Wire and Conductor, anticlimbing devices and any other equipment/ material / article to complete the works as per the scope given in this specification.

The monopoles shall be fully galvanized. Provision will be made at the Cross Arm level for fixing phase plates and Bird guards. The holes for fixing the Earthing bonds at the peak and for grounding the monopoles at bottom or any other holes, which the purchaser may require, shall be provided at the convenient locations on the monopoles.

2.0 TYPE OF MULTI CIRCUIT AND DOUBLE CIRCUIT STEEL MONOPOLE

The multi circuit monopole will have four circuits (twelve cross arms), self-supporting, designed for the specified loading conditions. There will generally be following type of towers:-

Monopole type MP0: Tangent type tower with maximum line deviation up to 2° to be used with Single/ Double suspension insulator strings.
Monopole type MP30: Medium angle tower to be used for line deviation from 2° to 30° with Single/Double tension insulator strings.
Monopole type MP60: Heavy angle tower to be used for line deviation from 30° to 60° and also as dead end tower with Single/Double tension insulator strings.

The double circuit Monopole will have two circuits (six cross arms), self-supporting, designed for the specified loading conditions. There will generally be following type of towers:-

Monopole type MP0: Tangent type tower with maximum line deviation up to 2° to be used with Single/Double suspension insulator strings.
Monopole type MP30: Medium angle tower to be used for line deviation from 2° to 30° with Single/Double tension insulator strings.
Monopole type MP60: Heavy angle tower to be used for line deviation from 30° to 60° and also as dead end tower with Single/Double tension insulator strings.

The bidder may also quote for upgradation work using the categories of Monopole available with him. In such case the bidder will have to indicate the type of monopoles and extensions proposed to be used by him for upgradation work.

3.0 EXTENSIONS

Suitable extension of 3M, 6M, 9M & 12M height shall be designed for use with all type of towers (If required and as mentioned in BOQ).

DESIGN: 66KV as per ASCE-48-05

The bidder will furnish a design as per ASCE-48-05 for each of the offered monopoles with extensions based on the loading conditions indicated herein. The suspension monopoles shall be designed with using `I' suspension string.

Please note that in case of suspension monopole, full wind condition is to be considered in the design in case of security requirement i.e. transverse load due to wind action on tower structure, conductors, ground wire and insulators shall be computed as per clause 12.1.1(i), page 10 of IS 802 (Part-1) 1995 or its latest. The mechanical tension of conductor/ground wire is the tension corresponding to 100% design wind pressure at everyday temperature or 36% design wind pressure at minimum temperature after accounting for drag coefficient and gust response factor as defined in clause 11.3.2.1 page 10 of IS 802 (Part-1) 1995 or its latest. The longitudinal loads shall correspond to 50% of mechanical tension of conductor as per clause 11.3.2.1, page 10 of IS 802 (Part-1):1995 or its latest.

The monopole will have one conductor per phase (Goat ACSR) in vertical formation and one ground-wire of (7/3.15mm) galvanized stranded steel wire of 95kg/sq.mm grade placed on the top of the monopole. The conductor and ground-wire particulars are given in following sections.

The ground-wire at its suspension point shall provide a shielding angle of 30° with respect to the top most conductors. The drop of ground-wire suspension assembly should be taken into account so as to determine the shielding angle.

The minimum mid-span vertical clearance between Ground-wire and Conductor in still air shall be 7.4 Mtrs for 66 KV. The minimum electrical clearance between conductors shall be 2.3 Mtrs for 66KV (Horizontal) for 66KV tower.

ACSR Goat and ground wire data shall be as below:

Parameters	ACSR Goat Conductor	Ground wire:
Stranding and wire diameter	30/3.71 mm Al. + 7/3.71 mm Steel	7/3.15mm Steel
Total sectional area	399.6 sq. mm	54.55 mm²
Approximate overall diameter	26 mm	9.54 mm
Approximate weight	1492.4Kg/Km	428 kg/km
Approximate calculated breaking load	89.67 kN	5810 kg
Co-efficient of linear expansion	18.43×10^{-6} per degree C	11.50×10^{-6} per deg. C.

4.0 CLEARANCES:

The following minimum clearances may be made available between the live parts and the nearest Monopole bay.

Suspension string Jumper in case of tension monopoles Swing Clearance:

S. No.	Description	Swing Clearance (mm)
1	Still Air (Nil)	2130
2	15 deg	1980
3	30 deg	1830
4	45 deg	1675

The above clearances are based on maximum and minimum string lengths of insulators as per standard practice. If Pilot string is used in case of 60° monopole; swing of the pilot string shall be 15 deg. The clearance shall be available from grading ring if the same happens to be the nearest to the monopole body at any point of time.

5.0 DESIGN SPANS:

The wind span for the purpose of computing the wind load on conductors and ground-wire shall be indicated in the offer. Similarly the weight span shall also be indicated.

6.0 WIND LOAD:

The wind load on conductors, earth wire, towers and insulator strings shall be taken as per recommendations of IS: 802 (Part-I) -1995 or its latest with latest revision thereof, for following conditions:-

a. Wind zone - 4 (Six) (47mtrs/sec)
b. Reliability level –
    i. 1.0 (one) for Double circuit monopoles
    ii. 2.0 (Two) for Multi circuit monopoles.
c. Terrain category - 1 (one)

7.0 TEMPERATURE VARIATION:

The maximum working tension of conductor and ground-wire and the uplift conditions shall correspond to the minimum temperature of 0° C. The maximum conductor sag and ground clearance beneath should correspond to the maximum working temperature of 75° C. The Maximum ground-wire temperature shall be taken as 53°C.

8.0 STRUCTURAL STEEL:

Structural steel shall be conforming to IS: 2062 Grade E-355 JR and weld able quality and plates less than 6mm thickness (to be used for pack plate and pack washer) shall be as per IS: 1079.

Permissible stresses in the design of self-supporting steel monopole tower shall conform to ASCE: 48-05 latest edition or equivalent code of latest edition. The sheets/plates of monopole shall be from TATA/SAIL/JSW/ESSAR.

9.0 LOADS ON MONOPOLES:

Transmission lines are subjected to various loads during their life time. These loads are classified into three distinct categories, namely
a) Climatic Loads: related to the reliability requirements.

b) Failure containment Loads: related to security requirements.
c) Construction & Maintenance Loads: related to safety requirements.

a) Climatic Loads:

These are random loads imposed on monopole, insulator string; conductor & ground wire due to action of wind on transmission line & do not act continuously. Climatic loads shall be determined under either of the following climatic conditions whichever is more stringent:

(1)100 percent design wind pressure at every day temperature (32°C) **or**

(2) 36 percent design wind pressure at minimum temperature (0°C)

b) Failure Containment Loads:

Anti-cascading Loads & Torsional & Longitudinal Loads

i) Anti-Cascading Loads:

Cascade failure may be caused by failure of items such as insulators, hardware, joints failures of major components such as monopoles, foundations, conductor due to defective material or Workman ship or from climatic overloads sometimes from casual events such as misdirected aircraft, avalanches, sabotage etc. The security measures adopted for containing cascade failures in the line is to provide angle monopoles at specific intervals which shall be checked for Anti-cascading loads.

ii) Anti-cascading checks:

1. Suspension monopoles shall be checked for narrow front wind with a wind speed of 2.0 of basic wind speed.
2. Angle monopoles shall be checked for the following anti cascading conditions with all the conductors & ground wire intact only on one side of the monopole.

Transverse load: These loads shall be taken under no wind condition.

Vertical Load: These loads shall be the sum of weight of conductor/ground wire as per weight span of intact conductor/ground wire, weight of insulator strings and accessories.

Longitudinal Loads: These loads shall be the pull of conductor/ground wire at every day temperature & no wind applied simultaneously at all points on one side with zero degree line deviation.

Torsional & Longitudinal Loads:

These loads are caused by breakage of conductors and/or ground wire. All the monopoles shall be designed for these loads for the number of conductor(s) and or ground wire considered broken as per provisions of this specification.

c) Construction & Maintenance Loads:

These are loads that are imposed on monopoles during constructions & maintenance of transmission lines.

Computation of Loads & loading combinations: The computation of loads is to be done in line with relevant provisions/ sections of IS 802- 1992 (latest amendment)

Tension Limits:

Conductor/ground wire tension at everyday temperature & without external load, should not exceed the following percentage of the ultimate tensile strength of the conductor:

Initial unloaded tension **22 percent**, Final unloaded tension **25 percent** provided that the ultimate tension under everyday temperature & **100 percent** design wind pressure or minimum temperature & **36 percent** design wind pressure does not exceed **70 percent** of the ultimate tensile strength of the conductor/ground wire.

TRANSVERSE LOADS

The transverse loads due to wind on conductors and ground-wire shall be calculated

(i) The normal span for normal Multi-circuit monopoles (i.e. upto +6m Extension) shall be 200m
(ii) The wind span is the sum of the two half spans adjacent to the support under consideration. For normal horizontal spans this equal to normal ruling span.
(iii) The weight span shall be shown in the design report of monopoles. The horizontal distance between the lowest point of the conductors on the two spans adjacent to the tower. The weight spans considered for design of monopoles is as below.

under normal condition.

Under broken wire conditions 50% of the intact span and 10% of the broken span shall be assumed as wind span. In addition to this, transverse loads due to line deviation, wind on towers, and wind on insulator strings should also have to be taken into consideration in the design of the towers.

CONDUCTOR AND GROUND-WIRE SAG:

The maximum sag for the conductor should be calculated for 75° C and no wind with an allowance of 3% of maximum sag to allow for plotting and sagging errors.

GROUND CLEARANCE:

The minimum ground clearance of **7.4**Meters shall be available corresponding to the maximum working temperature and normal span.

BROKEN WIRE CONDITIONS:

Following broken wire conditions should be assumed in the design of towers:-

a. Suspension monopole- Any one of power conductor broken or ground-wire broken which ever condition is more stringent for design.

b. **Angle Monopole** for 2° to 30° deviation **-** Any two of power conductors broken on the same side and on the same span or any one of the power conductor broken and ground-wire broken on the same span whichever combination constitutes the most stringent condition for design of a particular member.

c. **Angle Monopole** for 30° to 60° deviation **-** Any Three power conductors broken on the same side and on the same span or any two of the power conductor broken and ground-wire broken on the same

side and same span whichever combination constitutes the most stringent condition for design. Further this monopole shall also be designed for dead end condition i.e. all conductors and ground wire broken on the same side and same span.

In all type of monopoles, the power conductor's supports and ground-wire supports should be designed for broken wire conditions also.

FACTORS OF SAFETY FOR MONOPOLES:

The factors of safety for design of monopoles shall be as under:-
(i) Normal condition – **1.5.**
(ii) Broken wire condition – **1.5**

DEFLECTION CRITERIA: 1.5% of the height under safety normal condition and 5% of height under ultimate wind for both suspension and tension poles.

BOLTS AND NUTS AND WASHERS:

The design of the monopoles should be based on use of HRH mild steel hot dip galvanized bolts having grade 6.8(for foundation bolts)/8.8(for connection bolts). The connections shall be designed on the basis of use of 24 mm dia bolts. The spring washers shall be provided for insertion under all nuts. These washers shall be of steel, electro galvanized, and positive lock type and of minimum 3.5mm thickness.

The nuts shall be forged and tapped after galvanizing and then lubricated. The nuts shall be chamfered on one face only, the other face shall be machined.

The bolts and nuts shall be free from forging and threading defects such as cuts, splits, burrs, bulging, taper, eccentricity, loose fit etc.

The bolts shall be threaded up to standard length only as per relevant Indian Standard and not to full length.

The bolts and nuts shall confirm to IS 1367-1971 Part-III and Part-IV, IS 12427, IS 1363-92, IS 1367 Part-XIII with latest amendment.

The spring washers after coiling shall be suitably heat treated so as to result in the finished washer having hardness 43 to 50 HRC when tested in accordance with IS 1586- 1968.

The surface of the washers shall be free of scales and burrs. The washers shall be coiled without any kinks (except for the shape with turned-up ends). The ends of the washer shall not about when the washers are compressed. The ends shall be so served as to prevent tangling.

LOAD ON FOUNDATIONS:

The foundations shall withstand the ultimate loads on the superstructure as specified in this specification, for the full footing reactions along the stub angle slopes obtained from the structural stress analysis.

The reactions on the footing shall be composed of the following types of loads for which they shall be required to be checked.

(a) Maximum tension or uplift.
(b) Maximum compression or down-thrust.
(c) Maximum horizontal shear or side thrust.

The additional weight of concrete in the footing below ground level over the earth weight and full weight of concrete above the ground level in the footing and embedded steel parts will also be taken into account adding to the down-thrust.

STABILITY ANALYSIS:

The following primary types of soil resistances shall be assumed to act in resisting the loads imposed on the footings in earth:

(a) Resistance against uplift:

The uplift loads will be assumed to be resisted by weight of earth in an inverted frustum of a conical pyramid of earth on the footings pad whose sides make an angle equal to the angle of repose of the earth with the vertical in average soil. The weight of concrete embedded in earth and that above the ground will also be considered for resisting the uplift. In case where the frustum of earth pyramids of two adjoining legs super-impose each other, the earth frustum will be assumed truncated by a vertical plane passing through the centre line of the tower base.

(b) Resistance against down-thrust:

The down -thrust loads combined with the additional weight of concrete above earth will be resisted by bearing strength of the soil assumed to be acting on the total area of the bottom of the footings.

(c) Resistance against side thrust:

The bidder shall describe in detail the methods followed by them to check the stability of foundations for horizontal shears.

OR

Side-thrust along with the relevant reference (**IS or other standard**) in support of their contentions.

In addition to the strength design, stability analysis of the foundation shall be done to check the possibility of failure by over-turning, uprooting, sliding and tilting of the foundation.

DESIGN OF FOUNDATIONS:

The bidder is requested to submit the design of foundations. It is recommended to give Single Pile Foundation.

FACTORS OF SAFETY FOR FOUNDATION:

The minimum factors of safety/overload factor based on the ultimate strength of the foundation material when the monopoles are under full working loads under various conditions of loadings combined with the other loads specified for the foundations shall be as given below:-

(a) Normal condition - 1.5
(b) Broken wire condition - 1.5

TYPE TEST:

Monopoles are to be type tested as per relevant standards.
Manufacturer/supplier shall posses' valid Type test reports of (suspension & angle monopoles) from CPRI/ERDA for 66 KV or higher voltage grade monopole and conducted during last 5 years from the date of submission of drawings for approval subject to submission of report for verification.

SECTION-3

TECHNICAL SPECIFICATIONS OF ACSR CONDUCTOR

1.0 SCOPE

1.1 This specification covers the design, manufacture, testing at manufacturer's works, packing and delivery at site of the ACSR conductor along with necessary accessories.

1.2 The conductor and its accessories shall be complete with all fittings and components necessary for the effective working and efficient performance and satisfactory maintenance under the various operating conditions specified. All such parts shall deemed to be included within the scope of supply where specifically included or not in this specification in the tender schedule. The successful bidder shall not eligible for any extra charge for such accessories.

2. CODES AND STANDARDS

2.1 All equipment and material shall be designed, manufactured and tested in accordance with the latest applicable Indian Standard, IEC standard and CBIP manuals enlisted in the appendix 1, except where modified and / or supplemented by this specification.

2.2 Equipment and material confirming to any other standard, which ensures equal or better quality, may be accepted. In such case copies of English version of the standard adopted shall be submitted by the vendor with the offer

2.3 The electrical installation shall meet the requirement of Indian Electricity Rules as amended upto date, relevant IS code of practice and Indian electricity act. In addition other rules & regulations applicable to the work shall be followed. In case of any discrepancy the most stringent & restrictive one shall be binding.

2.4 The equipment offered shall in general comply with the latest issues including amendments of the standards enlisted in the appendix 1 but not restricted to it.

3. DESIGN

3.1 General

3.1.1 All steel strands shall be smooth, uniform and free from all imperfections, such as spills and splits, die marks, scratches, abrasions and kinks after drawing and also after stranding.

3.1.2 The finished material shall have minimum brittleness, as it will be subjected to appreciate vibration while in use.

3.1.3 The steel strands shall be hot dip galvanized and shall have a maximum zinc coating of 240gms/sqm. after stranding. The zinc coating shall be smooth, continuous of uniform thickness, free from imperfections and shall withstand three and a half dips after stranding in standard Preece test. The steel wire rod shall be of such quality and purity that, when drawn to the size of the strands specified and coated with zinc, the finished strands shall be of uniform quality and have the same properties and characteristic as prescribed in relevant ASTM/IS/IEC standards.

3.1.4 To avoid susceptibility towards wet storage stains (while rust), the finished material shall be provided with a protective coating of boiled linseed oil.

3.1.5 The finished conductor shall have a smooth surface without any surface cuts, abrasions, scuff marks and shall be free from dirt, grit etc.

3.1.6 The Steel wire shall be made from materials produced either by the acid or basic Open Hearth process or by electric process. No steel wire drawn from 'Bessemer Process' shall be used. The steel wire shall not contain sulphur or phosphorous exceeding 0.5% and the total of sulphur and phosphorous shall not exceed 0.085%.

3.1.7 The steel strands shall be performed and post formed in order to prevent spreading of strands in the event of cutting of composite core wire. Care shall be taken to avoid damages to galvanization during performing and post forming operations.

3.2 MATERIALS

3.2.1 The aluminum strands shall be hard drawn from electrolytic aluminum rods having a purity of not less than 99.5% and a copper content not exceeding 0.04%.

3.2.2 The steel wire strands shall be drawn from high carbon steel wire rods produced by either the acid or basic open hearth process, the electric furnace process, or the basic oxygen process and shall conform to the following requirements as to the chemical composition:

Element	% composition
Carbon	0.50 to 0.85
Manganese	0.50 to 1.10
Phosphorus	Not more than 0.035
Sulphur	Not more than 0.045
Silicon 0.10 to 0.35	

3.2.3 The zinc used in galvanizing shall be electrolytic high grade zinc of 99.95% purity. It shall conform to and satisfy all the requirements of IS/IEC.

3.3 STANDARD LENGTH

3.3.1 The standard length of the conductor shall be 3000 meters. A tolerance of +/-5% on the standard length offered by the Bidder shall be permitted. All lengths outside this limit of tolerance shall be treated as random lengths.

3.3.2 Random lengths will be accepted provided no length is less than 70% of the standard length and the total quantity of such random length shall not be more than 10% of the total quantity ordered. When one number random length has been manufactured at any time, five (5) more individual lengths, each equivalent to the above random length with a tolerance of +/-5% shall also be manufactured and all the above six random lengths shall be dispatched in the same shipment. At any point, the cumulative quantity supplied including such random lengths shall not be more than 12.5% of the total cumulative quantity supplied including such random lengths. However, the last 20% of the quantity ordered shall be supplied only in standard lengths as specified.

3.3.3 Bidder shall also indicate the maximum single length, above the standard length, he can manufacture in the guaranteed technical particulars of offer. This is required for special stretches like river crossing etc. The employer reserves the right to place orders for the above lengths on the same terms and conditions applicable for the standard lengths during the

pendency of the Contract.

3.4 JOINT IN WIRES

3.4.1 Aluminium wires

No joints shall be permitted in the individual wires in the outer most layer of the finished conductor. However, joints in the 12 wire and 18 wire inner layer of the conductor shall be allowed but these joints shall be made by cold pressure butt welding and shall be such that no such way joints are within 15 meters of each other in the complete stranded conductor. The joints shall withstand a stress of not less than the breaking strength of individual strand guaranteed.

3.4.2 Steel Wires

There shall be no joint of any kind in the finished wire entering into manufacture of the strand nor strand joint or strand splices in any length of the complete stranded steel core of the conductor.

4 TESTS

The following acceptance and routine tests and tests during manufacture shall be carried out on the conductor. For the purpose of this clause, the following shall apply

i. Acceptance tests shall mean those tests which are to be carried out on samples taken from each lot offered for pre-dispatch inspection, for the purpose of acceptance of that lot.

ii. Routine tests shall mean those tests, which are to be carried out on each strand/spool/length of the conductor to check requirements which are likely to vary during production.

iii. Tests during manufacture shall mean those tests, which are to be carried out during the process of manufacture to ensure the desired quality of the end product.

iv. For all acceptance tests, the acceptance values shall be the values shall be the values guaranteed by the Bidder in the guaranteed technical particulars of his proposal or the acceptance value specified in this Specification, whichever is more stringent for that particular test.

4.1 TYPE TESTS

All Type test certificate as per relevant IS/IEC shall be submitted for purchaser review. In case type tests have not been conducted earlier the same has to be carried out without any cost implication to purchaser. Purchaser has the right of witnessing any of the tests for which the supplier has to give prior notice before the date of conducting such tests. The unit rates for each type of the tests to be carried out shall be indicated in the offer. Requirement of type test shall be as listed below. Type test charges shall not be included as part of main price to be indicated in the offer.

The following tests shall be performed on a typical length of conductor. The cost of these tests shall be quoted separately.

a) Surface condition test
b) Test for ultimate breaking load on stranded conductor
c) Stress strain test
d) Measurement of diameter of individual aluminium and steel wires.
e) Measurement of lay ratio.
f) Breaking load of individual wires
g) Ductility test
h) Wrapping test
i) Resistance test and
j) Galvanizing test

4.2 ACCEPTANCE TESTS

a) Visual and dimensional check by drum
b) Visual check for joints scratches etc and lengths of conductor by rewinding
c) Dimensional check on steel and Aluminium strands
d) Galvanizing test on steel strands
e) Torsion and elongation test on steel strands
f) Check for lay ratio of various layers
g) Breaking load test on steel and aluminium strands
h) Wrap test on steel and aluminum strands
i) DC resistance test on aluminium strands
j) UTS Test on welded joint of strands

All above tests except (j) shall be carried out on aluminium and steel strands after stranding only.

4.3 ROUTINE TESTS

a) Check to ensure that the joints are as per Specification.
b) Check that there are no cuts, fins etc on the strands.
c) Check that drums as per Specification.
d) All acceptance test as mentioned above to be carried out on each coil

4.4 TEST REPORTS

a) Records of routine tests reports shall be maintained by the Manufacturer at his works for periodic inspection by the purchaser's representative.
b) Test Certificates of tests during manufacture shall be maintained by the manufacturer. These shall be produced for verification as and when desired by the purchaser.

5. Drum Identification:

Each drum shall have the following information stenciled on it in indelible ink along with other essential data:

i. Contract/Award letter number
ii. Name and address of consignee
iii. Manufacturer's name and address
iv. Drum number.
v. Size of conductor
vi. Length of conductor in meters
vii. Gross weight of drum with conductor

viii. Weight of drum without lagging
ix. Weight of empty drum with lagging
x. Barrel diameter at three locations is an arrow marking at the location of measurement.
xi. Number of turns in the outer most layer
xii. Arrow marking for unwinding
xiii. Position of the conductor ends
xiv. Distance between outer most layer of Conductor and the inner surface of lagging.

LIST OF APPLICABLE CODES AND STANDARDS

The conductor and earthwire shall conform to the following Indian/International Standards, which mean latest revisions amendments/changes adopted and published, unless otherwise specified here in before, International and internationally recognized standards to which these standard generally corresponding are also listed below:

Sl. No,	Indian Standard	Title
1.	IS: 209-1992	Zinc Ingot - Specification
2.	IS 398-1982 Part I, II, III and IV	Specification for Aluminium Conductors for overhead Transmission purposes
4.	IS: 1778-1980	Reels and drums for bare conductors
5.	IS: 2629-1985	Recommended practice for hot dip galvanizing of iron and steel
7.	IS:2633-1992	Method of Testing Uniformity of coating or zinc coated articles
8.	IS: 4826-1979	Galvanized coating on round steel wires.
9	IS: 6745-1990	Methods of determination of weight of zinc coating of zinc coated iron and
10.	BS: 433-1969	
11.	ISO/R89-1959	
12.	BS: 1559-1949	
13.	BS: 3436-1986	
14.	IEC: 1089	
15.	BS: 215-1970	
16.	ASTM A472-729	
17.	IS:7098 Part –I-1988	XLPE Insulation

DATA SHEET OF CLIENT REQUIREMENT

3. DETAILS OF CONDUCTOR - GOAT

3.1 The conductor shall be ACSR 'Goat' and the details of the conductor are tabulated below:

a)	Stranding and wire diameter		:	30/3.71 mm Al. + 7/3.71 mm Steel
b)	Number of strands			
	Core		:	1
	Ist layer		:	6
	2nd layer		:	12
	3rd layer		:	18
c)	Sectional area of aluminium		:	316.5 sq. mm
d)	Total sectional area		:	399.6 sq. mm
e)	Overall Diameter		:	25.97 mm
f)	Approximate weight			
		i) Aluminium	:	898.2 Kg/Km
		ii) Steel	:	594.2 Kg/Km
		iii) Total	:	1492.4Kg/Km
g)	Calculated DC resistance at 20 deg. C		:	0.08989 Ohms/Km
h)	Breaking load of conductor		:	89.67 kN

3.2 **TOLERANCES**

The manufacturing tolerances to the extent of the following limits only shall be permitted in the diameter of individual strands and lay-ratio of the conductor:

c) Diameter of Aluminium & Steel Strands

	Nominal	Maximum	Minimum
Aluminium	3.71 mm	3.74mm	3.68mm
Steel	3.71 mm	3.76 mm	3.65 mm

d) Lay ratio of conductor

	Max.	Min.
6 wire layer (steel)	30	20
12 wire layer (Al.)	21	14
18 wire layer (Al.)	14	11.25

SECTION-4

Technical Specification for Polymeric Insulator

1.0 Scope

This specification covers the design, manufacture, testing & supply of Polymeric Insulators.

2.0 Codes and Standards

The Polymeric Insulator shall be designed, manufactured & tested in accordance with the following National / International Standards (IS/IEC).

Sl No	Indian Standard	Title	International Standard
1	IS:209-1992	Specification for zinc	BS:3436
2	IS:406-1991	Method of Chemical Analysis of Slab Zinc	BS:3436
3	IS:731-1991	Porcelain insulators for overhead Power lines with a nominal voltage greater than 1000 V	BS:137- (I&II) IEC:60383
4	IS:2071 Part (I) – 1993 (Part(II)-1991, Part(III)-1991	Methods of High Voltage Testing	IEC:60060-1
5	IS:2486 Part- I-1993 Part- II-1989 Part-III-1991	Specification for Insulator fittings for Overhead Power Lines with a nominal voltage greater than 1000V General Requirements and Tests Dimensional Requirements Locking Devices	BS:3288 IEC:60120 IEC:60372
6	IS:2629-1990	Recommended Practice for Hot, Dip Galvanization for iron and steel	ISO-1461 (E)
7	IS:2633-1992	Testing of Uniformity of Coating of zinc coated articles	
8	IS:3188-1988	Dimensions for Disc Insulators	IEC:60305
9	IS:6745-1990	Determination of Weight of Zinc Coating on Zinc coated iron and steel articles	BS:433-1969 ISO:1460-1973
10	IS:8263-1990	Methods of RI Test of HV insulators	IEC:60437 NEMA Publication No.07/ 1964/ CISPR
11	IS:8269-1990	Methods for Switching Impulse test on HV insulators	IEC:60506
12		Thermal Mechanical Performance test and mechanical performance test on string insulator units	IEC: 60575
13		Salt Fog Pollution Voltage Withstand Test	IEC:60507
14		Composite insulators for A.C. Overhead lines with nominal voltage greater than 1000V – Definitions, test methods and acceptance criteria	IEC 61109
15		Guide for the selection of insulators in respect of polluted conditions	IEC:60815

16		Tests on insulators of Ceramic material or glass or glass for overhead lines with a nominal voltage greater than 1000V	IEC:60383
17		Characteristics of string insulator units of the long rod type	IEC : 60433

3.0 Service Conditions:

The Polymeric Insulator to be supplied against this specification shall be suitable for satisfactory continuous operation under the following service conditions:

a) Maximum ambient temperature (Degree C) 50

b) Minimum ambient temperature (Degree C) 0

c) Relative Humidity (%) 100

d) Maximum annual rainfall (mm). 1450

e) Maximum wind pressure (Kg/Sq.m) 150

f) Maximum Altitude above mean sea level (Meters) 1000

g) Seismic level (Horizontal Acceleration) 0.30

h) Climatic Conditions : Moderately Hot and humid tropical climate conductive to rust and fungus growth

i) Ref Ambient Temperature for Temperature (Degree C) 50

4.0 Design Feature:

4.1 Details of Composite Long Rod Insulators:

- The insulators of the strings shall consist of composite long rod insulators for a three phase, 50 Hz, effectively earthed transmission system application in a very heavy polluted environment. Couplings shall be ball and socket type.
- Bidder shall quote such composite insulators which have proven use under foggy/humid operational conditions in polluted environment combined with smoke and dust particles. The Bidder shall furnish evidence in the form of certification from the power utilities that the similar type of product supplied to them had been performing satisfactory. The Bidder shall also submit certified test report (from CPRI/ERDA) for an accelerated ageing test of 5000 hours such as that described in Appendix-C of IEC-61109.
- Insulators shall have sheds of the “open aerodynamic profile without any under ribs” with good self-cleaning properties. Insulator shed profile; spacing projection etc. shall be strictly in accordance with the recommendation of IEC-60815.
- The size of long rod insulator, minimum creepage distance, electromechanical strength and mechanical strength of insulator string along with hardware fittings up to 66 KV shall be as follows-

Sl. No	Type of String	Size of Composite Insulator (mm)	Min. Creepage Distance (mm)	EM strength of Insulator Unit (KN)	Mechanical strength of Insulator string along with Hardware fittings (kN)
1	Single Suspension	20X870	2280	90	90
2	Single Tension	20X870	2280	120	120

*** Note:** The core dia. of composite insulators mentioned at column No.3 is minimum requirement. The bidder shall offer composite long rod insulators of suitable core dia to meet specified E&M strength requirements. However, the overall string length shall be within the limits specified in the drawing

4.2 Pin and Cap:

- Pin and cap shall be designed to transmit the mechanical stress & develop uniform mechanical strength in the insulator. The cap shall be circular with the inner and outer surfaces concentric of such design that it will not yield or distort under load conditions
- The design shall be such as to permit easy removal of replacement of either insulator units or fittings under the live line conditions.

4.3 Ball and Socket Designation:

The dimensions of the Ball and Socket shall be of 16 mm for 90kN & 120kN Insulators in accordance with the standard dimensions stated in IEC: 120/ IS: 2486 (Part-II).

4.4 Dimensional Tolerance of Composite Insulator:

The tolerances on all dimensions e.g. diameter, length and creepage distance shall be allowed as follows:
± (0.04d+1.5) mm when d≤300 mm.
± (0.025d+6) mm when d>300 mm
Where 'd' is in mm being the diameter, length or creepage distance.

*** Note-no negative tolerance shall be applicable to creepage distance.**

4.5 Materials:

- **Core-** It shall be a glass-fiber reinforced (FRP rod) epoxy resin rod of high strength. Glass fibers and resin shall be optimized. The rod shall be electrical grade corrosion resistant (ECR), **boron free** glass and shall exhibit both high electrical integrity and high resistance to acid corrosion.
- **Housing and Weather sheds-** The FRP rod shall be covered by a seamless sheath of a silicone rubber compound of a thickness of minimum 3mm. The housing & weather sheds should have silicon content of minimum 30% by weight. It should protect the FRP rod against environmental influences, external pollution and humidity. It shall be extruded or directly molded on the core. The interface between the housing and the core must be uniform and without voids. The strength of the bond shall be greater than the tearing strength of the polymer. The manufacturer shall follow non-destructive technique (N.D.T.) to check the quality of jointing of the housing interface with the core. The technique

being followed with detailed procedure and sampling shall be furnished along with the bid. The details for this shall be finalized during detailed engineering and finalization of MQP.

- **End Fittings-** End fittings transmit the mechanical load to the core. They shall be made of malleable cast iron spheroidal graphite or forged steel. They shall be connected to the rod by means of a controlled compression technique. The manufacturer shall have in-process Acoustic emission arrangement or some other arrangement to ensure that there is no damage to the core during crimping. This verification shall be in-process and done on each insulator. The gap between fitting and sheath shall be sealed by a flexible silicone rubber compound. The system of attachment of end fitting to the rod shall provide superior sealing performance between housing and metal connection. The sealing must be humidity proof and durable with time

- **Corona Ring/Grading Ring-** Grading rings shall be used at both ends of each composite insulator unit for reducing the voltage gradient on and within the insulator and to reduce radio and TV noise to acceptable levels. The size and placement of the metallic grading rings shall be designed to eliminate dry band arcing/corona cutting/ exceeding of permissible electrical stress of material. The bidder shall furnish calculations along with the proposed placement and design of corona ring in support of the above. Grading rings shall be capable of installation and removal with hot line tools without disassembling any other part of the insulator assembly.

*** Note:-**The supply of grading rings shall be in the scope of the composite insulator supplier.

5.0 General Requirement:

5.1 Interchangeability- The composite long rod insulators inclusive of the ball & socket connection shall be standard design suitable for use with the hardware fittings of any make conforming to relevant IEC standards.

5.2 All surfaces shall be clean, smooth, without cuts, abrasions or projections. No part shall be subjected to excessive localized pressure. The insulator and metal parts shall be so designed and manufactured that it shall avoid local corona formation and shall not generate any radio interference beyond specified limit under the operating conditions.

5.3 The long rod insulators offered shall be suitable for employment of hot line maintenance technique so that usual hot line operation can be carried out with ease, speed and safety.

5.4 All insulators shall be designed to facilitate cleaning and insulators shall have the minimum practical number of sheds and grooves. All grooves shall be so proportioned that any dust deposit can be removed without difficulty either by wiping with a cloth or by remote washing under live line condition.

5.5 All the materials shall be of latest design and conform to the best modern practices adopted in the extra high voltage field. Bidders shall offer only such insulators as are guaranteed by him to be satisfactory and suitable for transmission lines specified and will give continued good service

5.6 The design, manufacturing process and material control at various stages shall be such as to give maximum working load, highest mobility, best resistance to corrosion, good finish and elimination of sharp edges and corners to limit corona and radio interference

5.7 The design of the insulators shall be such that stresses due to expansion and contraction in any part of the insulator shall not lead to deterioration.

5.8 The core shall be free from cracks and voids which may adversely affect insulator.

5.9 Weather sheds shall be uniform in quality. They shall be clean, sound, smooth and free from gross defects and excessive flashing at parting lines.

5.10 End fittings shall be free from cracks, seams, shrinks, air holes and rough edges. End fittings should be effectively, sealed to prevent moisture ingress, effectiveness of sealing system must be supported by test documents. All surfaces of the metal parts shall be perfectly smooth with the projecting points or irregularities which may cause corona.

5.11 All load bearing surfaces shall be smooth and uniform so as to distribute the loading stresses uniformly.

5.12 All ferrous parts shall be hot dip galvanized to give a minimum average coating of zinc equivalent to 600 gm/sqmm and shall be in accordance with the requirement of ISO:1461 (E) and shall satisfy the tests mentioned in ISO:1460 (E). The zinc used for galvanizing shall be of purity of 99.95%. The zinc coating shall be uniform, adherent, smooth, reasonably bright continuous and free from imperfections such as flux, ash rust stains, bulky white deposits and blisters. The galvanized metal parts shall be guaranteed to withstand at least six successive dips each lasting for one (1) minute duration under the standard test. The galvanizing shall be carried out only after any machining

6.0 Quality Assurance:

Vendor Quality Plan	To be submitted for purchaser approval
Inspection Points	To be mutually identified & agreed in quality plan

7.0 Testing and Inspection:

7.1 Type Test:

The insulators should be offered type tested from CPRI/ERDA. Type test reports should not be more than 5 (Five) years old considered from the date of bid opening in respect of all the tests carried out in CPRI/ERDA, based on ISO/IEC.

IEC:383-1993	On the complete composite Long Rod Insulator String with Hardware Fittings	Power frequency voltage withstand test with corona control rings/grading ring and arcing horns under wet condition
		Switching surge voltage withstand test under wet condition
		Impulse voltage withstand test under dry condition
		Corona and RIV test under dry condition
		Mechanical Strength test
		Vibration test
		Salt-fog pollution withstand test

IEC: 61109	On Composite Insulator Units (Tests on interfaces and connections of metal fittings)	Dry power frequency voltage test
		Sudden load release test
		Thermal mechanical test
		Water immersion test
		Steep front impulse voltage test
		Dry power frequency voltage test
IEC: 61109	On Composite Insulator Units (Assembled core load time test)	Determination of the average failing load of the core of the assembled unit
		Control of the slope of the strength time curve of the insulator
	Brittle fracture resistance test	
	Test of housing, Tracking and erosion test	
	Tests for the core material	Dye penetration test
		Water diffusion test
	Flammability test	
	Recovery of Hydrophobicity test	
	Mechanical Load Time test and test of tightness between end firings and insulator housing	
	Silicone content test	
	High Pressure washing test	

7.1 Acceptance Test : The following tests shall constitute the Acceptance : -

IS/IEC Reference	Test Description
IEC : 61109	Verification of dimensions
	Verification of tightness of interface between end fittings and insulator housing and of specified mechanical load
	Tests on interfaces and connections of metal fittings (Tests to be performed on the same samples in the sequence given below)- i) Dry power frequency voltage test, ii) Sudden load release test, iii) Thermal mechanical test, iv) Water immersion test, v) Steep front impulse voltage test, vi) Dry power frequency voltage test
IEC : 60383	Galvanizing test (IS:209-1979)
	Verification of locking system
	Recovery of Hydrophobicity
	Silicone content test

Note: - 1) Test on interfaces and connection shall be carried out for a lot with qty. minimum 2000 nos.

2) Test for silicon shall be carried out for a lot with qty. minimum 2000 nos.
3) In the event of failure of the sample to satisfy the acceptance test(s) specified above, the retest procedure shall be as per clause 7.6 of IEC 61109

7.2 Routine Tests: The following tests shall constitute the

1) Visual Inspection as per IEC 61109

2) Mechanical Routine Test as per IEC 61109

7.3 Test During Manufacturing:

1) Chemical analysis of Zinc used for galvanizing.

2) Chemical analysis, mechanical, metallographic test and magnetic particle inspection for malleable castings.

3) Chemical analysis hardness tests and magnetic particle inspection for forging.

4) Tracking and erosion test on insulating material

Inspection:

SL No.	Descriptions
7.3.1	The buyer reserves the right to witness all tests specified on Polymeric Insulators
7.3.2	The buyer reserves the right to inspect Polymeric Insulators at the Seller's works at any time prior dispatch, to verify compliance with the specifications
7.3.3	In-process and final inspection call intimation shall be given in advance to purchaser
7.3.4	In the event of any discrepancy in the test report i.e. test reports not acceptable or any type test (including special/additional test if any) not carried out, same shall be carried out without any cost implication to BSES before dispatch.

Note:

1) The routine and acceptance tests should be performed on sample chosen at random out of every lot.
2) Three sets of complete test certificates shall be submitted along with the dispatch documents.

8 Shipping, Handling and Site Support:

8.1	Packing	All insulators shall be packed in suitable PVC/ plastic tubes/any other suitable packing along with temporary wrap-on shields/shrouds for each insulator unit. The packing shall be of sufficient strength to withstand rough handling during transit, storage at site and subsequent handling in the field
		Suitable cushioning, protective padding, or dunnage or spacers shall be provided to prevent damage or deformation during transit and handling

		The items so wound will be grouped as per numbers per packet. The information like product quantity shall be mentioned on the packets
		Purchase order no. with SAP code shall be mentioned clearly
		Net weight and gross weight with packet shall be mentioned
		Batch no. or lot no shall be mentioned
8.2	Shipping	The seller shall give complete shipping information concerning the gross weight, size of each packing and the seller has to send the materials to buyer's preferable store or site.
8.3	Handling & Storage	Manufacturer instruction shall be followed. Detail handling & storage instruction sheet / manual needs to be furnished before commencement of supply.
8.4	Transit damage	The seller shall be responsible for any transit damage due to improper packing.

9 Deviations:

Deviations from this Specification shall be stated in writing with the tender by reference to the Specification clause/GTP/Drawing and a description of the alternative offer. In absence of such a statement, it will be assumed by the Buyer that the Seller complies fully with this specification.

10 Drawings and Materials Details:

The bidder has to summit drawings along with bid for preliminary acceptance and for final approval before manufacturing. BRPL may insist trial installation to check dimensions and may suggest necessary changes if required. BRPL decision in this regard would be final and binding to short listed vendor without any subsequent commercial liability on purchaser.

Marking:

The Following information shall be marked on each cross arm:

10.1 Manufacturer's name or trade mark

10.2 Year of manufacture

10.3 BSES-BRPL, order number, date & SAP Code number

SECTION- 5
TECHNICAL SPECIFICATIONS FOR HIGH TENSILE GALVANISED STEEL EARTH WIRE

1.0 STANDARDS:

The High Tensile Galvanized Steel Earth Wire shall conform to the following Indian Standards, which shall mean latest revisions, amendments/changes adopted and published, unless otherwise specified hereinbefore.

S. No.	Indian Standards or any Equivalent International Standard	Title
1	IS:209 -1992	Specification for Zinc
2	IS:2141 -1992	Specification for Earth wire for overhead Transmission purpose
3	IS:1778	Reels and drums for Bare wires
4	IS:1521	Method of Tensile Testing of Steel wire
5	IS:2629 -1992	Recommended practice for Hot Dip Galvanising Iron and Steel
6	IS:2633 -1992	Method of Testing Uniformity of Zinc coating of Zinc coated Articles.
7	IS:4826	Galvanised coating on Round Steel wire
8	IS:6745 -1992	Method of Determination of weight of Zinc coating of zinc coated Iron and Steel Articles
9	IS: 12776	Method of Testing of Earth wire

2.0 PARAMETERS:

2.1 PRINCIPAL PARAMETERS OF EARTH WIRE:

The standard technical particulars of 7/3.15mm galvanized steel earth wire shall be as follows:-

a. The details of Steel strand:

i.	Material	Steel
ii.	Stranding	7
iii.	Weight per Km	428 Kgs

iv.	Dia. of wire	3.15 mm
v	Tolerance	2%
vi	Minimum elongation in 100 mm	5 mm length
vii	Minimum breaking strength per strand	1000 Kg
viii	Minimum tensile strength	95 Kg./mm^2
ix	D.C. resistance at 20 Deg. C	3.14 Ohms/Km

b. The details of Stranded Earth Wire :

i.	Maximum Length of Lay	265
ii.	Minimum Length of Lay	127
iii.	Minimum breaking load	**5600 Kgs**
iv.	Overall diameter	10.98mm
v	Modulus of elasticity	1.933 x 10^6 Kg./cm^2
vi	Co-efficient of linear expansion	11.50 x 10^{-6} per Deg.C
vii	Weight of zinc coating on wire	260 gms./ $_m$ 2 (Min.)
viii	No. of one minute dip and half minute dip respectively	3 one minute and 1 half minute
ix	Calculated d.c. Resistance at 20 Deg.C	3.14 Ohms per Km

3.0 GENERAL TECHNICAL REQUIREMENT : MATERIAL AND WORKMANSHIP FOR EARTH WIRE:

3.1 The steel wire (strands) used in manufacture of galvanized steel earth wire shall be drawn from steel wire rod produced by either acid or basic open hearth process or by the electric furnace process or basic oxygen process. The steel wire shall not have sulphur and phosphorous contents exceeding 0.045% each. The carbon content shall not exceed 0.55%. The steel produced by bassemer process shall not be used for drawing of steel wire strands. The finished earth wire shall have minimum brittleness as it will be subjected to continuous vibration while in use on line.

3.2 The steel wire shall be hot dip galvanized and shall have zinc coating of minimum 260 gram per sq. meter of the uncoated wire surface. The zinc coating shall be smooth and continuous of uniform thickness, free from imperfections not consistent with good commercial practice and shall meet the test requirement. The zinc used in galvanizing of earth wire shall be as per IS: 209-1992.

3.3 All the steel wires shall be circular, smooth, uniform and free from imperfections, such as spills and splits, die marks scratches, abrasions, cuts and kinks etc. drawing and after stranding.

3.4 The steel wires, after galvanizing shall be bright in appearance, smooth and free from all defects like flux, ash, cross inclusions, bare and black spots, pimples, lumpiness in runs, rust, stains, bulky white deposits and blisters.

3.5 The finished earth wire shall have a smooth surface without any surface cuts, abrasions, scuff marks and shall be free from dirt, grit etc.

4.0 SIZE AND PROPERTIES:

4.1 The earth wire size, physical properties, tolerance in diameter of individual strands and length of lay of the strand shall be as given above.

4.2 The wires shall be so stranded together that when an evenly distributed pulls is applied at the end of completed strands, each wire will take an equal share of the pull.

4.3 The earth wire shall be supplied in the standard lengths which shall not be less than 3 Km. Not less than 95% of the total quantity of the earth wire shall be supplied in standard lengths. The quantity of earth wire in length shorter than standard one shall not exceeds 5% of the total quantity to be supplied. Further, no single earth wire length in respect of such 5% (maximum) supply in random lengths shall be shorter than 50% of the standard length.

4.4 The length of the stranded wire shall be supplied without joints in the individual wires comprising it, excluding welds made in base rod before it is drawn.

4.5 Each coil be warranted to contain no welds, joints or splice other than in the base rod before it is drawn.

5.0 GALVANISING AND OILING:

5.1 All the wires of the strand shall be galvanized in accordance with IS-2629-1990. Recommended practice for Hot dip galvanizing of Iron and Steel of some other authoritative equivalent standard.

5.2 The galvanized earth wire after stranding operation shall have dipped in boiled linseed oil before winding it on drums.

6.0 TEST FOR EARTH WIRE :

6.1 Earth wire shall be subjected, before dispatch from the works to tests as specified in the IS-2141, IS 1521, IS 1755 & IS 4826 or any other authoritative equivalent standard.

6.2 All the drums of galvanized steel stranded earth wire of the same grade, diameter and construction, manufactured under similar condition shall be grouped to constitute one lot.

6.3 Samples from each lot shall be tested for ascertaining the conformity to the requirements of the earth wire specified herein. The drums selected shall be tested for length of the lay and diameter of individual strands etc. The lot shall be declared conforming to the requirement of these characteristics if all the samples are found satisfactory. One test specimen from each wire of the strand shall now be drawn from every selected drum and subjected to chemical analysis, tensile tests, ductility test, elongation test and coating test. One test specimen, of the completed strand from each drum shall be subjected to tensile strength. The lot shall be declared conforming to the requirements of these characteristics, if the entire test specimen satisfies the relevant requirement.

7.0 END SEALING :

Both the ends of each length of earth wire should be provided with non-destructive type metal crimped or epoxy capped seals with punching embossing/ engraving of manufacturer's monogram and drum number.

SECTION- 6

TECHNICAL SPECIFICATION FOR HARDWARE FITTINGS FOR 66KV LINES

1.0 STANDARDS:

This section provides for the Design, manufacturing, stage testing, inspection and testing before dispatch, packing and delivery of Hardware fittings Conductor and Earth wire for use on 66KV transmission lines. The material and services under this specification shall be performed as per the requirements of the latest revisions and amendments available at the time of placement of order of all the relevant Indian Standards/Codes listed here under or equivalent International Standards, except as modified in this document:

S. No	Indian Standard	Title
1	IS:209-1992	Specification for Zinc Ingot
2	IS:206 – 1992	Tee and Strap Hinges
3	IS:7814-1985	Phosphor Bronze Sheet and Strip
4	IS:2071	Method of high voltage testing
6	IS:961	Structural Steel
7	IS:1385	Phosphor Bronze Rods & Bar Sheet and Strips and Wire
8	IS:2004	Carbon Steel Forgings for General Engineering Purpose
9	IS:2107	White Hearth Malleable Iron Castings
10	IS:2108	Black Hearth Malleable Iron Castings
11	IS:2121(Part -I & II)	Specification for Conductors and Earth wire Accessories for Overhead Power Line, Armour Rods Binding Wires and Tapes for Conductor
12	IS:2486	Specification for Insulator Fittings for Overhead Power Lines with a Nominal Voltage Greater than 1000 V.
13	IS:2629	Recommended Practice for Hot Dip Galvanization of Iron and Steel.
14	IS:2633	Testing of Uniformity of Coating of Zinc coated Articles
15	IS:3138	Hexagon Bolts and Nuts
16	IS:6639	Hexagon Bolts for Steel Structures

17	IS:6745	Determination of Weight of Zinc Coating on Zinc Coated Iron and Steel Articles
18	IS:3188	Characteristic of String Insulators Units
19	IS:4218	ISO Metric screw Threads
20	IS:4172	Dimensions for Radii under the Heads of Bolts & Screws
21	IS:4206	Dimensions for nominal lengths and Thread length for Screws and Studs (with amendment)
22	IS:4759	Hot Dip Zinc Coatings on Structural Steel and other Allied Products
23	IS:1573	Electroplated Coatings of Zinc on Iron and Steel
24	IS: 398	Specification for Aluminium Conductor Steel Reinforced for overhead transmission purpose.
25	IS: 1327-1966	Methods for determination of weight of tin Coating on Tin Plates
26	IS: 4826-1979	Hot Dip Galvanised Coating on Round Steel Wires
27	IS: 1363	Hexagon Head Bolts, Screws & Nuts.
28	IS: 1367	Technical supply conditions for threaded Steel Fasteners
29	IS: 9708	Stockbridge Vibration Dampers for Overhead Power lines.
30	IS: 8263	Method of Radio Interference Tests on High Voltage Insulators.
31	IS:10162	Spacers and Spacer Dampers for twin horizontal bundle Conductors.
32	IS: 2004	Carbon Steel Forgings for general engineering purposes.
33	BS:970 (Part-I)	General Instructions and Testing Procedures Specific Requirements for Carbon and Carbon Manganese Alloy and Stainless Steels.

2.0 INSULATOR STRING CHARACTERISTICS:

The Hardware fittings shall be suitable for single/double suspension Insulator strings and single/double tension Insulator strings. Each Hardware fitting shall be supplied complete in all respect and shall include all components, which are required for making complete set.

2.1.1 The complete insulator string including Hardware fittings shall have the following characteristics:

Sr. No.	Details	Single/Double suspension 66kV	Single/Double tension 66kV
1	Lighting impulse voltage (dry) KV peak	375	375
2.	Power frequency withstand voltage (wet) KV rms	275	275
3	Mechanical failing load kgf.	7000	9000/18000
4	No deformation load-kgf.	4690	6030/12060

The Insulator string Hardware fittings and Earth wire assemblies shall comply and conform to the above requirement.

2.2.0 REQUIRED GUARANTEED STRENGTH OF HARDWARE OF INSULATOR STRINGS:

2.3.0 The Hardwares and Clamps of 66kV single suspension and double suspension strings suitable for Goat ACSR for transmission line and shall have the ultimate breaking strength of not less than 13600 kgs. The Compression Clamp shall have slipping strength not less than 95% of breaking strength of Goat ACSR.

2.3.1 The slipping strength of the suspension clamp shall not be less than 15% and more than 20% of the Conductor strength with which it is to be used.

2.3.2 Each individual Hardware component of double suspension and double tension strings such as ball-clevis, socket clevis etc. shall have minimum breaking strength as specified for respective single suspension and tension string respectively.

3.0 PARTICULARS OF HARDWARE FITTINGS:

Each Hardware fitting for the transmission line shall be complete in all respect and Bidder should furnish complete drawings and technical particulars of the items of hardware fittings. The Hardware fittings should normally comprise items conforming to enclose drawing as under: -

3.1 Single Suspension Hardware Fitting With AGS Type Clamp:
Single suspension Hardware string shall comprise of one Ball Hook, one Socket Eye Horn holder, one line side Arcing Horn and one Suspension Clamp of AGS type with armour rod suitable for respective sizes of Conductors.

3.2 Double Suspension String Hardware Fittings with AGS Type Clamp:
The double suspension string Hardware fittings shall comprise of one Ball Hook, one Socket Clevis, one Top Yoke Plate, two Ball Clevis, two Socket Clevis, one bottom Yoke Plate, two line side Arcing Horns, one Clevis Eye and one AGS type Suspension Clamp suitable for respective sizes of Conductors.

3.3 Single Tension String Hardware Fittings:
Single tension string Hardware shall comprise of one `D' Shackle, one Ball Link, one Forged Steel Socket, Socket Clevis Horn holder, one line side Arcing Horn and one Tension Clamp of compression type

3.4 Double Tension String Hardware Fittings:
The double tension string Hardware shall comprise of two `D' shackle, one chain link one top yoke

plate, two ball clevis, two socket clevis, one bottom yoke plate, one line side arcing horn, one clevis and a compression type dead-end Clamp

3.5 Earth Wire Suspension Assembly With Preformed Armour Rods:

This shall comprise of envelope type Suspension Clamp of heat-treated malleable iron, one Chain Link and one 'D' Shackle. The entire assembly shall be hot dip galvanized complete with minor accessories. The breaking strength of all the Hardware items of the assembly shall not be less than 7000 kgs. The complete assembly of suspension clamp shall be guaranteed for slip strength of not less han 15 KN & not more than 19 KN.

3.6 Earth Wire Tension Assembly:

The Earth wire tension assembly shall have minimum breaking strength equal to that of the Earth Wire. The slipping strength of the Compression Clamp shall not be less than 95% of the breaking strength of Earth Wire. The strain assembly of the Earth wire for transmission line shall comprise of compression type dead end Clamp and two `D' Shackles complete with minor accessories such as pins, bolts & nuts etc. Strain assembly shall be hot dip galvanized and made inherently resistant to the atmosphere corrosion. The dead end Clamp of the assembly shall be of compression type. The tension clamp shall be attached to the horizontal strain plate of the tower body by means of a "D" shackle. "D" shackle shall be suitable for attaching the tension clamp to strain plate of towers having 8mm thickness with a hole of 21.5 mm diameter. The tension clamp body shall be made out of steel of 304 L grade or equivalent with Brinnel Hardness not exceeding 200. The complete assembly shall also include one 12.5mm dia, 45 mm long HRH MS Bolt hot dip galvanized with nuts and lock washers for attaching G.I. earth bond.

3.7 Mid Span Joints and Repair Sleeves:

I. The Mid Span Joints for Conductor & Earth wire shall be compression type.
II. The Conductor Mid Span Joints shall comprise of Aluminum and Steel Sleeves. The Earth wire Mid Span Joints and Steel Sleeves of Conductor Mid Span Joints shall be Hot dip Galvanized. Sleeves shall be of circular shape suitable for compression into hexagonal shape. The detailed drawing showing the length of Sleeves, inner and outer cross sectional dimension, before compression for Aluminum corresponding dimensions of hexagon after compression for Aluminum and Steel Sleeve shall be indicated. The Aluminum Sleeve shall be of extruded Aluminum. The material of the Steel Sleeve shall be specified.
III. The Repair Sleeve of Conductor shall be in two halves preferably of same shape, and this should be of extruded Aluminum. The Repair Sleeve for Earth wire shall be single piece and Hot dip Galvanized. Its material shall be specified. The Repair Sleeves shall be of circular shape suitable for compression into hexagonal shape.
IV. The steel and Aluminum Sleeves for Mid Span Joints as well as Aluminum Repair Sleeves and Steel Repair Sleeves shall have their outer dia tapered towards the two ends. Also the inside of the Sleeves shall be well rounded off, so that there is no sharp edge, which can cut the strands.
V. The Joints and Repair Sleeves shall conform to IS:2121/1981 or equivalent International Standard.
VI. The conductor compressed with mid span joint or with repair sleeve shall not permit slipping of, damage to or failure of complete conductor or any part thereof at a load of not less than 95% of the ultimate tensile strength of the conductor.
VII. The electrical resistance of the joint/repaired portion of the conductor shall not exceed 75% of the measured resistance of equivalent length of conductor.

3.8 4R-VIBRATION DAMPERS FOR GOAT ACSR:

Only Vibration Dampers having 4-resonance frequency characteristic commonly called 4R Dampers shall be offered. The Damper shall eliminate fatigue on the Conductor due to vibration and damp-out

the vibrations effectively, so that no damage due to vibration is caused to Conductor and string.

The Dampers are to be used at all tension locations and suspension locations. One or more Dampers are proposed to be used on tension/suspension locations depending upon the span. The Damper shall be such as to effectively damp out the vibration on the conductor, so that the dynamic strain at the suspension point with conventional type of Suspension Clamp 'U' bolt and keeper pieces, shall not exceed 150 micro strains. Contractor shall recommend the number of Dampers required to effectively damp out the vibration of the Conductor, so that the dynamic strain at the suspension point with conventional Suspension type Clamp shall not exceed 150 micro strains.
The requirement indicated in Schedule-I Ais based on use of two Vibration Dampers per Conductor per span. However, final requirement will depend upon Bidder's recommendations duly supported by literature. Contractor shall also recommend the number of Dampers required to effectively damp out Conductor vibration for different values of span lengths and the distance for fixation. While working out Damper Characteristics, it may be kept in view that on suspension locations, preformed Armour rods are also to be fitted on the conductor. Contractor shall given full details of the damper characteristics and energy dissipation curves of the Damper and shall also guarantee their effectiveness for damping design.

The messenger cable shall be made of high strength steel strands of spring steel with a minimum strength of 136 Kg/sq. mm and preformed in order to prevent subsequent dropping of weights in service. The Contractor shall indicate full technical particulars of the messenger cable. The keeper pieces shall have proper curvature and edges be rounded off so that it shall have proper grip over the conductor without any damage to conductor strands. Clamping bolts shall be provided with self-locking nuts designed to prevent corroding of the threads or loosening during service ensuring that no slippage occurs up to specified longitudinal force on clamp along the conductor. All ferrous parts including the messenger cable shall be effectively sealed to prevent corrosion.

The collar for fixing the bolt shall be designed in such a way that sufficient space is available for tightening the bolt through spanner. Further bolt length be maintained in such a way that it should not come out completely while affixing the clamp on Conductor.

Fixing of the masses to the messenger cable shall be done by pressing Aluminium Sleeves at each end of the messenger cable under pressure. Each end should be sealed properly so as to achieve prefect joint. The molten metal filling method for attachment of messenger cable to counter weight is not acceptable.

4.0 COMPONENTS OF HARDWARE FITTINGS:

All components for hardware fittings shall be as pe IS 5561 and any other relevant IS to meet the requirement.

5.0 DIMESIONS & TOLERANCES:

5.1 The dimensions and tolerances of pin balls and socket ends shall conform to IS 2486 Part-II/IEC-120 and shall be checked by the gauge therein after galvanizing.
5.2 The bearing surfaces of balls and machined sockets, before galvanizing shall not have surface roughness more than 250 micro inches.
5.3 The bearing surface of socket ends shall be uniform about the entire circumference without depressions or high spots. The internal contour of the socket ends shall be concentric with the axis of fittings. The axis of the bearing surface of socket ends shall be coaxial with the axis of fittings with no appreciable tilting.

6.0 IMPORTANT CONDITIONS:

6.1 All Hardware items shall be complete with minor items such as security clip, bolts, nuts, washer,

split pins and inners etc.

6.2 All ferrous fittings (except those specified otherwise) shall be hot dip galvanized, after all machining and fitting has been completed, in accordance with relevant Indian Standard. All Hardware items (other than clamps) and those specified otherwise should be made of Drop Forged Steel. Socket items in forged steel must be forged. All forgings supplied should be stress relieved and this treatment should be done at the Contractor works. Forgings, which are not stress relieved, will not be acceptable. The items like Yoke Plate, Arcing Horn, Bolts and Nuts shall be of mild steel and rest of the items shall be of forged steel.

6.3 All Bolts, Nuts and Screw heads shall have only wide worth standard thread and of sizes indicated in the enclosed drawing. Bolts head and Nuts shall be hexagonal. Where required, nuts shall be locked in approved manner. The thread in Nuts shall be over tapped after galvanizing and shall be cut before galvanizing. The threads shall not be undercut. The Nuts should be tapped such that they are fit on the bolt threads i.e. these should not have loose fitting.

7.0 GALVANISING:

7.1 Hot dip galvanizing shall conform to Indian Standard specification IS-2633 or equivalent International Standard. Galvanising shall be uniform, free from blisters, and shall not peel off due to abrasion, Zinc coating shall be thick enough to withstand 6 one minute dips in Copper Sulphate solution (precee test) for all ferrous parts except for threaded portions which shall withstand at least 4 one minute dips.

7.2 The Contractor must emboss/engrave their name in each forged steel item and Aluminium castings such as Ball Hook, Yoke Plate, Socket Clevis, Clevis Eye, Clevis-Clevis, Anchor Shackle/D-Shackle, Chain Link, Suspension Clamps of AGS type, Tension Clamps and Arcing Horns.

8.0 TESTS :

8.1 The hardware fittings offered shall be type tested as per the relevant standards. Further the acceptance, routine tests and tests during manufacture shall be carried out on the conductor.

8.2 Acceptance tests shall mean those tests, which are to be carried out on samples taken from each lot offered for pre-dispatch inspection, for the purpose of acceptance of that lot.

8.3 Routine tests shall mean those tests which are to be carried out on each and every product so as to check with requirements which are likely to vary during production.

9.0 ACCEPTANCE TEST/SAMPLE TESTS:

9.1 Suspension and tension hardware fittings:

a.	Visual Examination	IS:2486 (Part-I)
b.	Verification of dimensions	IS:2486 (Part-I)
c.	Galvanizing test/Electroplating	As per this Specification.
d.	Mechanical strength test of welded joint	As per this Specification.
e.	Mechanical strength test for corona control rings.	BS:3288(Part-I
f.	Test on locking devices for ball & socket coupling.	IEC:372(2)
g.	Mechanical strength test of each components excluding corona control ring and arcing horn.	As per this specification.

9.2 Suspension Hardware fittings only:

a. Clamp slip strength vs torque test for suspension clamp.
b. Shore hardness test of elastomer cushion for AG suspension clamp.
c. Bend test for armour rod set.
d. Re silence test for armour rods set.
e. Conductivity test for armour rods

9.3 Suspension hardware for Earth wire.

a. Visual examination
b. Dimensional verification.
c. Slip strength test.
d. Mechanical strength test on each component
e. Galvanising test
f. Mechanical strength test of welded joint

9.4 Tension hardware for Earth wire

a. Visual examination
b. Dimensional verification.
c. Slip strength test.
c. Electrical resistance test .

9.5 Midspan Compression Joint for Power Conductor & Earth wire

a. Visual examination
b. Dimensional verification.
c. Galvanising Test
d. Hardness test.
e. Failing load test (test to be conducted after 24 hours of compression).

9.6 Repair Sleeves for Conductor.

a. Visual examination
b. Dimensional verification.

9.7 Vibration Damper for power conductor/ Earth wire.

a. Visual examination
b. Dimensional verification.
c. Galvanizing Test
d. Verification of resonance frequencies
e. Clamp slip test
f. Clamp bolt torque test
g. Strength of messenger cable.
h. Mass pull off test.

9.8 Clamps

i. Tensile Test
ii. Resistance Test
iii. Dimensional Check
iv. Galvanizing Test

ANNEXURE-1

GURANTEED TECHNICAL PARTICULARS of ACSR Conductor
(SEPARATE DATA SHEET SHALL BE SUBMITTED FOR EACH TYPE OF CONDUCTOR)

SI.NO.	DESCRIPTION	BRPL Requirement	PARTICULARS
1.	Name of the material offered	XLPE Insulated ACSR Conductor	
2.	Maker's Name	Required	
3	Address and Phone No.		
4	Reference Standards	IS-398 Pt-3, IS-7098 Pt-1, IS 17778-80	
5	No. of strands/diameter of Galvanized steel wire/Al strand	Required	
6	Apporx. Dia over covered conductor		
7	Minimum Ultimate Tensile Strength of Conductor	18.25	
8	Direction Of Lay	Successive layers shall have opposite directions of lay outermost layer being Right Handed	
9	Lay ratio of Aluminum wire	10-14	
10	Continuous max.current rating of ACSR Conductor in still air at an ambient temperature at 45 Deg C	Required	
11	Temperature rise for the above current	Required	
12	Short Circuit current rating of ACSR Conductor for 1sec	Required	
13	Module of elasticity of complete conductor	79	
14	Coefficient of linear expansion of complete conductor	19.1x10^6	
15	Cross sectional area	Required	
16	Nominal aluminum area	Required	
16.1	Conductivity and Grade of Al	61% EC Grade	
16.2	% Composition of steel wire	As Per spec	
17	Chemical composition certificate from NABL approved lab	Required	
18	Minimum breaking load		
18.1	Aluminum strand (After Stranding)	Required	

18.2	Galvanized steel wire (After Stranding)	Required	
19	Total Conductor	Required	
20	Max.Working tension of conductor	75% of UTS	
21	Resistance of Al conductor at 20Deg C(Max)	Required	
22	Weight		
22.1	Aluminum strand	Required	
22.2	Steel Strand	Required	
22.3	Conductor without insulation	Required	
22.4	Conductor with insulation	Required	
23	Purity of AL.rod in %age	Required	
24	Zinc coating on steel wire		
24.1	Grade of Zinc	Electrolytic High Grade Zinc not less than 99.95% purity as per IS209-1992	
24.2	Min wt of Zinc Coating	Required	
24.3	No.& duration of dips of Zinc coating (Before Stranding)	Required	
25	Type of Insulation	XLPE Type as per IS 7098	
25.1	Nominal thickness of XLPE insulation	1.6	
25.2	Min thickness of XLPE insulation	1.5	
25.3	Color of XLPE insulation	Black	
25.4	Tensile strength of Insulation (Min)	12.5	
25.5	Percentage elongation at break of Insulation (Min)	200	
25.6	Insulation resistance test (Volume resistivity) Min	1x10^14 at 27deg C 1x10^12 at 90deg C	
26	Chemical composition test certificate of XLPE insulation material	Required, shall be weather proof and have property of protection against ultraviolet light having 2.5% black carbon content	
27	Drum	Required	
27.1	Ref IS	IS-1778-1980	
27.2	Gross weight of drum including weight of conductor	Required	
27.3	Standard length of each piece of conductor	3Km	
27.4	Non standard length	1% of the ordered Quantity & no length less than 50% of the standard length	

28	Order quantity tolerance	(+/-)2%	Yes/No
29	Embossing	Name of manufacturer, Manufacture year, Manufacturing month, Type of conductor, BRPL, P.O. No & date	

ANNEXURE-2

GARAUNTEED TECHNICAL PARTIVULAR of POLYMERIC INSULATORS

Sl. No.	Descriptions	Unit	Data to be filled by Manufacturer
1	Name & address of manufacture		
2	Weight of single unit	Kg	
3	Size and designation of ball & socket assembly	mm	
4	Core diameter	mm	
5	Tolerance on core diameter	±mm	
6	Nominal length (section length)	mm	
7	Tolerance on Nominal length	±mm	
8	Dry arcing distance	mm	
9	Number of sheds	nos	
10	Sheds profile (type)		
11	Shed spacing	mm	
12	Sheds profile (regular alternating)		
13	Shed diameter	mm	
14	Tolerance on shed diameter	±mm	
15	Minimum creepage distance	mm	
16	Tolerance on creepage distance	±mm	
17	Guaranteed mechanical strength	KN	
18	Routine mechanical load	KN	
19	Materials		
a	FRP Rod		
b	Weather sheds with % contents of silicon		
c	Housing		
d	End Fitting		
e	Grading Ring		
20	Minimum thickness of sheath covering over the core	mm	
21	Power frequency withstand voltage of single unit		
a	Dry	KV (rms)	
b	Wet	KV (rms)	
22	Power frequency flashover voltage of single unit		
a	Dry	KV (rms)	
b	Wet	KV (rms)	
23	Impulse withstand voltage of single unit (dry)		
a	Positive	KV (peak)	
b	Negative	KV (peak)	
24	Impulse flashover voltage of single unit (dry)		
a	Positive	KV (peak)	
b	Negative	KV (peak)	
25	Purity of zinc used for galvanizing end fittings	%	

26	Number of dips which the end fittings can withstand in standard preece test	Nos.	
27	Certified test report of accelerated ageing test of 5000 hours (enclosed) (appendix-C of IEC-61109)	Yes/No	
28	Drawings Enclosed	Yes/No	

ANNEXURE- 3
GUARANTEED TECHNICAL PARAMETERS OF HTGS EARTH WIRE

S.N.	Particulars	Data to be filled by Vendor
1	Particulars of single steel wire before stranding	
a)	No. of wires	7
b)	Diameter (mm)	3.15 mm
b)	Tolerance	
	Plus	
	Minus	
c)	Minimum elongation in 100 mm length	
d)	Breaking load (Kg.)	
	Standard/Minimum	
e)	Minimum ultimate tensile stress (Kg/mm2)	
g)	D.C. resistance at 20 deg. C (Ohm/Km)	
2	Stranded Wire	
a)	Length of lay (mm)	
	Maximum	
	Minimum	
b)	Overall diameter of Earth wire(mm)	
c)	Area of cross section of Earth wire(sq. mm.)	
d)	Breaking load (Kg.)	
	Standard/Minimum	
e)	Resistance in Ohms per Km. at 20 deg. C.	
F)	Modulus of elasticity of Earth Wire (Kg/cm2)	
h)	Weight of Earth wire (Kg/Km)	
i)	Co-efficient of linear expansion (per deg. C)	
3	Quality of zinc used (Specify the grading and percentage)	
4	Coating of zinc on wires In Gms. Per sq. mtrs.	
5	Nos. of Dip	
6	Oiling/greasing on Earth wire	
7	Tolerance in standard length	

ANNEXURE-4

GUARANTEED TECHNICAL PARTICULARS OF HARDWARE FITTINGS FOR ACSR GOAT AND EARTH WIRE FOR LINE

GTP of Hardware fittings to be provided by vendors

ANNEXURE-5

LIST OF DRAWINGS TO BE SUBMITTED for APPROVAL

S. No	Document / drawing description
1	Route map of proposed 66kV line and associated work of 66kV line
2	Detailed design calculation of Monopole and Foundation
3	IIT Validation of Detailed design calculation of Monopole and Foundation
4	Details of earthing arrangement
5	Number plate
6	Phase plate
7	Danger Board
8	Anti climbing device
9	Flexible Bond for earth wire.
10	Cross sectional drwg for Goat conductor
11	Cross sectional drwg for earth wire
12	66kV Single & Double suspension insulator string hardware for Goat ACSR conductor
13	66kV Single & Double tension insulator string hardware for Goat ACSR conductor
14	Hardware fittings for Earth wire
15	Mid span compression joint for Goat ACSR Conductor
16	Vibration damper for Goat ACSR Conductor
17	Repair sleeve for Goat ACSR
18	Mid span compression joint for earth wire(if any)
19	Vibration damper for earth wire(if any)
20	Repair sleeve for earth wire(if any)
21	Polymeric Insulators
22	Design calculations & drawing of earthing for monopole and earthwire

#

TECHNICAL SPECIFICATION

for

SUPPLY OF MATERIAL AND ERECTION, TESTING & COMMISSIONING FOR

33kV MONOPOLE

Specification No.: GN101-03-SP-143-00

Prepared by		Checked by		Approved by		Rev	Date
Name	Sign	Name	Sign	Name	Sign		
Seema Shekhawat		Abhinav Shrivastava		K. Sheshadri		00	11th Sept18

INDEX

SECTION-1
GENERAL REQUIREMENT

1.0 SCOPE OF WORK:

The scope covers the requirement of Erection, Testing and Commissioning of 33 kV O/H Double circuit Monopole with associated works including supply of all equipments/materials. Detailed scope shall be as below:

1. Route Survey, Profiling and Monopole spotting and submission of detailed drawing.
2. Design, manufacture, testing at manufacturer's works (before dispatch), supply of Monopoles as specified.
3. Supply of Other Line items/ Accessories such as ACSR Wolf, Insulator strings, vibration dampers, hardwares, earthing material, earth wire with accessories etc. Bidder shall supply this material from BRPL approved vendors.
4. Erection of supplied steel tubular monopoles (including civil work) along with all related accessories as per the approved Monopole spotting/ alignment.
5. Erection of other Line items/ accessories such as ACSR Wolf, Insulator strings, vibration dampers, hardwares, earthing material, earth wire with accessories etc.
6. Provision of Earthing of monopole and earth wire.
7. Testing and commissioning of 33KV lines on rated voltage.
8. Dismantling of existing Tower line structure and transport to scrap store of BRPL.

Any item, which may not have been mentioned herein, but necessary for the satisfactory operation of the above items shall be deemed to be part of the requirements. The material shall have all essential features prescribed in relevant IS/International or equivalent Standards referred in this specification.

2.0 STANDARDS:

Indian Standards

IS 5613 -for determining the clearance diagrams for the pole
IS 802 - for sag tension and loading calculation
IS 875- CEA Safety Regulation 2010

ASTM – American Society for Testing and Materials

A 36 /36 M Standard Specification for Structural Steel, Book 01.04
A 123 Specification for Zinc (Hot-Dip Galvanized) Coatings on iron and Steel Products, Book 01.06, 15.08
A 153 Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware, Book 01.06.15.08
A 572/572M Specification for High-Strength Low Alloy Columbium Vanadium Steels of Structural Quality
A 780 Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings

AWS – American Welding Society

D1.1-92 Structural Welding Code – Steel. Specification for Carbon Steel Covered Arc-Welding Electrodes
A5.17-89. Specification for Carbon Steel Electrodes and Fluxes for Submerged Arc- Welding

American Society of Civil Engineers

ASCE SEI 48-05 - Design of Steel Transmission Pole Structures.

ISO – International Standards Organization

ISO 9001-Quality System Model for Quality Assurance in Design/Development, Manufacture and Testing
ISO 9002-Quality System Model for Quality Assurance in Production, installation and Servicing

Full scale testing

IEC 60652 – 2002

These codes and standards set forth the minimum requirements which may be exceeded by Contractor if, in Contractor's judgment and with PURCHASERS acceptance, superior designs and materials are available for successful and continuous operation of equipment as required by this specification.

3.0 ATMOSPHERIC CONDITIONS:

S. No.	Particulars	Data
1	Average Grade of Atmosphere	Heavily Polluted, Dry
2	Maximum Altitude above Sea Level	1000 M
3	Ambient Temperature	Max. 50 Deg. C, Min. 0 Deg. C Average 40 Deg. C
4	Relative Humidity	100%
5	Seismic Zone	4
6	Rain Fall	750 mm concentrated in four months

4.0 Electrical System Data:

S. No.	Particulars	Data
1	Nominal Voltage	33KV
2	Highest System Voltage	36 kV
3	Power Frequency Withstand Voltage	70 kV rms
4	Basic Insulation Level (Impulse)	170 kV peak
5	Short Circuit Level	26.5 kA for 3 Sec.
6	Nominal Frequency	50 Hz

5.0 CIRCUIT DETAILS

S. No.	Particulars	Data
1	Name of the circuit	33 kV O/H Double circuit line from Kilokari to AIIMS and Kilokari to RK Puram
2	Circuit Configuration	Double Circuit, Vertical Configuration
3	Conductor	ACSR Wolf
4	No. of Conductors	3-phase per circuit, One conductor per phase
5	Earth Wire	One 7/3.15 mm

6	Shielding Angle	<=30 degree
7	Minimum Ground Clearance	6.1 M
8	Nominal Span	200 M
9	Basic Wind Speed	47 m/Sec. as per IS – 875 Part – 3

6.0 TESTING AND INSPECTION:

All routine & acceptance tests shall be witnessed by the purchaser/his authorized representative.

6.1 Routine Test:

The bidder shall provide material wise routine test reports conducted at their work along with the standards application in their bid.

6.2 Acceptance tests:

Acceptance test shall be carried out as per technical specification and relevant standard. Following compulsory acceptance test shall be carried out on all items before the supply of material:

a) Visual Inspection
b) Physical verification
c) Dimensional checks

6.3 TYPE TEST CERTIFICATES

The bidder shall furnish the type test certificates from CPRI/ERDA for Monopoles, as per relevant standards and specification.
The bidder shall furnish the type test certificates from CPRI/ERDA for ACSR Wolf, Earth wires, Insulators and All hardware fittings and other accessories as per relevant standards and Technical specification.
Type tests should have been conducted in certified Test laboratories not exceeding 5 years from the date of opening the bid, In the event of any discrepancy In the test reports, i.e. any test report not acceptable, same shall be carried out without any cost implication to the Purchaser.

7.0 DRAWINGS, DATA & MANUALS

7.1	Documents	copy of signed documents also shall be part of entire soft file (e-file) or CD.)
7.2	Along with the Bid	Vendor shall submit signed 3 sets (plus 1 set of soft copy) of following documents: a) GTP (duly filled-in) (as per Annexure - A). b) Cross-sectional drawings for components Assembly c) Type Test Certificates d) Complete Catalogue and Instructions. e) Any other document.
7.3	After Award of Contract	Vendor shall submit signed 2 sets (plus 1 set of soft copy) of above mentioned documents within 15 days, for Purchaser's approval.
7.4	"As-Built"	Final signed "As-built" documents for the equipment in 3 sets

	documents	(hardcopy), 1 no. soft copy and 1 no. CD. These documents shall include signed Routine & Acceptance Test Certificates also.
7.5	Packing, Marking, Shipping, Handling and Storage	Every component/kit/box shall be properly sealed/ packed for protection against damage.
7.6	Transit damage	The seller shall be responsible for any transit damage due to improper packing.

8.0 Quality Assurance (QA)

8.1	Vendor's Quality Plan (QP)	To be submitted for Purchaser's approval as well along the bid.
8.2	Sampling Method	Sampling Method for quality checks shall be as per manufacturer's standard practice / ESI guidelines and Purchaser's prior approval shall be taken for the same.
8.3	Inspection Hold-Points	To be mutually identified, agreed and approved in Quality Plan.

9.0 Deviations

9.1	Deviations	A) Deviations from this specification can· be acceptable, only where the Seller has listed in his quotation the requirements he cannot, or does not, wish to comply with and which deviations the Buyer has agreed to in writing, before any order is placed. B) In the absence of any list of deviations from the Seller, it will be assumed by the Buyer that the Seller complies with the Specification fully

TECHNICAL SPECIFICATION OF MONOPOLE

1.0 SCOPE

The designs of multi circuit and double circuit steel monopole towers and their extensions should be conforming to the design parameter specified herein. The scope of supply of towers also includes supply of design calculations and test reports for towers and extensions including detailed structural/shop drawings of towers, extensions and stub-setting templates and design and drawings of foundations in various types of soil, sag templates, sag tension chart for conductor and ground wire etc.

The fabricated steel poles shall include base plate with its required accessories, monopole body (including extensions, if required), Cross Arms. Monopole shall be joined with friction clip or Flanged joint. Cross Arms shall be also Polygonal with structural jointing arrangement. The accessories shall include strain plates, D-shackles with nuts, bolts and washers, U-Bolts with nuts and washers, space washers, links for providing attachment to the Earth Wire and Conductor, anticlimbing devices and any other equipment/ material / article to complete the works as per the scope given in this specification.

The monopoles shall be fully galvanized. Provision will be made at the Cross Arm level for fixing phase plates and Bird guards. The holes for fixing the Earthing bonds at the peak and for grounding the monopoles at bottom or any other holes, which the purchaser may require, shall be provided at the convenient locations on the monopoles.

2.0 TYPE OF MULTI CIRCUIT AND DOUBLE CIRCUIT STEEL MONOPOLE

The multi circuit monopole will have four circuits (twelve cross arms), self-supporting, designed for the specified loading conditions. There will generally be following type of towers:-

Monopole type MP0: Tangent type tower with maximum line deviation up to 2° to be used with Single/ Double suspension insulator strings.
Monopole type MP30: Medium angle tower to be used for line deviation from 2° to 30° with Single/Double tension insulator strings.
Monopole type MP60: Heavy angle tower to be used for line deviation from 30° to 60° and also as dead end tower with Single/Double tension insulator strings.
The double circuit Monopole will have two circuits (six cross arms), self-supporting, designed for the specified loading conditions. There will generally be following type of towers:-

Monopole type MP0: Tangent type tower with maximum line deviation up to 2° to be used with Single/Double suspension insulator strings.
Monopole type MP30: Medium angle tower to be used for line deviation from 2° to 30° with Single/Double tension insulator strings.
Monopole type MP60: Heavy angle tower to be used for line deviation from 30° to 60° and also as dead end tower with Single/Double tension insulator strings.

The bidder may also quote for up gradation work using the categories of Monopole available with him. In such case the bidder will have to indicate the type of monopoles and extensions proposed to be used by him for up gradation work.

3.0 EXTENSIONS

Monopole shall be designed and provided with extension of 3M height for use with all type of towers.

DESIGN: 33KV as per ASCE-48-05

The bidder will furnish a design as per ASCE-48-05 for each of the offered monopoles with extensions based on the loading conditions indicated herein. The suspension monopoles shall be designed with using `I' suspension string.

Please note that in case of suspension monopole, full wind condition is to be considered in the design in case of security requirement i.e. transverse load due to wind action on tower structure, conductors, ground wire and insulators shall be computed as per clause 12.1.1(i), page 10 of IS 802 (Part-1) 1995 or its latest. The mechanical tension of conductor/ground wire is the tension corresponding to 100% design wind pressure at everyday temperature or 36% design wind pressure at minimum temperature after accounting for drag coefficient and gust response factor as defined in clause 11.3.2.1 page 10 of IS 802 (Part-1) 1995 or its latest. The longitudinal loads shall correspond to 50% of mechanical tension of conductor as per clause 11.3.2.1, page 10 of IS 802 (Part-1):1995 or its latest.

The monopole to be designed considering Goat ACSR one conductor per phase (although bidder need to supply Wolf ACSR) in vertical formation and one ground-wire of (7/3.15mm) galvanized stranded steel wire of 95kg/sq.mm grade placed on the top of the monopole. The conductor and ground-wire particulars are given in following sections.

The ground-wire at its suspension point shall provide a shielding angle of 30° with respect to the top most conductors. The drop of ground-wire suspension assembly should be taken into account so as to determine the shielding angle.

The minimum mid-span vertical clearance between Ground-wire and Conductor in still air shall be 4 Mtrs for 33KV. The minimum electrical clearance between conductors shall be 2 Mtrs for 33KV (Horizontal) tower.

Note: The Monopoles shall be designed as per site requirements and following the guidelines of statutory clearances, CEA's Regulations, 2010.

ACSR Wolf and ground wire data shall be as below:

Parameters	**ACSR Wolf Conductor**	**Ground wire**
Stranding and wire diameter	30/2.59 mm Al. + 7/2.59 mm Steel	7/3.15mm Steel
Total sectional area	194.9 sq. mm	54.55 mm^2
Approximate overall diameter	18.13 mm	9.54 mm
Approximate weight	727Kg/Km	428 kg/km
Approximate calculated breaking load	67.34 KN	34KN

4.0 CLEARANCES:

The following minimum clearances may be made available between the live parts and the nearest Monopole bay.

Suspension string Jumper in case of tension monopoles Swing Clearance:

S. No.	Description	Swing Clearance (mm)
1	Still Air (Nil)	2130
2	15 deg	1980
3	30 deg	1830
4	45 deg	1675

The above clearances are based on maximum and minimum string lengths of insulators as per standard practice. If Pilot string is used in case of 60° monopole; swing of the pilot string shall be 15 deg. The clearance shall be available from grading ring if the same happens to be the nearest to the monopole body at any point of time.

5.0 DESIGN SPANS:

The wind span for the purpose of computing the wind load on conductors and ground-wire shall be indicated in the offer. Similarly the weight span shall also be indicated.

6.0 WIND LOAD:

The wind load on conductors, earth wire, towers and insulator strings shall be taken as per recommendations of IS: 802 (Part-I) -1995 or its latest with latest revision thereof, for following conditions:-

a. Wind zone - 4 (47mtrs/sec)
b. Reliability level –
    i. 1.0 (one) for Double circuit monopoles
    ii. 2.0 (Two) for Multi circuit monopoles.
c. Terrain category - 2 (two)

7.0 TEMPERATURE VARIATION:

The maximum working tension of conductor and ground-wire and the uplift conditions shall correspond to the minimum temperature of 0° C. The maximum conductor sag and ground clearance beneath should correspond to the maximum working temperature of 75° C. The Maximum ground-wire temperature shall be taken as 53°C.

8.0 STRUCTURAL STEEL:

Structural steel shall be conforming to IS: 2062 Grade E-355 JR and weld able quality and plates less than 6mm thickness (to be used for pack plate and pack washer) shall be as per IS: 1079.

Permissible stresses in the design of self-supporting steel monopole tower shall conform to ASCE: 48-05 latest edition or equivalent code of latest edition. The sheets/plates of monopole shall be from TATA/SAIL/JSW/ESSAR.

9.0 LOADS ON MONOPOLES:

Transmission lines are subjected to various loads during their life time. These loads are classified into three distinct categories, namely

a) Climatic Loads: related to the reliability requirements.
b) Failure containment Loads: related to security requirements.
c) Construction & Maintenance Loads: related to safety requirements.

a) Climatic Loads:

These are random loads imposed on monopole, insulator string; conductor & ground wire due to action of wind on transmission line & do not act continuously. Climatic loads shall be determined under either of the following climatic conditions whichever is more stringent:

(1) 100 percent design wind pressure at every day temperature (32°C) **or**

(2) 36 percent design wind pressure at minimum temperature (0°C)

b) Failure Containment Loads:

Anti-cascading Loads &
Torsional & Longitudinal Loads

i) Anti-Cascading Loads:

Cascade failure may be caused by failure of items such as insulators, hardware, joints failures of major components such as monopoles, foundations, conductor due to defective material or Workman ship or from climatic overloads sometimes from casual events such as misdirected aircraft, avalanches, sabotage etc. The security measures adopted for containing cascade failures in the line is to provide angle monopoles at specific intervals which shall be checked for Anti-cascading loads.

ii) Anti-cascading checks:

1. Suspension monopoles shall be checked for narrow front wind with a wind speed of 2.0 of basic wind speed.
2. Angle monopoles shall be checked for the following anti cascading conditions with all the conductors & ground wire intact only on one side of the monopole.

Transverse load: These loads shall be taken under no wind condition.

Vertical Load: These loads shall be the sum of weight of conductor/ground wire as per weight span of intact conductor/ground wire, weight of insulator strings and accessories.

Longitudinal Loads: These loads shall be the pull of conductor/ground wire at every day temperature & no wind applied simultaneously at all points on one side with zero degree line deviation.

Torsional & Longitudinal Loads:

These loads are caused by breakage of conductors and/or ground wire. All the monopoles shall be designed

for these loads for the number of conductor(s) and or ground wire considered broken as per provisions of this specification.

c) Construction & Maintenance Loads:

These are loads that are imposed on monopoles during constructions & maintenance of transmission lines.

Computation of Loads & loading combinations: The computation of loads is to be done in line with relevant provisions/ sections of IS 802- 1992 (latest amendment)

Tension Limits:

Conductor/ground wire tension at everyday temperature & without external load, should not exceed the following percentage of the ultimate tensile strength of the conductor:

Initial unloaded tension **22 percent**, Final unloaded tension **25 percent** provided that the ultimate tension under everyday temperature & **100 percent** design wind pressure or minimum temperature & **36 percent** design wind pressure does not exceed **70 percent** of the ultimate tensile strength of the conductor/ground wire.

TRANSVERSE LOADS

The transverse loads due to wind on conductors and ground-wire shall be calculated

(i) The normal span for normal Multi-circuit monopoles (i.e. upto +6m Extension) shall be 200m
(ii) The wind span is the sum of the two half spans adjacent to the support under consideration. For normal horizontal spans this equal to normal ruling span.
(iii) The weight span shall be shown in the design report of monopoles. The horizontal distance between the lowest point of the conductors on the two spans adjacent to the tower. The weight spans considered for design of monopoles is as below.

under normal condition.

Under broken wire conditions 50% of the intact span and 10% of the broken span shall be assumed as wind span. In addition to this, transverse loads due to line deviation, wind on towers, and wind on insulator strings should also have to be taken into consideration in the design of the towers.

CONDUCTOR AND GROUND-WIRE SAG:

The maximum sag for the conductor should be calculated for 75° C and no wind with an allowance of 3% of maximum sag to allow for plotting and sagging errors.

GROUND CLEARANCE:

The minimum ground clearance of **6.1** Meters shall be available corresponding to the maximum working temperature and normal span.

BROKEN WIRE CONDITIONS:

Following broken wire conditions should be assumed in the design of towers:

a. Suspension monopole- Any one of power conductor broken or ground-wire broken which ever condition is more stringent for design.

b. **Angle Monopole** for 2° to 30° deviation **-** Any two of power conductors broken on the same side and on the same span or any one of the power conductor broken and ground-wire broken on the same span whichever combination constitutes the most stringent condition for design of a particular member.

c. **Angle Monopole** for 30° to 60° deviation **-** Any Three power conductors broken on the same side and on the same span or any two of the power conductor broken and ground-wire broken on the same side and same span which ever combination constitutes the most stringent condition for design. Further this monopole shall also be designed for dead end condition i.e. all conductors and ground wire broken on the same side and same span.

In all type of monopoles, the power conductor's supports and ground-wire supports should be designed for broken wire conditions also.

FACTORS OF SAFETY FOR MONOPOLES:

The factors of safety for design of monopoles shall be as under:

(i) Normal condition – **1.5.**
(ii) Broken wire condition – **1.5**

DEFLECTION CRITERIA: 1.5% of the height under safety normal condition and 5% of height under ultimate wind for both suspension and tension poles.

BOLTS AND NUTS AND WASHERS:

The design of the monopoles should be based on use of HRH mild steel hot dip galvanized bolts having grade 6.8(for foundation bolts)/8.8(for connection bolts). The connections shall be designed on the basis of use of 24 mm dia bolts. The spring washers shall be provided for insertion under all nuts. These washers shall be of steel, electro galvanized, and positive lock type and of minimum 3.5mm thickness.

The nuts shall be forged and tapped after galvanizing and then lubricated. The nuts shall be chamfered on one face only, the other face shall be machined.

The bolts and nuts shall be free from forging and threading defects such as cuts, splits, burrs, bulging, taper, eccentricity, loose fit etc.

The bolts shall be threaded up to standard length only as per relevant Indian Standard and not to full length.

The bolts and nuts shall confirm to IS 1367-1971 Part-III and Part-IV, IS 12427, IS 1363-92, IS 1367 Part-XIII with latest amendment.

The spring washers after coiling shall be suitably heat treated so as to result in the finished washer having hardness 43 to 50 HRC when tested in accordance with IS 1586- 1968.

The surface of the washers shall be free of scales and burrs. The washers shall be coiled without any kinks (except for the shape with turned-up ends). The ends of the washer shall not about when the washers are compressed. The ends shall be so served as to prevent tangling.

LOAD ON FOUNDATIONS:

The foundations shall withstand the ultimate loads on the superstructure as specified in this specification, for the full footing reactions along the stub angle slopes obtained from the structural stress analysis.

The reactions on the footing shall be composed of the following types of loads for which they shall be required to be checked.

(a) Maximum tension or uplift.
(b) Maximum compression or down-thrust.
(c) Maximum horizontal shear or side thrust.

The additional weight of concrete in the footing below ground level over the earth weight and full weight of concrete above the ground level in the footing and embedded steel parts will also be taken into account adding to the down-thrust.

STABILITY ANALYSIS:

The following primary types of soil resistances shall be assumed to act in resisting the loads imposed on the footings in earth:

(a) Resistance against uplift:

The uplift loads will be assumed to be resisted by weight of earth in an inverted frustum of a conical pyramid of earth on the footings pad whose sides make an angle equal to the angle of repose of the earth with the vertical in average soil. The weight of concrete embedded in earth and that above the ground will also be considered for resisting the uplift. In case where the frustum of earth pyramids of two adjoining legs super-impose each other, the earth frustum will be assumed truncated by a vertical plane passing through the centre line of the tower base.

(b) Resistance against down-thrust:

The down -thrust loads combined with the additional weight of concrete above earth will be resisted by bearing strength of the soil assumed to be acting on the total area of the bottom of the footings.

(c) Resistance against side thrust:

The bidder shall describe in detail the methods followed by them to check the stability of foundations for horizontal shears.

OR

Side-thrust along with the relevant reference (**IS or other standard**) in support of their contentions.

In addition to the strength design, stability analysis of the foundation shall be done to check the possibility of failure by over-turning, uprooting, sliding and tilting of the foundation.

DESIGN OF FOUNDATIONS:

The bidder is requested to submit the design of foundations. It is recommended to give Single Pile Foundation.

FACTORS OF SAFETY FOR FOUNDATION:

The minimum factors of safety/overload factor based on the ultimate strength of the foundation material when the monopoles are under full working loads under various conditions of loadings combined with the other loads specified for the foundations shall be as given below:-

(a) Normal condition - 1.5
(b) Broken wire condition - 1.5

TYPE TEST:

Monopoles are to be type tested as per relevant standards.
Manufacturer/supplier shall posses valid Type test reports of (suspension & angle monopoles) from CPRI/ ERDA for 33KV or higher voltage grade monopole and conducted during last 5 years from the date of submission of drawings for approval subject to submission of report for verification.

SECTION-3

TECHNICAL SPECIFICATIONS OF ACSR CONDUCTOR

1.0 SCOPE

1.1 This specification covers the design, manufacture, testing at manufacturer's works, packing and delivery at site of the ACSR conductor along with necessary accessories.

1.2 The conductor and its accessories shall be complete with all fittings and components necessary for the effective working and efficient performance and satisfactory maintenance under the various operating conditions specified. All such parts shall deemed to be included within the scope of supply where specifically included or not in this specification in the tender schedule. The successful bidder shall not eligible for any extra charge for such accessories.

2. CODES AND STANDARDS

2.1 All equipment and material shall be designed, manufactured and tested in accordance with the latest applicable Indian Standard, IEC standard and CBIP manuals enlisted in the appendix 1, except where modified and / or supplemented by this specification.

2.2 Equipment and material confirming to any other standard, which ensures equal or better quality, may be accepted. In such case copies of English version of the standard adopted shall be submitted by the vendor with the offer

2.3 The electrical installation shall meet the requirement of Indian Electricity Rules as amended upto date, relevant IS code of practice and Indian electricity act. In addition other rules & regulations applicable to the work shall be followed. In case of any discrepancy the most stringent & restrictive one shall be binding.

2.4 The equipment offered shall in general comply with the latest issues including amendments of the standards enlisted in the appendix 1 but not restricted to it.

3. DESIGN

3.1 General

3.1.1 All steel strands shall be smooth, uniform and free from all imperfections, such as spills and splits, die marks, scratches, abrasions and kinks after drawing and also after stranding.

3.1.2 The finished material shall have minimum brittleness, as it will be subjected to appreciate vibration while in use.

3.1.3 The steel strands shall be hot dip galvanized and shall have a maximum zinc coating of 240gms/sqm. after stranding. The zinc coating shall be smooth, continuous of uniform thickness, free from imperfections and shall withstand three and a half dips after stranding in standard Preece test. The steel wire rod shall be of such quality and purity that, when drawn to the size of the strands specified and coated with zinc, the finished strands shall be of uniform quality and have the same properties and characteristic as prescribed in relevant ASTM/IS/IEC standards.

3.1.4 To avoid susceptibility towards wet storage stains (while rust), the finished material shall be provided with a protective coating of boiled linseed oil.

3.1.5 The finished conductor shall have a smooth surface without any surface cuts, abrasions, scuff marks and shall be free from dirt, grit etc.

3.1.6 The Steel wire shall be made from materials produced either by the acid or basic Open Hearth process or by electric process. No steel wire drawn from 'Bessemer Process' shall be used. The steel wire shall not contain sulphur or phosphorous exceeding 0.5% and the total of sulphur and phosphorous shall not exceed 0.085%.

3.1.7 The steel strands shall be performed and post formed in order to prevent spreading of strands in the event of cutting of composite core wire. Care shall be taken to avoid damages to galvanization during performing and post forming operations.

3.2 MATERIALS

3.2.1 The aluminium strands shall be hard drawn from electrolytic aluminium rods having a purity of not less than 99.5% and a copper content not exceeding 0.04%.

3.2.2 The steel wire strands shall be drawn from high carbon steel wire rods produced by either the acid or basic open hearth process, the electric furnace process, or the basic oxygen process and shall conform to the following requirements as to the chemical composition:

Element	% composition
Carbon	0.50 to 0.85
Manganese	0.50 to 1.10
Phosphorus	Not more than 0.035
Sulphur	Not more than 0.045
Silicon	0.10 to 0.35

3.2.3 The zinc used in galvanizing shall be electrolytic high grade zinc of 99.95% purity. It shall conform to and satisfy all the requirements of IS/IEC.

3.3 STANDARD LENGTH

3.3.1 The standard length of the conductor shall be 3000 meters. A tolerance of +/-5% on the standard length offered by the Bidder shall be permitted. All lengths outside this limit of tolerance shall be treated as random lengths.

3.3.2 Random lengths will be accepted provided no length is less than 70% of the standard length and the total quantity of such random length shall not be more than 10% of the total quantity ordered. When one number random length has been manufactured at any time, five (5) more individual lengths, each equivalent to the above random length with a tolerance of +/-5% shall also be manufactured and all the above six random lengths shall be dispatched in the same shipment. At any point, the cumulative quantity supplied including such random lengths shall not be more than 12.5% of the total cumulative quantity supplied including such random lengths. However, the last 20% of the quantity ordered shall be supplied only in standard lengths as specified.

3.3.3 Bidder shall also indicate the maximum single length, above the standard length, he can manufacture

in the guaranteed technical particulars of offer. This is required for special stretches like river crossing etc. The employer reserves the right to place orders for the above lengths on the same terms and conditions applicable for the standard lengths during the pendency of the Contract.

3.4 JOINT IN WIRES

3.4.1 Aluminium wires

No joints shall be permitted in the individual wires in the outer most layer of the finished conductor. However, joints in the 12 wire and 18 wire inner layer of the conductor shall be allowed but these joints shall be made by cold pressure butt welding and shall be such that no such way joints are within 15 meters of each other in the complete stranded conductor. The joints shall withstand a stress of not less than the breaking strength of individual strand guaranteed.

3.4.2 Steel Wires

There shall be no joint of any kind in the finished wire entering into manufacture of the strand nor strand joint or strand splices in any length of the complete stranded steel core of the conductor.

4 TESTS

The following acceptance and routine tests and tests during manufacture shall be carried out on the conductor. For the purpose of this clause, the following shall apply

i. Acceptance tests shall mean those tests which are to be carried out on samples taken from each lot offered for pre-dispatch inspection, for the purpose of acceptance of that lot.

ii. Routine tests shall mean those tests, which are to be carried out on each strand/spool/length of the conductor to check requirements which are likely to vary during production.

iii. Tests during manufacture shall mean those tests, which are to be carried out during the process of manufacture to ensure the desired quality of the end product.

iv. For all acceptance tests, the acceptance values shall be the values shall be the values guaranteed by the Bidder in the guaranteed technical particulars of his proposal or the acceptance value specified in this Specification, whichever is more stringent for that particular test.

4.1 TYPE TESTS

All Valid Type test certificate as per relevant IS/IEC shall be submitted for purchaser review. In case type tests have not been conducted earlier the same has to be carried out without any cost implication to purchaser. Purchaser has the right of witnessing any of the tests for which the supplier has to give prior notice before the date of conducting such tests. The unit rates for each type of the tests to be carried out shall be indicated in the offer. Requirement of type test shall be as listed below. Type test charges shall not be included as part of main price to be indicated in the offer.

The following tests shall be performed on a typical length of conductor. The cost of these tests shall be

quoted separately.

a) Surface condition test
b) Test for ultimate breaking load on stranded conductor
c) Stress strain test
d) Measurement of diameter of individual aluminium and steel wires.
e) Measurement of lay ratio.
f) Breaking load of individual wires
g) Ductility test
h) Wrapping test
i) Resistance test and
j) Galvanizing test

4.2 ACCEPTANCE TESTS

a) Visual and dimensional check by drum
b) Visual check for joints scratches etc and lengths of conductor by rewinding
c) Dimensional check on steel and aluminium strands
d) Galvanizing test on steel strands
e) Torsion and elongation test on steel strands
f) Check for lay ratio of various layers
g) Breaking load test on steel and aluminium strands
h) Wrap test on steel and aluminum strands
i) DC resistance test on aluminium strands
j) UTS Test on welded joint of strands

All above tests except (j) shall be carried out on aluminium and steel strands after stranding only.

4.3 ROUTINE TESTS

a) Check to ensure that the joints are as per Specification.
b) Check that there are no cuts, fins etc on the strands.
c) Check that drums as per Specification.
d) All acceptance test as mentioned above to be carried out on each coil

4.4 TEST REPORTS

a) Records of routine tests reports shall be maintained by the Manufacturer at his works for periodic inspection by the purchaser's representative.
b) Test Certificates of tests during manufacture shall be maintained by the manufacturer. These shall be produced for verification as and when desired by the purchaser.

5. Drum Identification:

Each drum shall have the following information stenciled on it in indelible ink along with other essential data:

i. Contract/Award letter number
ii. Name and address of consignee
iii. Manufacturer's name and address

iv. Drum number.
v. Size of conductor
vi. Length of conductor in meters
vii. Gross weight of drum with conductor
viii. Weight of drum without lagging
ix. Weight of empty drum with lagging

x. Barrel diameter at three locations is an arrow marking at the location of measurement.
xi. Number of turns in the outer most layer
xii. Arrow marking for unwinding
xiii. Position of the conductor ends
xiv. Distance between outer most layer of Conductor and the inner surface of lagging

LIST OF APPLICABLE CODES AND STANDARDS

The conductor and earthwire shall conform to the following Indian/International Standards, which mean latest revisions amendments/changes adopted and published, unless otherwise specified here in before, International and internationally recognized standards to which these standard generally corresponding are also listed below:

Sl.No,	Indian Standard	Title
1.	IS: 209-1992	Zinc Ingot - Specification
2.	IS 398-1982 Part I, II, III and IV	Specification for Aluminium Conductors for overhead Transmission purposes
4.	IS: 1778-1980	Reels and drums for bare conductors
5.	IS: 2629-1985	Recommended practice for hot dip galvanizing of iron and steel
7.	IS:2633-1992	Method of Testing Uniformity of coating or zinc coated articles
8.	IS: 4826-1979	Galvanized coating on round steel wires.
9	IS: 6745-1990	Methods of determination of weight of zinc coating of zinc coated iron and
10.	BS: 433-1969	
11.	ISO/R89-1959	
12.	BS: 1559-1949	
13.	BS: 3436-1986	
14.	IEC: 1089	

15. BS: 215-1970

16. ASTM A472-729

17. IS:7098 Part –I-1988 XLPE Insulation

DATA SHEET OF CLIENT REQUIREMENT

3. DETAILS OF CONDUCTOR - WOLF

3.1 The conductor shall be ACSR 'Wolf' and the details of the conductor are tabulated below:

a)	Stranding and wire diameter	:	30/2.59 mm Al. + 7/2.59 mm Steel
b)	Number of strands		
	Core	:	1
	Ist layer	:	6
	2nd layer	:	12
	3rd layer	:	18
c)	Sectional area of aluminum	:	158.1 sq. mm
d)	Total sectional area	:	194.9 sq. mm
e)	Overall Diameter	:	18.13 mm
f)	Approximate weight		
	i) Aluminium	:	438 Kg/Km
	ii) Steel	:	289 Kg/Km
	iii) Total	:	727 Kg/Km
g)	Calculated DC resistance at 20 deg. C	:	.1871 Ohms/Km
h)	Breaking load of conductor	:	67.34 kN

3.2 **TOLERANCES**

The manufacturing tolerances to the extent of the following limits only shall be permitted in the diameter of individual strands and lay-ratio of the conductor:

c) Diameter of Aluminium & Steel Strands

	Nominal	Maximum	Minimum
Aluminium	2.59 mm	2.62mm	2.56mm
Steel	2.59 mm	2.64 mm	2.54 mm

d) Lay ratio of conductor

	Max.	Min.
6 wire layer (steel)	30	20
12 wire layer (Al.)	21	14
18 wire layer (Al.)	14	11.25

SECTION-4

Technical Specification for Polymeric Insulator

1.0 Scope

This specification covers the design, manufacture, testing & supply of Polymeric Insulators.

2.0 Codes and Standards

The Polymeric Insulator shall be designed, manufactured & tested in accordance with the following National / International Standards (IS/IEC).

Sl No	Indian Standard	Title	International Standard
1	IS:209-1992	Specification for zinc	BS:3436
2	IS:406-1991	Method of Chemical Analysis of Slab Zinc	BS:3436
3	IS:731-1991	Porcelain insulators for overhead Power lines with a nominal voltage greater than 1000 V	BS:137- (I&II) IEC:60383
4	IS:2071 Part (I) – 1993 (Part(II)-1991, Part(III)-1991	Methods of High Voltage Testing	IEC:60060-1
5	IS:2486 Part- I-1993 Part- II-1989 Part-III-1991	Specification for Insulator fittings for Overhead Power Lines with a nominal voltage greater than 1000V General Requirements and Tests Dimensional Requirements Locking Devices	BS:3288 IEC:60120 IEC:60372
6	IS:2629-1990	Recommended Practice for Hot, Dip Galvanization for iron and steel	ISO-1461 (E)
7	IS:2633-1992	Testing of Uniformity of Coating of zinc coated articles	
8	IS:3188-1988	Dimensions for Disc Insulators	IEC:60305
9	IS:6745-1990	Determination of Weight of Zinc Coating on Zinc coated iron and steel articles	BS:433-1969 ISO:1460-1973
10	IS:8263-1990	Methods of RI Test of HV insulators	IEC:60437 NEMA Publication No.07/ 1964/ CISPR
11	IS:8269-1990	Methods for Switching Impulse test on HV insulators	IEC:60506
12		Thermal Mechanical Performance test and mechanical performance test on string insulator units	IEC: 60575
13		Salt Fog Pollution Voltage Withstand Test	IEC:60507
14		Composite insulators for A.C. Overhead lines with nominal voltage greater than 1000V – Definitions, test methods and acceptance criteria	IEC 61109

15		Guide for the selection of insulators in respect of polluted conditions	IEC:60815
16		Tests on insulators of Ceramic material or glass or glass for overhead lines with a nominal voltage greater than 1000V	IEC:60383
17		Characteristics of string insulator units of the long rod type	IEC : 60433

3.0 Service Conditions:

The Polymeric Insulator to be supplied against this specification shall be suitable for satisfactory continuous operation under the following service conditions:

a) Maximum ambient temperature (Degree C) 50

b) Minimum ambient temperature (Degree C) 0

c) Relative Humidity (%) 100

d) Maximum annual rainfall (mm). 1450

e) Maximum wind pressure (Kg/Sq.m) 150

f) Maximum Altitude above mean sea level (Meters) 1000

g) Seismic level (Horizontal Acceleration) 0.30

h) Climatic Conditions : Moderately Hot and humid tropical climate conductive to rust and fungus growth

i) Ref Ambient Temperature for Temperature (Degree C) 50

4.0 Design Feature:

4.1 Details of Composite Long Rod Insulators:

- The insulators of the strings shall consist of composite long rod insulators for a three phase, 50 Hz, effectively earthed transmission system application in a very heavy polluted environment. Couplings shall be ball and socket type.
- Bidder shall quote such composite insulators which have proven use under foggy/humid operational conditions in polluted environment combined with smoke and dust particles. The Bidder shall furnish evidence in the form of certification from the power utilities that the similar type of product supplied to them had been performing satisfactory. The Bidder shall also submit certified test report (from CPRI/ERDA) for an accelerated ageing test of 5000 hours such as that described in Appendix-C of IEC-61109.
- Insulators shall have sheds of the “open aerodynamic profile without any under ribs” with good self-cleaning properties. Insulator shed profile; spacing projection etc. shall be strictly in accordance with the recommendation of IEC-60815.

- The size of long rod insulator, minimum creepage distance, electromechanical strength and mechanical strength of insulator string along with hardware fittings up to 33KV shall be as follows-

Sl. No	Type of String	Size of Composite Insulator (mm)	Min. Creepage Distance (mm)	EM strength of Insulator Unit (KN)	Mechanical strength of Insulator string along with Hardware fittings (kN)
1	Single Suspension	20X870	2280	90	90
2	Single Tension	20X870	2280	120	120

*** Note:** The core dia. of composite insulators mentioned at column No.3 is minimum requirement. The bidder shall offer composite long rod insulators of suitable core dia to meet specified E&M strength requirements. However, the overall string length shall be within the limits specified in the drawing

4.2 Pin and Cap:

- Pin and cap shall be designed to transmit the mechanical stress & develop uniform mechanical strength in the insulator. The cap shall be circular with the inner and outer surfaces concentric of such design that it will not yield or distort under load conditions

- The design shall be such as to permit easy removal of replacement of either insulator units or fittings under the live line conditions.

4.3 Ball and Socket Designation:

The dimensions of the Ball and Socket shall be of 16 mm for 90kN & 120kN Insulators in accordance with the standard dimensions stated in IEC: 120/ IS: 2486 (Part-II).

4.4 Dimensional Tolerance of Composite Insulator:

The tolerances on all dimensions e.g. diameter, length and creepage distance shall be allowed as follows:
± (0.04d+1.5) mm when d≤300 mm.
± (0.025d+6) mm when d>300 mm
Where 'd' is in mm being the diameter, length or creepage distance.

*** Note-no negative tolerance shall be applicable to creepage distance.**

4.5 Materials:

- **Core-** It shall be a glass-fiber reinforced (FRP rod) epoxy resin rod of high strength. Glass fibers and resin shall be optimized. The rod shall be electrical grade corrosion resistant (ECR), **boron free** glass and shall exhibit both high electrical integrity and high resistance to acid corrosion.

- **Housing and Weather sheds-** The FRP rod shall be covered by a seamless sheath of a silicone rubber compound of a thickness of minimum 3mm. The housing & weather sheds should have silicon content of

minimum 30% by weight. It should protect the FRP rod against environmental influences, external pollution and humidity. It shall be extruded or directly molded on the core. The interface between the housing and the core must be uniform and without voids. The strength of the bond shall be greater than the tearing strength of the polymer. The manufacturer shall follow non-destructive technique (N.D.T.) to check the quality of jointing of the housing interface with the core. The technique being followed with detailed procedure and sampling shall be furnished along with the bid. The details for this shall be finalized during detailed engineering and finalization of MQP.

- **End Fittings-** End fittings transmit the mechanical load to the core. They shall be made of malleable cast iron spheroidal graphite or forged steel. They shall be connected to the rod by means of a controlled compression technique. The manufacturer shall have in-process Acoustic emission arrangement or some other arrangement to ensure that there is no damage to the core during crimping. This verification shall be in-process and done on each insulator. The gap between fitting and sheath shall be sealed by a flexible silicone rubber compound. The system of attachment of end fitting to the rod shall provide superior sealing performance between housing and metal connection. The sealing must be humidity proof and durable with time

- **Corona Ring/Grading Ring-** Grading rings shall be used at both ends of each composite insulator unit for reducing the voltage gradient on and within the insulator and to reduce radio and TV noise to acceptable levels. The size and placement of the metallic grading rings shall be designed to eliminate dry band arcing/corona cutting/ exceeding of permissible electrical stress of material. The bidder shall furnish calculations along with the proposed placement and design of corona ring in support of the above. Grading rings shall be capable of installation and removal with hot line tools without disassembling any other part of the insulator assembly.

*** Note:-**The supply of grading rings shall be in the scope of the composite insulator supplier.

5.0 General Requirement:

5.1 Interchangeability- The composite long rod insulators inclusive of the ball & socket connection shall be standard design suitable for use with the hardware fittings of any make conforming to relevant IEC standards.

5.2 All surfaces shall be clean, smooth, without cuts, abrasions or projections. No part shall be subjected to excessive localized pressure. The insulator and metal parts shall be so designed and manufactured that it shall avoid local corona formation and shall not generate any radio interference beyond specified limit under the operating conditions.

5.3 The long rod insulators offered shall be suitable for employment of hot line maintenance technique so that usual hot line operation can be carried out with ease, speed and safety.

5.4 All insulators shall be designed to facilitate cleaning and insulators shall have the minimum practical number of sheds and grooves. All grooves shall be so proportioned that any dust deposit can be removed without difficulty either by wiping with a cloth or by remote washing under live line condition.

5.5 All the materials shall be of latest design and conform to the best modern practices adopted in the extra high voltage field. Bidders shall offer only such insulators as are guaranteed by him to be satisfactory and suitable for transmission lines specified and will give continued good service.

5.6 The design, manufacturing process and material control at various stages shall be such as to give maximum working load, highest mobility, best resistance to corrosion, good finish and elimination of sharp edges and corners to limit corona and radio interference

5.7 The design of the insulators shall be such that stresses due to expansion and contraction in any part of the insulator shall not lead to deterioration.

5.8 The core shall be free from cracks and voids which may adversely affect insulator.

5.9 Weather sheds shall be uniform in quality. They shall be clean, sound, smooth and free from gross defects and excessive flashing at parting lines.

5.10 End fittings shall be free from cracks, seams, shrinks, air holes and rough edges. End fittings should be effectively, sealed to prevent moisture ingress, effectiveness of sealing system must be supported by test documents. All surfaces of the metal parts shall be perfectly smooth with the projecting points or irregularities which may cause corona.

5.11 All load bearing surfaces shall be smooth and uniform so as to distribute the loading stresses uniformly.

5.12 All ferrous parts shall be hot dip galvanized to give a minimum average coating of zinc equivalent to 600 gm/sqmm and shall be in accordance with the requirement of ISO:1461 (E) and shall satisfy the tests mentioned in ISO:1460 (E). The zinc used for galvanizing shall be of purity of 99.95%. The zinc coating shall be uniform, adherent, smooth, reasonably bright continuous and free from imperfections such as flux, ash rust stains, bulky white deposits and blisters. The galvanized metal parts shall be guaranteed to withstand at least six successive dips each lasting for one (1) minute duration under the standard test. The galvanizing shall be carried out only after any machining

6.0 Quality Assurance:

Vendor Quality Plan	To be submitted for purchaser approval
Inspection Points	To be mutually identified & agreed in quality plan

7.0 Testing and Inspection:

7.1 Type Test:

The insulators should be offered type tested from CPRI/ERDA. Type test reports should not be more than 5 (Five) years old considered from the date of bid opening in respect of all the tests carried out in CPRI/ERDA, based on ISO/IEC.

IEC:383-1993	On the complete composite Long Rod Insulator String with Hardware Fittings	Power frequency voltage withstand test with corona control rings/grading ring and arcing horns under wet condition
		Switching surge voltage withstand test under wet condition
		Impulse voltage withstand test under dry condition
		Corona and RIV test under dry condition
		Mechanical Strength test
		Vibration test
		Salt-fog pollution withstand test
IEC: 61109	On Composite Insulator Units (Tests on interfaces and connections of metal fittings)	Dry power frequency voltage test
		Sudden load release test
		Thermal mechanical test
		Water immersion test
		Steep front impulse voltage test
		Dry power frequency voltage test
IEC: 61109	On Composite Insulator Units (Assembled core load time test)	Determination of the average failing load of the core of the assembled unit
		Control of the slope of the strength time curve of the insulator
	Brittle fracture resistance test	
	Test of housing, Tracking and erosion test	
	Tests for the core material	Dye penetration test
		Water diffusion test
	Flammability test	
	Recovery of Hydrophobicity test	
	Mechanical Load Time test and test of tightness between end firings and insulator housing	
	Silicone content test	
	High Pressure washing test	

7.1 Acceptance Test : The following tests shall constitute the Acceptance : -

IS/IEC Reference	**Test Description**
IEC : 61109	Verification of dimensions
	Verification of tightness of interface between end fittings and insulator housing and of specified mechanical load

	Tests on interfaces and connections of metal fittings (Tests to be performed on the same samples in the sequence given below)- i) Dry power frequency voltage test, ii) Sudden load release test, iii) Thermal mechanical test, iv) Water immersion test, v) Steep front impulse voltage test, vi) Dry power frequency voltage test
IEC : 60383	Galvanizing test (IS:209-1979)
	Verification of locking system
	Recovery of Hydrophobicity
	Silicone content test

Note: - 1) Test on interfaces and connection shall be carried out for a lot with qty. minimum 2000 nos.
2) Test for silicon shall be carried out for a lot with qty. minimum 2000 nos.
3) In the event of failure of the sample to satisfy the acceptance test(s) specified above, the retest procedure shall be as per clause 7.6 of IEC 61109

7.2 Routine Tests: The following tests shall constitute the

1) Visual Inspection as per IEC 61109

2) Mechanical Routine Test as per IEC 61109

7.3 Test During Manufacturing:

1) Chemical analysis of Zinc used for galvanizing.

2) Chemical analysis, mechanical, metallographic test and magnetic particle inspection for malleable castings.

3) Chemical analysis hardness tests and magnetic particle inspection for forging.

4) Tracking and erosion test on insulating material

Inspection:

SL No.	Descriptions
7.3.1	The buyer reserves the right to witness all tests specified on Polymeric Insulators
7.3.2	The buyer reserves the right to inspect Polymeric Insulators at the Seller's works at any time prior dispatch, to verify compliance with the specifications
7.3.3	In-process and final inspection call intimation shall be given in advance to purchaser
7.3.4	In the event of any discrepancy in the test report i.e. test reports not acceptable or any type test (including special/additional test if any) not carried out, same shall be carried out without any cost implication to BSES before dispatch.

Note:

1) The routine and acceptance tests should be performed on sample chosen at random out of every lot.
2) Three sets of complete test certificates shall be submitted along with the dispatch documents.

8 Shipping, Handling and Site Support:

8.1	Packing	All insulators shall be packed in suitable PVC/ plastic tubes/any other suitable packing along with temporary wrap-on shields/shrouds for each insulator unit. The packing shall be of sufficient strength to withstand rough handling during transit, storage at site and subsequent handling in the field
		Suitable cushioning, protective padding, or dunnage or spacers shall be provided to prevent damage or deformation during transit and handling
		The items so wound will be grouped as per numbers per packet. The information like product quantity shall be mentioned on the packets
		Purchase order no. with SAP code shall be mentioned clearly
		Net weight and gross weight with packet shall be mentioned
		Batch no. or lot no shall be mentioned
8.2	Shipping	The seller shall give complete shipping information concerning the gross weight, size of each packing and the seller has to send the materials to buyer's preferable store or site.
8.3	Handling & Storage	Manufacturer instruction shall be followed. Detail handling & storage instruction sheet / manual needs to be furnished before commencement of supply.
8.4	Transit damage	The seller shall be responsible for any transit damage due to improper packing.

9 Deviations:

Deviations from this Specification shall be stated in writing with the tender by reference to the Specification clause/GTP/Drawing and a description of the alternative offer. In absence of such a statement, it will be assumed by the Buyer that the Seller complies fully with this specification.

10 Drawings and Materials Details:

The bidder has to summit drawings along with bid for preliminary acceptance and for final approval before manufacturing. BRPL may insist trial installation to check dimensions and may suggest necessary changes if required. BRPL decision in this regard would be final and binding to short listed vendor without any subsequent commercial liability on purchaser.

Marking:

The Following information shall be marked on each cross arm:

10.1 Manufacturer's name or trade mark

10.2 Year of manufacture

10.3 BSES-BRPL, order number, date & SAP Code number

SECTION- 5

TECHNICAL SPECIFICATIONS FOR HIGH TENSILE GALVANISED STEEL EARTH WIRE

1.0 STANDARDS:

The High Tensile Galvanized Steel Earth Wire shall conform to the following Indian Standards, which shall mean latest revisions, amendments/changes adopted and published, unless otherwise specified hereinbefore.

S. No.	Indian Standards or any Equivalent International Standard	Title
1	IS:209 -1992	Specification for Zinc
2	IS:2141 -1992	Specification for Earth wire for overhead Transmission purpose
3	IS:1778	Reels and drums for Bare wires
4	IS:1521	Method of Tensile Testing of Steel wire
5	IS:2629 -1992	Recommended practice for Hot Dip Galvanizing Iron and Steel
6	IS:2633 -1992	Method of Testing Uniformity of Zinc coating of Zinc coated Articles.
7	IS:4826	Galvanized coating on Round Steel wire
8	IS:6745 -1992	Method of Determination of weight of Zinc coating of zinc coated Iron and Steel Articles
9	IS: 12776	Method of Testing of Earth wire

2.0 PARAMETERS:

2.1 PRINCIPAL PARAMETERS OF EARTH WIRE:

The standard technical particulars of 7/3.15mm galvanized steel earth wire shall be as follows:-

a. The details of Steel strand:

i.	Material	Steel
ii.	Stranding	7
iii.	Weight per Km	428 Kgs
iv.	Dia. of wire	3.15 mm
v	Tolerance	2%
vi	Minimum elongation in 100 mm	5 mm length
vii	Minimum breaking strength per strand	1000 Kg
viii	Minimum tensile strength	95 Kg./mm^2
ix	D.C. resistance at 20 Deg. C	3.14 Ohms/Km

b. The details of Stranded Earth Wire :

i.	Maximum Length of Lay	265
ii.	Minimum Length of Lay	127
iii.	Minimum breaking load	**)0 Kgs**
iv.	Overall diameter	10.98mm
v	Modulus of elasticity	1.933 x 10^6 Kg./cm^2
vi	Co-efficient of linear expansion	11.50 x 10^{-6} per Deg.C
vii	Weight of zinc coating on wire	260 gms./ $_m$ 2 (Min.)
viii	No. of one minute dip and half minute dip respectively	3 one minute and 1 half minute
ix	Calculated d.c. Resistance at 20 Deg.C	3.14 Ohms per Km

3.0 GENERAL TECHNICAL REQUIREMENT : MATERIAL AND WORKMANSHIP FOR EARTH WIRE:

3.1 The steel wire (strands) used in manufacture of galvanized steel earth wire shall be drawn from steel wire rod produced by either acid or basic open hearth process or by the electric furnace process or basic oxygen process. The steel wire shall not have sulphur and phosphorous contents exceeding 0.045% each. The carbon content shall not exceed 0.55%. The steel produced by bassemer process shall not be used for drawing of steel wire strands. The finished earth wire shall have minimum brittleness as it will be subjected to continuous vibration while in use on line.

3.2 The steel wire shall be hot dip galvanized and shall have zinc coating of minimum 260 gram per sq. meter of the uncoated wire surface. The zinc coating shall be smooth and continuous of uniform thickness, free from imperfections not consistent with good commercial practice and shall meet the test requirement. The zinc used in galvanizing of earth wire shall be as per IS: 209-1992.

3.3 All the steel wires shall be circular, smooth, uniform and free from imperfections, such as spills

and splits, die marks scratches, abrasions, cuts and kinks etc. drawing and after stranding.

3.4 The steel wires, after galvanizing shall be bright in appearance, smooth and free from all defects like flux, ash, cross inclusions, bare and black spots, pimples, lumpiness in runs, rust, stains, bulky white deposits and blisters.

3.5 The finished earth wire shall have a smooth surface without any surface cuts, abrasions, scuff marks and shall be free from dirt, grit etc.

4.0 SIZE AND PROPERTIES:

4.1 The earth wire size, physical properties, tolerance in diameter of individual strands and length of lay of the strand shall be as given above.

4.2 The wires shall be so stranded together that when an evenly distributed pulls is applied at the end of completed strands, each wire will take an equal share of the pull.

4.3 The earth wire shall be supplied in the standard lengths which shall not be less than 3 Km. Not less than 95% of the total quantity of the earth wire shall be supplied in standard lengths. The quantity of earth wire in length shorter than standard one shall not exceeds 5% of the total quantity to be supplied. Further, no single earth wire length in respect of such 5% (maximum) supply in random lengths shall be shorter than 50% of the standard length.

4.4 The length of the stranded wire shall be supplied without joints in the individual wires comprising it, excluding welds made in base rod before it is drawn.

4.5 Each coil be warranted to contain no welds, joints or splice other than in the base rod before it is drawn.

5.0 GALVANISING AND OILING:

5.1 All the wires of the strand shall be galvanized in accordance with IS-2629-1990. Recommended practice for Hot dip galvanizing of Iron and Steel of some other authoritative equivalent standard.

5.2 The galvanized earth wire after stranding operation shall have dipped in boiled linseed oil before winding it on drums.

6.0 TEST FOR EARTH WIRE :

6.1 Earth wire shall be subjected, before dispatch from the works to tests as specified in the IS-2141, IS 1521, IS 1755 & IS 4826 or any other authoritative equivalent standard.

6.2 All the drums of galvanized steel stranded earth wire of the same grade, diameter and construction, manufactured under similar condition shall be grouped to constitute one lot.

6.3 Samples from each lot shall be tested for ascertaining the conformity to the requirements of the earth wire specified herein. The drums selected shall be tested for length of the lay and diameter of individual strands etc. The lot shall be declared conforming to the requirement of these characteristics if all the samples are found satisfactory. One test specimen from each wire of the strand shall now be drawn from every selected drum and subjected to chemical analysis, tensile tests, ductility test, elongation test and coating test. One test specimen, of the completed strand from each drum shall be subjected to tensile strength. The lot shall be declared conforming to the requirements of these characteristics, if the entire test specimen satisfies the relevant requirement.

7.0 END SEALING :

Both the ends of each length of earth wire should be provided with non-destructive type metal crimped or epoxy capped seals with punching embossing/ engraving of manufacturer's monogram and drum number.

SECTION- 6

TECHNICAL SPECIFICATION FOR HARDWARE FITTINGS FOR 33KV LINES

1.0 STANDARDS:

This section provides for the Design, manufacturing, stage testing, inspection and testing before dispatch, packing and delivery of Hardware fittings for Conductor and Earth wire for use on 33KV transmission lines. The material and services under this specification shall be performed as per the requirements of the latest revisions and amendments available at the time of placement of order of all the relevant Indian Standards/Codes listed here under or equivalent International Standards, except as modified in this document:

S. No	Indian Standard	Title
1	IS:209-1992	Specification for Zinc Ingot
2	IS:206 – 1992	Tee and Strap Hinges
3	IS:7814-1985	Phosphor Bronze Sheet and Strip
4	IS:2071	Method of high voltage testing
6	IS:961	Structural Steel
7	IS:1385	Phosphor Bronze Rods & Bar Sheet and Strips and Wire
8	IS:2004	Carbon Steel Forgings for General Engineering Purpose
9	IS:2107	White Hearth Malleable Iron Castings
10	IS:2108	Black Hearth Malleable Iron Castings
11	IS:2121(Part -I & II)	Specification for Conductors and Earth wire Accessories for Overhead Power Line, Armour Rods Binding Wires and Tapes for Conductor
12	IS:2486	Specification for Insulator Fittings for Overhead Power Lines with a Nominal Voltage Greater than 1000 V.
13	IS:2629	Recommended Practice for Hot Dip Galvanization of Iron and Steel.
14	IS:2633	Testing of Uniformity of Coating of Zinc coated Articles
15	IS:3138	Hexagon Bolts and Nuts

16	IS:6639	Hexagon Bolts for Steel Structures
17	IS:6745	Determination of Weight of Zinc Coating on Zinc Coated Iron and Steel Articles
18	IS:3188	Characteristic of String Insulators Units
19	IS:4218	ISO Metric screw Threads
20	IS:4172	Dimensions for Radii under the Heads of Bolts & Screws
21	IS:4206	Dimensions for nominal lengths and Thread length for Screws and Studs (with amendment)
22	IS:4759	Hot Dip Zinc Coatings on Structural Steel and other Allied Products
23	IS:1573	Electroplated Coatings of Zinc on Iron and Steel
24	IS: 398	Specification for Aluminium Conductor Steel Reinforced for overhead transmission purpose.
25	IS: 1327-1966	Methods for determination of weight of tin Coating on Tin Plates
26	IS: 4826-1979	Hot Dip Galvanised Coating on Round Steel Wires
27	IS: 1363	Hexagon Head Bolts, Screws & Nuts.
28	IS: 1367	Technical supply conditions for threaded Steel Fasteners
29	IS: 9708	Stockbridge Vibration Dampers for Overhead Power lines.
30	IS: 8263	Method of Radio Interference Tests on High Voltage Insulators.
31	IS:10162	Spacers and Spacer Dampers for twin horizontal bundle Conductors.
32	IS: 2004	Carbon Steel Forgings for general engineering purposes.
33	BS:970 (Part-I)	General Instructions and Testing Procedures Specific Requirements for Carbon and Carbon Manganese Alloy and Stainless Steels.

2.0 INSULATOR STRING CHARACTERISTICS:

The Hardware fittings shall be suitable for single/double suspension Insulator strings and single/double tension Insulator strings. Each Hardware fitting shall be supplied complete in all respect and shall include all components, which are required for making complete set.

2.1.1 The complete insulator string including Hardware fittings shall have the following characteristics:

Sr. No.	Details	Single/Double suspension 33KV	Single/Double tension 33KV
1	Lighting impulse voltage (dry) KV peak	170	170
2.	Power frequency withstand voltage (wet) KV rms	70	70
3	Mechanical failing load kgf.	7000	9000/18000
4	No deformation load-kgf.	4690	6030/12060

The Insulator string Hardware fittings and Earth wire assemblies shall comply and conform to the above requirement.

2.2.0 REQUIRED GUARANTEED STRENGTH OF HARDWARE OF INSULATOR STRINGS:

2.3.0 The Hardwares and Clamps of 33KV single suspension and double suspension strings suitable for Wolf ACSR for transmission line and shall have the ultimate breaking strength of not less than 13600 kgs. The Compression Clamp shall have slipping strength not less than 95% of breaking strength of Wolf ACSR.

2.3.1 The slipping strength of the suspension clamp shall not be less than 15% and more than 20% of the Conductor strength with which it is to be used.

2.3.2 Each individual Hardware component of double suspension and double tension strings such as ball-clevis, socket clevis etc. shall have minimum breaking strength as specified for respective single suspension and tension string respectively.

3.0 PARTICULARS OF HARDWARE FITTINGS:

Each hardware fitting for the transmission line shall be complete in all respect and Bidder should furnish complete drawings and technical particulars of the items of hardware fittings. The Hardware fittings should normally comprise items conforming to enclose drawing as under: -

3.1 Single Suspension Hardware Fitting With AGS Type Clamp:
Single suspension Hardware string shall comprise of one Ball Hook, one Socket Eye Horn holder, one line side Arcing Horn and one Suspension Clamp of AGS type with armour rod suitable for respective sizes of Conductors.

3.2 Double Suspension String Hardware Fittings with AGS Type Clamp:
The double suspension string Hardware fittings shall comprise of one Ball Hook, one Socket Clevis, one Top Yoke Plate, two Ball Clevis, two Socket Clevis, one bottom Yoke Plate, two line side Arcing Horns, one Clevis Eye and one AGS type Suspension Clamp suitable for respective sizes of Conductors.

3.3 Single Tension String Hardware Fittings:

Single tension string Hardware shall comprise of one `D' Shackle, one Ball Link, one Forged Steel Socket, Socket Clevis Horn holder, one line side Arcing Horn and one Tension Clamp of compression type

3.4 Double Tension String Hardware Fittings:

The double tension string Hardware shall comprise of two `D' shackle, one chain link one top yoke plate, two ball clevis, two socket clevis, one bottom yoke plate, one line side arcing horn, one clevis and a compression type dead-end Clamp

3.5 Earth Wire Suspension Assembly With Preformed Armour Rods:

This shall comprise of envelope type Suspension Clamp of heat-treated malleable iron, one Chain Link and one 'D' Shackle. The entire assembly shall be hot dip galvanized complete with minor accessories. The breaking strength of all the Hardware items of the assembly shall not be less than 7000 kgs. The complete assembly of suspension clamp shall be guaranteed for slip strength of not less han 15 KN & not more than 19 KN.

3.6 Earth Wire Tension Assembly:

The Earth wire tension assembly shall have minimum breaking strength equal to that of the Earth Wire. The slipping strength of the Compression Clamp shall not be less than 95% of the breaking strength of Earth Wire. The strain assembly of the Earth wire for transmission line shall comprise of compression type dead end Clamp and two `D' Shackles complete with minor accessories such as pins, bolts & nuts etc. Strain assembly shall be hot dip galvanized and made inherently resistant to the atmosphere corrosion. The dead end Clamp of the assembly shall be of compression type. The tension clamp shall be attached to the horizontal strain plate of the tower body by means of a "D" shackle. "D" shackle shall be suitable for attaching the tension clamp to strain plate of towers having 8mm thickness with a hole of 21.5 mm diameter. The tension clamp body shall be made out of steel of 304 L grade or equivalent with Brinnel Hardness not exceeding 200. The complete assembly shall also include one 12.5mm dia, 45 mm long HRH MS Bolt hot dip galvanized with nuts and lock washers for attaching G.I. earth bond.

3.7 Mid Span Joints and Repair Sleeves:

I. The Mid Span Joints for Conductor & Earth wire shall be compression type.
II. The Conductor Mid Span Joints shall comprise of Aluminum and Steel Sleeves. The Earth wire Mid Span Joints and Steel Sleeves of Conductor Mid Span Joints shall be Hot dip Galvanized. Sleeves shall be of circular shape suitable for compression into hexagonal shape. The detailed drawing showing the length of Sleeves, inner and outer cross sectional dimension, before compression for Aluminum corresponding dimensions of hexagon after compression for Aluminum and Steel Sleeve shall be indicated. The Aluminum Sleeve shall be of extruded Aluminum. The material of the Steel Sleeve shall be specified.
III. The Repair Sleeve of Conductor shall be in two halves preferably of same shape, and this should be of extruded Aluminum. The Repair Sleeve for Earth wire shall be single piece and Hot dip Galvanized. Its material shall be specified. The Repair Sleeves shall be of circular shape suitable for compression into hexagonal shape.
IV. The steel and Aluminum Sleeves for Mid Span Joints as well as Aluminum Repair Sleeves and Steel Repair Sleeves shall have their outer dia tapered towards the two ends. Also the inside of the Sleeves shall be well rounded off, so that there is no sharp edge, which can cut the strands.
V. The Joints and Repair Sleeves shall conform to IS: 2121/1981 or equivalent International Standard.

VI. The conductor compressed with mid span joint or with repair sleeve shall not permit slipping of, damage to or failure of complete conductor or any part thereof at a load of not less than 95% of the
VII. Ultimate tensile strength of the conductor.
VIII. The electrical resistance of the joint/repaired portion of the conductor shall not exceed 75% of the measured resistance of equivalent length of conductor.

3.8 4R-VIBRATION DAMPERS FOR WOLF ACSR:

Only Vibration Dampers having 4-resonance frequency characteristic commonly called 4R Dampers shall be offered. The Damper shall eliminate fatigue on the Conductor due to vibration and damp-out the vibrations effectively, so that no damage due to vibration is caused to Conductor and string.

The Dampers are to be used at all tension locations and suspension locations. One or more Dampers are proposed to be used on tension/suspension locations depending upon the span. The Damper shall be such as to effectively damp out the vibration on the conductor, so that the dynamic strain at the suspension point with conventional type of Suspension Clamp 'U' bolt and keeper pieces, shall not exceed 150 micro strains. Contractor shall recommend the number of Dampers required to effectively damp out the vibration of the Conductor, so that the dynamic strain at the suspension point with conventional Suspension type Clamp shall not exceed 150 micro strains.

The requirement indicated in Schedule-I Ais based on use of two Vibration Dampers per Conductor per span. However, final requirement will depend upon Bidder's recommendations duly supported by literature. Contractor shall also recommend the number of Dampers required to effectively damp out Conductor vibration for different values of span lengths and the distance for fixation. While working out Damper Characteristics, it may be kept in view that on suspension locations, preformed Armour rods are also to be fitted on the conductor. Contractor shall given full details of the damper characteristics and energy dissipation curves of the Damper and shall also guarantee their effectiveness for damping design.

The messenger cable shall be made of high strength steel strands of spring steel with a minimum strength of 136 Kg/sq. mm and preformed in order to prevent subsequent dropping of weights in service. The Contractor shall indicate full technical particulars of the messenger cable. The keeper pieces shall have proper curvature and edges be rounded off so that it shall have proper grip over the conductor without any damage to conductor strands. Clamping bolts shall be provided with self-locking nuts designed to prevent corroding of the threads or loosening during service ensuring that no slippage occurs up to specified longitudinal force on clamp along the conductor. All ferrous parts including the messenger cable shall be effectively sealed to prevent corrosion.

The collar for fixing the bolt shall be designed in such a way that sufficient space is available for tightening the bolt through spanner. Further bolt length be maintained in such a way that it should not come out completely while affixing the clamp on Conductor.

Fixing of the masses to the messenger cable shall be done by pressing Aluminium Sleeves at each end of the messenger cable under pressure. Each end should be sealed properly so as to achieve prefect joint. The molten metal filling method for attachment of messenger cable to counter weight is not acceptable.

4.0 COMPONENTS OF HARDWARE FITTINGS:

All components for hardware fittings shall be as pe IS 5561 and any other relevant IS to meet the requirement.

5.0 DIMESIONS & TOLERANCES:

5.1 The dimensions and tolerances of pin balls and socket ends shall conform to IS 2486 Part-II/IEC-120 and shall be checked by the gauge therein after galvanizing.

5.2 The bearing surfaces of balls and machined sockets, before galvanizing shall not have surface roughness more than 250 micro inches.

5.3 The bearing surface of socket ends shall be uniform about the entire circumference without depressions or high spots. The internal contour of the socket ends shall be concentric with the axis of fittings. The axis of the bearing surface of socket ends shall be coaxial with the axis of fittings with no appreciable tilting.

6.0 IMPORTANT CONDITIONS:

6.1 All Hardware items shall be complete with minor items such as security clip, bolts, nuts, washer, split pins and inners etc.

6.2 All ferrous fittings (except those specified otherwise) shall be hot dip galvanized, after all machining and fitting has been completed, in accordance with relevant Indian Standard. All Hardware items (other than clamps) and those specified otherwise should be made of Drop Forged Steel. Socket items in forged steel must be forged. All forgings supplied should be stress relieved and this treatment should be done at the Contractor works. Forgings, which are not stress relieved, will not be acceptable. The items like Yoke Plate, Arcing Horn, Bolts and Nuts shall be of mild steel and rest of the items shall be of forged steel.

6.3 All Bolts, Nuts and Screw heads shall have only wide worth standard thread and of sizes indicated in the enclosed drawing. Bolts head and Nuts shall be hexagonal. Where required, nuts shall be locked in approved manner. The thread in Nuts shall be over tapped after galvanizing and shall be cut before galvanizing. The threads shall not be undercut. The Nuts should be tapped such that they are fit on the bolt threads i.e. these should not have loose fitting.

7.0 GALVANISING:

7.1 Hot dip galvanizing shall conform to Indian Standard specification IS-2633 or equivalent International Standard. Galvanising shall be uniform, free from blisters, and shall not peel off due to abrasion, Zinc coating shall be thick enough to withstand 6 one minute dips in Copper Sulphate solution (precee test) for all ferrous parts except for threaded portions which shall withstand at least 4 one minute dips.

7.2 The Contractor must emboss/engrave their name in each forged steel item and Aluminium castings such as Ball Hook, Yoke Plate, Socket Clevis, Clevis Eye, Clevis-Clevis, Anchor Shackle/D-Shackle, Chain Link, Suspension Clamps of AGS type, Tension Clamps and Arcing Horns.

8.0 TESTS :

8.1 The hardware fittings offered shall be type tested as per the relevant standards. Further the acceptance, routine tests and tests during manufacture shall be carried out on the conductor.

8.2 Acceptance tests shall mean those tests, which are to be carried out on samples taken from each lot offered for pre-dispatch inspection, for the purpose of acceptance of that lot.

8.3 Routine tests shall mean those tests which are to be carried out on each and every product so as to check with requirements which are likely to vary during production.

9.0 ACCEPTANCE TEST/SAMPLE TESTS:

9.1 Suspension and tension hardware fittings:

a.	Visual Examination	IS:2486 (Part-I)
b.	Verification of dimensions	IS:2486 (Part-I)

c.	Galvanizing test/Electroplating	As per this Specification.
d.	Mechanical strength test of welded joint	As per this Specification.
e.	Mechanical strength test for Corona control rings.	BS:3288(Part-I)
f.	Test on locking devices for ball & socket coupling.	IEC:372(2)
g.	Mechanical strength test of each components excluding corona control ring and arcing horn.	As per this Specification.

9.2 Suspension Hardware fittings only:

a. Clamp slip strength vs torque test for suspension clamp.

b. Shore hardness test of elastomer cushion for AG suspension clamp.

c. Bend test for armour rod set.

d. Re silence test for armour rods set.

e. Conductivity test for armour rods

9.3 Suspension hardware for Earth wire.

a. Visual examination

b. Dimensional verification.

c. Slip strength test.

d. Mechanical strength test on each component

e. Galvanising test

f. Mechanical strength test of welded joint

9.4 Tension hardware for Earth wire

a. Visual examination

b. Dimensional verification.

c. Slip strength test.

c. Electrical resistance test .

9.5 Midspan Compression Joint for Power Conductor & Earth wire

a. Visual examination

b. Dimensional verification.

c. Galvanising Test

d. Hardness test.

e. Failing load test (test to be conducted after 24 hours of compression).

9.6 Repair Sleeves for Conductor.

a. Visual examination
b. Dimensional verification.

9.7 Vibration Damper for power conductor/ Earth wire.

a. Visual examination
b. Dimensional verification.
c. Galvanizing Test
d. Verification of resonance frequencies
e. Clamp slip test
f. Clamp bolt torque test
g. Strength of messenger cable.
h. Mass pull off test.

9.8 Clamps

i. Tensile Test
ii. Resistance Test
iii. Dimensional Check
iv. Galvanizing Test

ANNEXURE-1

GURANTEED TECHNICAL PARTICULARS of ACSR Conductor
(SEPARATE DATA SHEET SHALL BE SUBMITTED FOR EACH TYPE OF CONDUCTOR)

SI.NO.	DESCRIPTION	BRPL Requirement	PARTICULARS
1.	Name of the material offered	XLPE Insulated ACSR Conductor	
2.	Maker's Name	Required	
3	Address and Phone No.		
4	Reference Standards	IS-398 Pt-3, IS-7098 Pt-1, IS 17778-80	
5	No. of strands/diameter of Galvanized steel wire/Al strand	Required	
6	Apporx. Dia over covered conductor		
7	Minimum Ultimate Tensile Strength of Conductor	18.25	
8	Direction Of Lay	Successive layers shall have opposite directions of lay outermost layer being Right Handed	
9	Lay ratio of Aluminum wire	10-14	
10	Continuous max.current rating of ACSR Conductor in still air at an ambient temperature at 45 Deg C	Required	
11	Temperature rise for the above current	Required	
12	Short Circuit current rating of ACSR Conductor for 1sec	Required	
13	Module of elasticity of complete conductor	79	
14	Coefficient of linear expansion of complete conductor	18.43×10^{-6}	
15	Cross sectional area	Required	
16	Nominal aluminum area	Required	
16.1	Conductivity and Grade of Al	61% EC Grade	
16.2	% Composition of steel wire	As Per spec	
17	certificate Chemical composition from NABL approved lab	Required	
18	Minimum breaking load		
18.1	Aluminum strand (After Stranding)	Required	
18.2	Galvanized steel wire (After Stranding)	Required	
19	Total Conductor	Required	
20	Max.Working tension of conductor	75% of UTS	
21	Resistance of Al conductor at 20Deg	Required	

	C(Max)		
22	Weight		
22.1	Aluminum strand	Required	
22.2	Steel Strand	Required	
22.3	Conductor without insulation	Required	
22.4	Conductor with insulation	Required	
23	Purity of AL.rod in %age	Required	
24	Zinc coating on steel wire		
24.1	Grade of Zinc	Electrolytic High Grade Zinc not less than 99.95% purity as per IS209-1992	
24.2	Min wt of Zinc Coating	Required	
24.3	No.& duration of dips of Zinc coating (Before Stranding)	Required	
25	Type of Insulation	XLPE Type as per IS 7098	
25.1	Nominal thickness of XLPE insulation	1.6	
25.2	Min thickness of XLPE insulation	1.5	
25.3	Color of XLPE insulation	Black	
25.4	Tensile strength of Insulation (Min)	12.5	
25.5	Percentage elongation at break of Insulation (Min)	200	
25.6	Insulation resistance test (Volume resistivity) Min	1x10^14 at 27deg C 1x10^12 at 90deg C	
26	Chemical composition test certificate of XLPE insulation material	Required, shall be weather proof and have property of protection against ultraviolet light having 2.5% black carbon content	
27	Drum	Required	
27.1	Ref IS	IS-1778-1980	
27.2	Gross weight of drum including weight of conductor	Required	
27.3	Standard length of each piece of conductor	3Km	
27.4	Non standard length	1% of the ordered Quantity & no length less than 50% of the standard length	
28	Order quantity tolerance	(+/-)2%	Yes/No
29	Embossing	Name of manufacturer Manufacture year, Manufacturing month,Type of conductor, BRPL, P.O. No & date	

ANNEXURE-2

GARAUNTEED TECHNICAL PARTIVULAR of POLYMERIC INSULATORS

Sl. No.	Descriptions	Unit	Data to be filled by Manufacturer
1	Name & address of manufacture		
2	Weight of single unit	Kg	
3	Size and designation of ball & socket assembly	mm	
4	Core diameter	mm	
5	Tolerance on core diameter	±mm	
6	Nominal length (section length)	mm	
7	Tolerance on Nominal length	±mm	
8	Dry arcing distance	mm	
9	Number of sheds	nos	
10	Sheds profile (type)		
11	Shed spacing	mm	
12	Sheds profile (regular alternating)		
13	Shed diameter	mm	
14	Tolerance on shed diameter	±mm	
15	Minimum creepage distance	mm	
16	Tolerance on creepage distance	±mm	
17	Guaranteed mechanical strength	KN	
18	Routine mechanical load	KN	
19	Materials		
a	FRP Rod		
b	Weather sheds with % contents of silicon		
c	Housing		
d	End Fitting		
e	Grading Ring		
20	Minimum thickness of sheath covering over the core	mm	
21	Power frequency withstand voltage of single unit		
a	Dry	KV (rms)	
b	Wet	KV (rms)	
22	Power frequency flashover voltage of single unit		
a	Dry	KV (rms)	
b	Wet	KV (rms)	
23	Impulse withstand voltage of single unit (dry)		
a	Positive	KV (peak)	
b	Negative	KV (peak)	

24	Impulse flashover voltage of single unit (dry)		
a	Positive	KV (peak)	
b	Negative	KV (peak)	
25	Purity of zinc used for galvanizing end fittings	%	
26	Number of dips which the end fittings can withstand in standard preece test	Nos.	
27	Certified test report of accelerated ageing test of 5000 hours (enclosed) (appendix-C of IEC-61109)	Yes/No	
28	Drawings Enclosed	Yes/No	

ANNEXURE- 3
GUARANTEED TECHNICAL PARAMETERS OF HTGS EARTH WIRE

S.N.	Particulars	Data to be filled by Vendor
1	Particulars of single steel wire before stranding	
a)	No. of wires	7
b)	Diameter (mm)	3.15 mm
b)	Tolerance	
	Plus	
	Minus	
c)	Minimum elongation in 100 mm length	
d)	Breaking load (Kg.)	
	Standard/Minimum	
e)	Minimum ultimate tensile stress (Kg/mm2)	
g)	D.C. resistance at 20 deg. C (Ohm/Km)	
2	Stranded Wire	
a)	Length of lay (mm)	
	Maximum	
	Minimum	
b)	Overall diameter of Earth wire(mm)	
c)	Area of cross section of Earth wire (sq. mm.)	
d)	Breaking load (Kg.)	
	Standard/Minimum	
e)	Resistance in Ohms per Km. at 20 deg. C.	
F)	Modulus of elasticity of Earth Wire (Kg/cm2)	
h)	Weight of Earth wire (Kg/Km)	
i)	Co-efficient of linear expansion (per deg. C)	
3	Quality of zinc used (Specify the grading and percentage)	
4	Coating of zinc on wires In Gms. Per sq. mtrs.	
5	Nos. of Dip	
6	Oiling/greasing on Earth wire	
7	Tolerance in standard length	

ANNEXURE-4

GUARANTEED TECHNICAL PARTICULARS OF HARDWARE FITTINGS FOR ACSR WOLF AND EARTH WIRE FOR LINE

GTP of Hardware fittings to be provided by vendors

ANNEXURE-5

SKETCH OF EXISTING 33KV D/C TRANSMISSION LINES

ANNEXURE-6

LIST OF DRAWINGS TO BE SUBMITTED for APPROVAL

S.No	Document / drawing description
1	Route map of proposed 33KV line to be diverted and associated work of 33KV line
2	Details of earthing arrangement.
3	Number plate
4	Circuit plate
5	Phase plate
6	Danger Board
7	Bird guard
8	Anti climbing device
9	Flexible Bond for earth wire.
10	Cross sectional drwg for Wolf conductor
11	Cross sectional drwg for earth wire
12	33KV Single & Double suspension insulator string hardware for Wolf ACSR conductor
13	33KV Single & Double tension insulator string hardware for Wolf ACSR conductor
14	Hardware fittings for Earth wire
15	Mid span compression joint for Wolf ACSR Conductor
16	Vibration damper for Wolf ACSR Conductor
17	Repair sleeve for Wolf ACSR
18	Mid span compression joint for earth wire(if any)
19	Vibration damper for earth wire(if any)
20	Repair sleeve for earth wire(if any)
21	Polymeric Insulators
22	Design calculations & drawing of earthing for monopole and earthwire