BIJU GRAMA JYOTI YOJANA

OFFICE OF THE COLLECTOR & DISTRICT MAGISTRATE MAYURBHANJ

E-Mail: dmmbj@ori.nic.in

Web site: http:// www. mayurbhanj.nic.in

TENDER NOTICE NO:335 Dt.06.04.2018

Strengthening of Electrical Infrastructure through the following works

1. **Conversion of Single pole to Double pole structure (Excluding DTR)**
2. **Conversion of 2ph 2W 11KV line to 3Ph 3W 11KV line.**
3. **Conversion of 1Ph 2W LT AB cable to 3Ph 5W (3x50+1x35+ 1x16) AB Cable.**
4. **Construction of NEW 11KV 3Ph 3W line.**
5. **Construction of NEW 3Ph 5W (3x50+1x35+ 1x16) AB Cable.**
6. **Up gradation of 11KV line with 100 mm2 Conductor.**
7. **Up gradation of 33KV line with 232 mm2 Conductor.**
8. **New 11KV line for Ring main System.**
9. **New 33KV line for Ring main System.**

OFFICE OF THE COLLECTOR & DISTRICT MAGISTRATE MAYURBHANJ

PHONE 06792-252606, FAX-257499, E-Mail: dmmbj@ori.nic.in

Web site: http://www.mayurbhanj.nic.in

TENDER NOTICE NO:335 DATED:06.04.2018

BIJU GRAM JYOTI YOJANA 2017-18 & 2018-19

1. For and on behalf of Government of Odisha the undersigned invites sealed tenders block-wise in duplicate from reputed firms having valid HT electrical contractor licence from ELBO Odisha for Strengthening of Electrical infrastructure under Biju Gram Jyoti Scheme as mentioned in the tender schedule under Mayurbhanj District on Turnkey basis.

DESCRIPTION OF WORK	APP. ESTIMATED COST OF WORKS (IN RS.) BLOCK WISE		EMD (IN RS.) (one percent of the estimated amt.)	COST OF THE TENDER DOCUMENTS (IN RS.)	PERIOD OF COMPLETION FOR EACH BLOCK
	Block	Cost (Approx)			
Strengthening of Electrical infrastructure of Villages/ Hamlets through the following. • **Conversion of Single pole to Double pole structure (Excluding DTR)** • **Conversion of 2ph 2W 11KV line to 3Ph 3W 11KV line (55 mm2 AAAC).** • **Conversion of 1Ph 2W LT AB cable to 3Ph 5W (3x50+1x35+ 1x16) mm2 AB Cable.** • **Construction of NEW 11KV 3Ph 3W line.** • **Construction of NEW 3Ph 5W (3x50+1x35+ 1x16) AB Cable.** • **Up gradation of 11KV line with 100 mm2 Conductor.** • **Up gradation of 33KV line with 232 mm2 Conductor.** • **New 11KV line for Ring main System.** • **New 33KV line for Ring main System.** **N.B:** The bidders should quote unit rate for each block for the works described in the bidding schedule.	1.Rairangpur 2.Bisoi 3.Bijatala 4.Kusumi 5.Jamda 6.Bahalda 7.Tiring 8.Karanjia 9.Thakurmunda 10.Sukruli 11.Raruan 12.Joshipur 13.Bangriposi 14.Sarasakana 15.Kuliana 16.Shamakhunta 17.Baripada 18.Suliapada 19.Morada 20.Rasgovindpur 21.Betnoti 22.Badasahi 23.Khunta 24.G.B. Nagar 25.Udala 26.Kaptipada	3.0 Cr for each Block @ 1.5 Cr per year	3Lakh for each Block	10000.00 for each block	The work to be completed within 1(One) calendar Year from the date of issue of Work Order.

2. Tender papers consisting of Technical Specification and other Terms and conditions etc. can be Downloaded from http://www.mayurbhanj.nic.in can be available in the office of the District Development Officer, Mayurbhanj from dt.11.04.2018. Tender papers are to be submitted along with the cost of tender papers (for each Block) in shape of Bank Draft in favour of the Collector & District Magistrate, Mayurbhanj payable at any nationalized bank at Baripada for consideration of their Tender. The cost of tender paper is not refundable.
3. Each Intending party/agency/company can bid for one or more Blocks, but separate tender is required to be submitted for each of Block.
4. If any of the Bidder found to be lowest in more than 3(Three) Blocks, he is to be allowed for execution of contract for 3(three) Blocks only as per discretion of the authority in order to complete the work within a reasonable period.
5. Sealed tenders should be sent to the office of the District Development Officer Collectorate, M ayurbhanj, AT/PO-Baripada Dist-Mayurbhanj through **Regd. Post/Speed Post** only. The envelope containing the Tender Papers should be superscribed with **"Tender for BIJU GRAM JYOTI YOJANA (_____) (Name of the Block)."**
6. The sealed Tender documents should reach the office of the District Development Officer, Collectorate, Mayurbhanj, Baripada on or before dated 30.04.2018 by 11.00PM positively.
7. Tenders will be opened on dated 03.05.2018 at 2PM. in the office of the Project Director, DRDA, Mayurbhanj in presence of bidders or their authorized representatives. If the office happens to be closed on last date of receipt or opening of the tenders as specified, Tenders will be received/opened on the next working day at the same time and venue.
8. Tenders received after due date and time will not be entertained under any circumstances. The authority will not be responsible for any postal delay.
9. The sealed tenders must be accompanied with attested copies of valid Electrical Contractor's license obtained from Electrical Licensing Board of Odisha (ELBO), up to date Income Tax Clearance Certificate, Pan Card, VAT Clearance Certificate, PF Registration Certificate along with attested copies of up-to-date deposit challans towards EPF&ESI dues/Labour Insurance & Labour License. The tenderer would be under obligation to produce Original EPF and Labour License before the undersigned as and when required. The bidders registered in other State Govt. are required to produce non-assessment certificate obtained from Commercial Tax Authority of Govt of Odisha at the time of submission of tender.
10. EMD as specified should be pledged to the Collector & District Magistrate, Mayurbhanj in shape of NSC/FIXED DEPOSIT CERTIFICATE on any Nationalized Bank payable at Baripada along with tender documents. In absence of proper EMD, the bid will be rejected.
11. The bidders must have a minimum annual turn over of Rs.50.00 Lakhs (Rupees fifty Lakhs) in the last financial year i.e. 2017-18. Copy of documents in support of the same and certificate from competent authorities regarding satisfactory completion of such works in last one year should be sub mitted along with bid documents.
12. The bidders are requested to quote rates both in words and figures which is negotiable by Competent Authority during finalization of tender. They are to sign on any over writing or any correction made in the bid rates. In case of any discrepancy between words & figure then the rate in word will be taken as final.
13. The undersigned reserves the right to reject any or all the tenders without assigning any reason thereof.

Sd/-

Collector & District Magistrate

Mayurbhanj

SECTION – I

INFORMATION TO BIDDERS

INFORMATION TO BIDDERS

00.0 The Collector & District Magistrate, Mayurbhanj invites sealed bids from eligible interested bidders on two part bidding system on ***Turnkey Basis*** for construction Conversion of Single pole to Double pole structure (Excluding DTR), Conversion of 2ph 2W 11KV line to 3Ph 3W 11KV line (55 mm2 AAAC), Conversion of 1Ph 2W LT AB cable to 3Ph 5W (3x50+1x35+ 1x16) mm2 AB Cable, Construction of NEW 11KV 3Ph 3W line, Construction of NEW 3Ph 5W (3x50+1x35+ 1x16) AB Cable, Up gradation of 11KV line with 100 mm2 Conductor, Up gradation of 33KV line with 232 mm2 Conductor, New 11KV line for Ring main System, New 33KV line for Ring main System in the district of Mayurbhanj.

01.00 INTRODUCTION :

01.01 The State Govt. of Odisha has launched "BIJU GRAM JYOTI Rural Electrification Programme of the state Government" for electrification of villages / habitation which are not scheduled to be covered under Rajiv Gandhi Grameen Vidyutkaran Yojana (RGGVY).

01.02 Strengthen of Electrical Infrastructure under Mayurbhanj district will be covered under this programme.

01.03 The scheme envisages Strengthening of electrical infrastructure in order to cope with additional load, which may include.

- Conversion of Single pole to Double pole structure (Excluding DTR)
- Conversion of 2ph 2W 11KV line to 3Ph 3W 11KV line (55 mm2 AAAC).
- Conversion of 1Ph 2W LT AB cable to 3Ph 5W (3x50+1x35+ 1x16) mm2 ABCable.
- Construction of NEW 11KV 3Ph 3W line.
- Construction of NEW 3Ph 5W (3x50+1x35+ 1x16) AB Cable.
- Up gradation of 11KV line with 100 mm2 Conductor.
- Up gradation of 33KV line with 232 mm2 Conductor.
- New 11KV line for Ring main System.
- New 33KV line for Ring main System.

01.04 Mayurbhanj District has total no **26** Blocks.

02.00 **DEFINITION OF TERMS:**

In construing this contract and the scope of work, the following words will have same meaning herein assigned to them unless there is something in the subject or context in context in consistent with such construction.

02.01 **Owner / Purchaser:**

The "Owner / Purchaser" shall mean the Collector & District Magistrate, Baripada and shall include its legal representative, successors and assignees.

02.02 **Contractor:**

The "Contractor" shall mean the firm whose tender has been accepted by the owner and shall include its legal representatives, successors and assignees.

02.03 **Engineer In Charge:**

The "Engineer In Charge" shall mean the Executive Engineer of concerned Electrical distribution division of SEEC, NESCO under the district of Mayurbhanj or his authorized representative.

02.04 **Consignee:**

The "Consignee" shall mean the person authorized by the Collector & District Magistrate, Baripada to receive the materials, supervise and take measurement of the work.

02.05 **Site:**

The "Site" shall mean the actual place of the proposed project as detailed in the specification or other place where work has to be executed under this contract.

02.06 **Specification:**

The "Specification: shall mean collectively all terms stipulated in the contract known as General Conditions of contract and technical field requirement, Technical Specification and such amendments as may be made in the Agreement pertaining to the method and manner of performing the work with respect of quantities and qualities of materials and workmanship to be furnished under the contract.

02.07 **Contract:**

The "Contract" shall mean and include the following documents:

a) Invitation to Tender
b) Instruction to Tender
c) General Terms of contract and Technical field requirement
d) Technical Specification
e) Contract Agreement
f) Contractor's tender proposal including clarification letter
g) Letter of intend
h) Work Order
i) Agreement

02.08 **Commissioning:**

The "Commissioning" shall mean the first authorized operation of the equipment / installation after completion of erection, testing, initial adjustment, statutory approvals etc.

02.09 **Approved:**

The "Approved" shall mean the written approval of the Consulting Engineer / Engineer–in-charge.

02.10 **Months:**

Months shall mean the calendar month.

02.11 **Performance Test:**

The "Performance Test" shall mean all the tests as prescribed in the specification / ISS to be carried out by the contractor before taking over the installation by the owner.

02.12 **Final Acceptance:**

The "Final Acceptance" shall mean the owners written acceptance of the works performed under the contract after successful completion of Performance & Guarantee Test and Commissioning.

03.00 APPROACH TO SITE:

Mayurbhanj District is located in the Northern part of Orissa. NH- 5 & NH- 6 pass through the district.

04.00 SITE:

The site is spread in **Mayurbhanj** revenue district of **Orissa** state. The Mayurbhanj district is subdivided into **26** Blocks as detailed below:

1	Rairangpur
2	Bisoi
3	Bijatala
4	Kusumi
5	Jamda
6	Bahalda
7	Tiring
8	Karanjia
9	Thakurmunda
10	Sukruli
11	Raruan
12	Jashipur
13	Bangriposi
14	Saraskana
15	Kuliana
16	Shamakhunta
17	Baripada
18	Suliapada
19	Morada
20	Rasgobindpur
21	Betnoti
22	Badsahi
23	Khunta
24	G.B.Nagar
25	Udala
26	Kaptipada

05.0 SERVICE CONDITIONS:

All out door Equipment/material to be supplied against this specification shall be suitable for satisfactory continuous operation under tropical conditions as specified below:

1. Maximum ambient temperature (0C) 50
2. Minimum ambient temperature (0C) 0
3. Relative humidity (%) – Range 10 - 100
4. Maximum Annual rainfall (cm) 70 - 200
5. Maximum wind Pressure (Kg/m^2.) 75
6. Moderately hot and humid tropical, climate, conductive to rust and fungus growth Yes

06.00 BID DOCUMENTS:

06.01 The bid specification documents are available in the office of the District Development Officer, Mayurbhanj, Baripada for sale to the interested eligible parties on receipt of application for the same alongwith Bank Demand Draft in favour of Collector & District Magistrate, payable at Baripada for an amount of Rs. for each block

06.02 The bid specification documents will be available for sale on submission of a written application from Dt.11.04.2018 during office working hours. Completed bids shall be received upto11.00Hrs on Dt**. 30.04.2018**. This part –I bid (technical bid) will be opened on on Dt**. 03.05.2018 at 2.00 Hrs** in presence of bidders or representatives who wish to be present. The part – II bid (price bid) of substantially responsive bidders will be opened on a date / time to be intimated to the concerned responsive bidders.

06.03 Bids received after the due date and without E.M.D. shall be rejected outright. The undersigned reserves the right to reject any or all bids without assigning any reasons if the situation warrants.

06.04 A complete set of bidding documents can be down loaded from the website http:// *www. Mayurbhanj.nic.in*. However for the bidders who has obtained the bid document by down loading from the website must submit the cost of the Tender paper in shape of Bank demand draft in favour of Collector & District Magistrate, Mayurbhanj payable at Baripada along with the bid document in order to make them eligible to participate in the tender.

06.05 Request for Bid Document through post will not be entertained, however Bid can be received through post, but owner will not be responsible for any postal delay.

06.06 The Bids will be opened in presence of Bidders / Bidder's representatives as per Guidelines.

06.07 Bids without E.M. Deposit shall be rejected outright. No adjustment of any previous deposit will be entertained. The E.M. Deposit shall be forfeited in case of withdrawal of bids after the last date of submission and / or non-acceptance of order.

07.00 SUBMISSION OF TENDER:

07.01 Sealed tenders in duplicate together with descriptive and illustrative literature superscribing Tender Notice No. and date of opening are to be submitted / sent by post to District Development Officer, Mayubhanj, AT/PO: Baripada, , PIN: 757001. However, under signed will not be hold responsible for postal delay, if any, for non-receipt of Bid documents in time.

07.02 The bidders are required to prepare their bid documents on the following manner.

07.03 **Envelope –A** – Bid security (EMD) in the form of NCS/FIXED DEPOSIT CERTIFICATE for the specified value drawn in favour of **"Collector & District Magistrate, Mayurbhanj"**, payable at Baripada & the Bank Demand draft in

favour of **Collector & District Magistrate, Mayurbhanj** payable at Baripada towards the cost of Tender paper, in case, bid documents are down loaded from website.

07.04 **Envelope – A** – Pre-qualification data i.e. attested copies of:

1. Valid H.T. license issued by ELBO of Odisha.
2. Audited balance sheet in support of Turnover more than Rs.50 lakhs for last one financial year.
3. Bidders liquidity capacity or access to liquidity supported by letter issued by a schedule Bank which shall have been issued within 6 (six) months from the date of bid opening.
4. E.P.F. Registration certificate.
5. ESI Registration certificate/Labour Insurance Certificate.
6. Labour license.
7. ITCC, PAN card, TAN card.
8. GST certificate
9. Experience supported by client's letter

07.05 **Envelope – B** – The price offer shall be furnished items as per Price Bid.

The Bank instrument and other data as described above under each Para shall be kept in different marked envelopes A & B duly sealed and appropriately marked with Envelope, Name of the Block, Bid specification number, name of work. All the two sealed envelopes i.e. A and B shall be kept in a big envelope marked **Envelope – C** superscribing the name of the Block, bid specification No., Name of work and date of opening.

On the stipulated date / time the envelopes marked **'C'** containing bids received shall be opened before all the representatives of bidders present. Thereafter the relevant envelopes of marked A and B of each bidder shall be opened in order. If on opening envelope 'A' the bid security/cost of tender in case, the bid documents are down loaded from website is prima face in order then the same will be read out as necessary.

The sealed **envelope 'B' containing price bids** shall be kept in safe custody which shall be opened on a date / time to be intimated to all the bidders whose bids will be found to be substantially responsive after due check and scrutiny. During evaluation to find the responsiveness of bidders, the undersigned will have the right to seek any clarification that might be necessary. The bidders are expected to respond to such quarries within seven days of issue of the letter. However quarries of undersigned and bidders response shall not affect the eligibility criteria in any manner.

Bidder.The Bidder has to extend the validity of the Bank Guarantee one month ahead of the validity period at his own cost & risky falling which the said BG will be encashed by the owner & credited to the govt. account.

08.00 ADDITIONAL PERFORMANCE SECURITY (APS)

The bidder will deposit cost of additional performance security in case the quoted offer is less than the scheduled price before execution of agreement.

09.00 TERMS OF PAYMENT:

(i) 80% of cost of materials, and services along with 100% taxes and duties shall be paid within 30 days of successful commissioning of works and made operational.
(ii) Balance 20% shall be released within 30 days of taking over of works by the Electrical Engineer in charge duly certifying the system to be free of defects.

10.00 PAYING AUTHORITY:

Collector & District Magistrate, Mayurbhanj will be the PAYING AUTHORITY

11.00 GUARANTEE:

In the event of any defect in the materials arising out of inferior quality of raw materials and bad workmanship within a period of 12 months of execution of work, the Bidder shall guarantee to replace or repair to the satisfaction of the owner the defective materials at site free of any cost. However if the contractor fails to do so within a reasonable time, the owner reserves the right to effect repair or replacement and recover charges for repair or replacement from the bidder by encashment of Performance Bank Guarantee.

12.00 INSURANCE:

All the materials shall have appropriate insurance cover from the time the same are out of the manufactures premises till work is completed.

13.00 THIRD PARTY INSURANCE:

The Contractor shall, prior to commencement of the jobs under this Work Order, take out a comprehensive insurance policy against any damage or loss or injury which may occur to any property or to any person or any employee or representative of any outside agency / company engaged or not engaged for the performance of the Service and arising out of the execution of the work or temporary work or in carrying out of jobs under this Work Order.

The work after due completion under the supervision of SE Electrical (or E.E.BED Baripada / E.E. UED Udala / E.E. RED Rairangpur),NESCO in their respective areas shall be inspected by competent authority of Electrical Inspectorate Govt. of

Odisha/by NESCO Electrical Engineers approved by Govt. of Odisha. All arrangement for this inspection including deposit of statutory fees shall be the responsibility of the Contractor.

14.00 COMMENCEMENT AND COMPLETION OF WORK:

The work shall have to be commenced within such period so that the total work under this contract shall have to be completed within a specified time (Maximum 365 days) from the date of placement of order. The phase wise completion period shall be intimated by the successful bidder to the Controlling officer in due course. The bidder has to mobilise the erection team adequately to maintain target period for the total completion of the work as per programme.

15.00 PROGRAMME & SCHEDULE TO BE FURNISHED:

The successful bidder has to submit to Collector & District Magistrate, Mayurbhanj for approval within 15days from the date of issue of order a detailed scheduled of programme in the form of Bar chart / GNATT Chart indicating various activities involving drawing, scheduled of material procurement, testing, reliability runs / delivery etc. The Collector & District Magistrate, Mayurbhanj reserves the right to call for further necessary detailed programme during currency of the contract so that he may able to follow up adequately the progress of work.

16.00 SERVICE GUARANTEE:

16.01 **Work Completion**

In no case, the successful bidder shall abandon the scheme till completion of the work. For the same successful bidder shall have to give an undertaking in proper forms otherwise risk Purchase clause shall be applicable.

16.02 **Nature of Price (s)**

The quoted price shall be firm throughout the contract period including the extension period (s) if any. The price schedule should be properly filled up and submitted along with other documents falling which the tender shall be rejected. Any increase in price, taxes and duties beyond the scheduled period of the order will not be borne by the owner, if the delay is due to any failure on the part of the Bidder.

16.03 **Quantity:**

The quantities mentioned in tender schedules are provisional. The Owner reserves the right to vary the quantities while placing the order.

16.04 **Risk Purchase:**

The time of completion of work stipulated in the Purchase order shall be deemed to be the essence of the contract and if the Bidder fails to complete the work within the period prescribed for such delay the purchaser shall be entitled to complete the work by nearest other substitute on the account and at the risk of bidder and Bidder shall be liable to compensate for any loss or damage which the Purchaser may sustain by reason of such failure on the part of the Bidder.

17.00 USE OF CONTRACT DOCUMENTS AND INFORMATION:

a) The contractor shall not, without the purchaser's prior written consent, disclose the Contract, or any provision thereof, or any specification, plan, information furnished by or on behalf of the purchaser in connection therewith, to any person.

b) The manufacturer shall not without the Purchaser's prior written consent, make use of any document or information except for purpose of performing the Contract.

18.00 STATUTORY OBLIGATION AGAINST THE CONTRACT:

The contractor shall be responsible to comply with all statutory obligations arising out of the Law of the Land. The contractor should be duly registered with PF, ESI Authority, District Labour Officer and the liability for such payment to the concerned authority shall be entirely borne by them. They should mention in the application submitted for purchase of Tender document, their PF, ESI Code No. / Registration No/Labour Insurance Certificate.

No Service tax shall be paid to the contractor against this contract. The Work Contract Tax, if applicable also shall not be paid. If Service Tax/Work Contract Tax is applicable during the period of execution of the job the same shall be borne by the contractor. Utility shall not accept any responsibility whatsoever on the taxes and duties as stated above. The bidder is expected to take these into account in his price bid indicating their break up.

19.00 Intially Work order of 1.5 Cr. for each block Will be issued in favour of the lowest bidder for first phase and second phase work order may issue after observation of performance of the bidder subject to availability of funds.

20.00 RESERVATION:

The purchaser reserves the right to deviate any of the terms and conditions stated herein and to split up the orders as and when necessary and reject any or all tenders without assigning any reasons what-so-ever and does not bind himself to accept the lowest tenders.

21.00 LEGAL JURISDICTION:

Material pertaining to this order including its execution from the placement of the order and if any disputes arise thereby the necessary judicious affairs and court case shall be within jurisdiction of Baripada only.

22.00 FORCE MAJEURE:

The manufacturer/Contractor shall be under no liability if he is prevented from carrying out any of his obligations by reasons of war, invasion, hostilities (whether war declared or not), riots, civil commotion, mutiny insurrection, rebellion, revolution, accident, earthquake fire, floods, Govt. orders and/or restrictions (except power supply restriction), delay or inability to obtain materials due to import or other statutory restrictions or other cause beyond the reasonable control of the bidder.

However, such force majeure circumstances are to be intimated immediately and to be established subsequently with proper documents/proofs to the entire satisfaction of the purchaser.

23.00 ACCEPTANCE OF ORDER:

The **Collector & District Magistrate, Mayurbhanj** will communicate acceptance of Bid to the successful Bidder or his Authorized agent by a letter of intent/formal order. The successful bidder shall communicate the acceptance of the order alongwith Performance Bank Guarantee so as to reach the Purchaser within 15 days from the date of issue of the said letter of intent/ order. **If the acceptance of order and the Performance Bank Guarantee is not received within the above period,** then the earnest money against the Tender is liable to be forfeited.

24.00 GENERAL:

24.01 Earnest Money in shape of NSC/FIXED DEPOSIT CERTIFICATE pledged to **"Collector & District Magistrate, Mayurbhanj"** must be from any Nationalised / Scheduled Bank payable at **Baripada**

- Cost of Bidding Scheduled Contract Document = Rs 10000.00/- (For each Block.
- Date of beginning of sale of Bidding documents = Dt. 11.04.2018 during office hours.
- Last date and time of receipt of Bids =Dt. 30.04.2018 upto 11.00 hrs.
- Date and time of opening of bid (Tech.) =Dt. 03.05.2018 At 2.00 hrs in the office of PD,DRDA, Mayurbhanj, Baripada**.**
- Date & time of opening of bid(Financial) will be intimated to all responsive bidders after evaluation of technical proposal.

Undersigned reserves the right to cancel / withdraw the invitation for bids without assigning any reasons and shall bear no liability whatsoever consequent upon such a decision.

24.02 The Bidders shall be required to keep their offers valid up to 90 days from the date of opening of bids.

24.03 Telex, Telegraphic or in-complete offers shall be rejected outright.

24.04 The correspondences with regard to the above shall be made at the following address **Collector & District Magistrate, Mayurbhanj**
Baripada.. Dist- Mayughanj, Pin Code-757001(Odisha)

Tel: 06792 - 252606
FAX- 06792- 257499
E-mail – dmmbj@ori.nic.in

01.00 SCOPE:

The Collector & District Magistrate, Mayurbhanj invites sealed bids from eligible interested bidders on two part bidding system on ***Turnkey Basis*** for system strengthening works in the different blocks in the district of Mayurbanj.

02.00 COST OF BIDDING:

The bidder shall bear all costs associated with the survey, preparation and submission of the bid and Collector & District Magistrate, Mayurbhanj, hereinafter referred to as the Purchaser / owner shall in no case be responsible or liable for those costs, regardless of the conduct or outcome of the bidding process.

03.00 CONTENT OF BIDDING DOCUMENTS:

The goods required, bidding procedures and contract terms are prescribed in the bidding documents. In addition to the invitation for bids, the Bidding Documents include:

(a) General Conditions of Contract

(b) Qualification Requirements

(c) Schedule of requirements

(d) Technical specifications

(e) Price Schedules & Schedule of Bids

(f) Earnest Money

(g) Performance Security Form

The bidder is expected to examine all instructions, forms, terms and specification in the bidding documents. Failure to furnish all information required as per the bidding documents, the bid so submitted shall come under non-responsive category and liable for rejection.

04.00 CLARIFICATION OF BIDDING DOCUMENTS:

A prospective Bidder requiring any clarification of the Bidding Documents may notify the Purchaser / Owner in writing or by fax at the Purchaser's mailing address indicated in the invitation for Bids. The Purchaser/ Owner shall respond in writing to any request for clarification of the Bidding Documents which it receives not later than 10 days prior to the deadline for the submission of bids prescribed by the Purchaser. Written copies of the Purchaser's response (including an explanation of the query but without identifying the source of inquiry) shall be sent to all prospective Bidders who have purchased the bidding document.

05.00 AMENDMENT TO BIDDING DOCUMENTS:

05.01 At any time prior to the deadline of final submission of bids, the Purchaser /Owner may, for any reason whether at his own initiative or in response to a clarification requested by a prospective Bidder, modify the Bidding documents by amendment.

05.02 The amendment shall be notified in writing or by fax or by E-mail to all prospective Bidders who have received the Bidding Documents and shall be binding on them.

05.03 In order to afford prospective Bidders reasonable time in which to take the amendments into account in preparing their bids, the Purchaser may, at his discretion, extend the deadline for the submission of bids.

06.00 PRELIMINARY EXAMINATION:

06.01 The Purchaser / Owner shall 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.

06.02 Arithmetical errors shall be rectified on the following bases. If there is a discrepancy between the unit price and the total price that is obtained by multiplying the unit price and quantity, the unit price shall prevail and the total price shall be corrected. If the Bidder does not accept the correction of the errors, his bid shall be rejected. If there is a discrepancy between words and figures, the amount in words shall prevail.

06.03 Prior to the detailed evaluation, the Purchaser / Owner shall determine the substantial responsiveness of each bid to the Bidding Documents. For purpose of these Clauses, a substantially responsive bid is one which conforms to all the terms and conditions of the Bidding Documents without material deviations. The Purchaser's determination of a bid's responsiveness shall be based on the contents of the bid itself without recourse to extrinsic evidence.

06.04 A bid determined as not substantially responsive shall be rejected by the Purchaser and may not subsequently be made responsive by the Bidder by correction of the non-conformity.

07.00 CONTACTING THE PURCHASER:

07.01 No Bidder shall contact the Purchaser / Owner on any manner relating to its bid, from the time of the bid opening to the time the contract is awarded, unless requested by the purchaser for any clarification, if any.

07.02 Any effort by a Bidder to influence the Purchaser in the Purchaser's Bid evaluation, bid comparison or contract award decision may result in the rejection of the Bidder's bid.

08.00 PURCHASER'S / OWNER'S RIGHT TO VARY QUANTITIES AT TIME OF AWARD:

The Purchaser reserve the right to increase or decrease the quantity of goods services specified in the Schedule of Requirement during execution of Contract without any change in price or other terms and conditions.

09.00 PURCHASER'S / OWNER'S RIGHT TO ACCEPT ANY BID AND TO REJECT ANY OR ALL BIDS:

The Purchaser reserves the right to accept or reject any Bid and reject all Bids at any time prior to award of contract, without thereby incurring liability to affected Bidders or any obligation to inform the affected Bidders of the grounds for the purchaser's action.

10.00 CONTRACTOR'S / FIRMS' CONSTRUCTION MANAGEMENT:

Contractor's / Firm's Representative:

The Contractor's/Firm's shall, in addition to a project coordinator, employ one or more competent representative to supervise the carrying out of the works on Site. He shall be fluent in the language for day to day communications. Their names shall be communicated in writing to the Purchaser before works on Site begins.

Any instruction or notice which the Purchaser gives to the Contractor's / Firm's representatives shall be deemed to have been given to the Supplier.

At least one of the Contractor's competent representatives on each Site shall be fluent in speaking, writing, reading and understanding Oriya / English / Hindi.

11.00 OBJECTION TO CONTRACTOR'S / FIRM'S EMPLOYEES:

The Contractor's / Firm's shall, upon the Purchaser's written instructions, remove from the Works any person employed by him in the execution of the Works, who misconduct himself or is incompetent or negligent.

12.00 SAFETY PRECAUTIONS:

The Contractor's shall observe all applicable regulations regarding safety on the Site.

13.00 ELECTRICITY AND WATER:

The Supplier shall be entitled to use for the purpose of performing the Services such supplies of electricity and water as may be available on the Site and shall provide any apparatus necessary for such use. The Supplier shall pay the Purchaser at the applicable tariff plus the Purchaser's overheads, if any, for such use. Where such supplies are not available, the Supplier shall make his own arrangement for provision of any supplies he may require.

14.00 CLEARANCE OF SITE:

The Contractor's shall from time to time during the progress of the Works clear away and remove all surplus materials and rubbish disposal in an approved manner. On completion of the work the Supplier shall remove all Suppliers' equipment and leave the whole of the Site clean and in a workable condition, to the satisfaction of the Purchaser. The Supplier shall obtain prior approval of the Purchaser to remove the surplus materials.

15.00 OPPORTUNITIES OF OTHER CONTRACTORS:

The Supplier shall in accordance with Purchaser's instructions, cooperate with and afford to other contractors engaged by the Purchaser to work on the Site and persons lawfully so engaged upon the Site all reasonable opportunities for carrying out their work provided that the same shall not obstruct or disturb the progress of the work. The Supplier shall also afford such opportunities to the employees of the Purchaser.

16.00 AUTHORITY FOR ACCESS:

No persons other than the employees of the Contractor and his sub-contractors shall be allowed on the Site except with the written consent of the Purchaser.

Facilities to inspect the work shall at all times be afforded by the Supplier to the Purchaser and his representatives, authorities and officials.

17.00 OBLIGATIONS OF THE PURCHASER:

17.01 **Access to and Possession of the Site:**

The purchaser shall in reasonable time grant the Supplier access to the possession of the Site, which shall not be exclusive to the Supplier.

17.02 **Assistance with Local Regulations:**

The Purchaser shall assist to the extent possible the Supplier in ascertaining the nature and extent of any laws, regulations orders or bye-laws and customs in India where the Goods are to be erected, which may affect the Supplier in the performance of his obligations under the Contract. The Purchaser shall if so requested procure for the Contractor copies thereof where available and information relating thereto at the Supplier's cost.

18.00 LABOUR:

18.01 **Engagement of Labour:**

The Contractor shall, unless otherwise provided in the Contract, make his own arrangements for the engagement of all labour and for their payment, housing, feeding and transport.

The Contractor / Firm shall pay rates of wages and allowances according to the nature of the work and observe hours and working conditions of his employees, so as to be no less favorable to the employees than those generally prevailing in the region where the work is to be carried out. At the same time, the Supplier shall observe all regulations prescribed by the law of the Government and shall strictly comply with any agreement, custom, practice or award relating to the wages.

The Contractor /Firm is encouraged, to the extent practicable and reasonable, to employ staff and labour with the required qualifications and experience from sources within the region of work.

18.02 **Return of Labour:**

The Supplier shall submit detailed returns showing the supervisory staff and the numbers of the several classes of labour from time to time employed by the Supplier on the Site. The returns shall be submitted in such form and at such intervals as the Purchaser may prescribe.

The Supplier shall within twenty-four (24) hours of the occurrence of any accident at or about the Site or in connection with the execution of the work, report such accident to the Purchaser. The Supplier shall also report such accident to the competent authority whenever such report is required by the Law.

The Supplier shall keep proper wages books and time sheets showing the wages paid to and the time worked by all workmen employed by him in and for the performance of the Contract and shall produce such wages books and time sheets on demand for inspection by any persons duly authorized by the Purchaser and shall furnish to the Purchaser such information relating to the wages and conditions of employment of such workmen as the Purchaser or his duly authorized representative may from time to time require.

18.03 The Contractor shall take all steps, necessary to comply with the various applicable laws/ rules/ regulations / notifications, including but not limited to the provisions of Contract Labour (Regulation and Abolition Act),1970 as amended, Minimum Wages Act. 1984, Workman Compensation Act, 1923, Employee State Insurance Act, 1948 ("ESI"), Public Provident Fund Act, 1968, Payment of Bonus Act, 1985 and all other applicable laws and rules framed there under including any statutory approval required from the Central/State Governments, Ministry of Labour in relation to the Contractor's employee/ labourer/ Workmen deployed to perform the Service under this Work Order.

19.00 WORKMAN COMPENSATION:

19.01 The Contractor shall take out a comprehensive insurance policy under the Workman Compensation Act 1923, to cover such workers, who will be engaged to undertake the jobs covered under this Work Order and a copy of this insurance

policy will be given to Company solely for its information, reference and records. The Contractor shall ensure that such insurance policies are kept at all times.

19.02 The Contractor shall keep the Company indemnified at all times, against all claims that may arise under this Work Order, including claims of compensation under the provisions of Workmen Compensation Act 1923, and as amended from time to time or any compensation payable under any other law for the time being in force by any workman engaged by the Contractor 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 any of the Company's rights make recovery.

19.03 The Company shall be entitled to deduct from any money due to or to become due to the Contractor under this Work Order or under any other contract, moneys paid or payable by way of compensation as aforesaid or cost or expenses in connection with any claims thereto. The Contractor shall abide by the decision of the Company as to the sums payable by the Contractor under the provisions of this Clause.

19.04 Nothing contained in this Work Order, shall establish any relationship of any kind between the Company on the one hand and the employees, workmen and labourers, of any kind whatsoever of the Contractor on the other hand.

20.00 RESTRICTION ON WORKING HOURS:

No work shall be carried out on the Site outside normal working hours or on the locally recognized days of rest, unless

a) The Contract so provides, or
b) The work is unavoidable or necessary for the saving of life or property or for the safety of the work, in which case the Supplier shall immediately advise the Purchaser, or
c) The Purchaser gives his consent.

20.01 The Contractor shall be expected to employ on the work only his regular skilled employees with experience of the particular type of work. No female labour shall be employed after dark. No person below the age of eighteen years shall be employed.

20.02 In case the Purchaser becomes liable to pay any wages or dues to the labour or any Government agency under any of the provisions of the Minimum Wages Act, Workmen Compensation Act, Contract Labour Regulation Act or any other law due to act of omission of the Contractor, the Purchaser may make payments and shall recover the same from the Contractor's invoices.

21.00 PERMISSION TO DELIVER:

21.01 The Contractor shall apply in writing to the Purchaser for permission to deliver any Goods or Supplier's equipment to the Site.

21.02 The Supplier shall be responsible for the receipt at Site of all Goods and Supplier's equipment, delivered for the purposes of the Contract and shall, upon arrival at Site, advise the Purchaser when and where it has arrived and/or been stored.

22.00 TAKING OVER:

The Goods and Services shall be taken over by the Purchaser when they have been completed in accordance with the Contract, except in minor respects that do not affect the use of the Goods and Services for their intended purpose, have passed the Test on Completion and a Taking Over Certificate has been issued.

23.00 INDEMNITY BOND:

For the Goods to be provided by the Supplier, it shall be the responsibility of the Supplier to take delivery, unload and store the Goods at Work Site and execute an Indemnity Bond, trust receipt and obtain authorization letter from the Purchaser in favor of the Supplier against loss, damage and any risks involved, for the full value of the Goods. This Indemnity Bond shall be furnished by the Supplier before commencement of the supplies and shall be initially valid till the scheduled date of testing, commissioning and handing over of the Goods to the Purchaser.

24.00 NOTIFICATION OF AWARD:

24.01 Prior to expiry of the bid validity, the Purchaser shall notify the successful Bidder in writing or by Fax, that its bid has been accepted.

24.02 The notification of award shall constitute the formation of the Contract.

24.03 Upon the successful Bidder's furnishing of Security Bank Guarantee, the purchaser shall promptly notify each unsuccessful Bidder and shall discharge their Earnest Money.

25.00 SIGNING OF CONTRACT:

25.01 At the same time as the purchaser notifies the successful bidder that its bid has been accepted, the purchaser shall send the bidder a Contract Form to be executed between the bidder & purchaser.

25.02 Within 15 days of receipt for the Contract Form, the successful Bidder shall sign and date the Contract Form and return it to the purchaser alongwith the Performance Bank Guarantee.

25.03 The Contract is to be executed on Rs. 100.00 Non-Judicial Stamp Paper.

26.00 CONFIDENTIALITY:

The technical information, drawing and other related documents forming part of this work order and the information obtained during the course of investigation under this Work Order shall be the Company's exclusive property and shall not be used for any other purpose except for this execution of this 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

26.01 In the event of any breach of this provision, the Contractor shall indemnify the Owner against any loss, cost or damage or claim by any party in respect of such breach.

26.02 The provisions of this Clause shall remain effective for a period of one (1) year from the expiry or termination of this Work Order.

26.03 The Contractor shall not use the name of the Owner in any manner either for credit arrangement or otherwise and it is agreed that the Owner shall not in any way be responsible for the debts, liabilities or obligations of the Contractor and/ or his employees.

SECTION – III

QUALIFICATION REQUIREMENTS

QUALIFICATION REQUIREMENTS

01.00 a) The Bidder must have valid HT Electrical Contractor license issued by ELBO.

b) Bidder must have executed similar type of work previously.

c) Bidder must have deposit requisite EMD & Tender Paper Cost as per provision in Clause 9 of Terms & Conditions of the Tender Booklet.

d) The contractor must have labour license for at least 20labour.

d) Bidder shall be financially sound and must have an annual turnover of minimum Rs. 50 lakhs for last one financial year.

e) Bidder must have EPF registration certificate, ESI registration certificate/Labour Insurance Certificate, PAN Card, TAN Card, Vat clearance certificate & Income Tax Clearance Certificate.

02.00 The Bidder should furnish the information on all past works and satisfactory performance.

03.00 All bids submitted shall also include the following information.

i) Copies of original documents defining the constitution or legal status, place of registration and principal place of business of the Company or Firm or Partnership etc.

ii) The Bidder should furnish a brief write up, backed with adequate data, explaining his available capacity and experience (both technical and commercial) for the manufacture and supply of the required materials within the specified time of completion after meeting all his current commitment.

iii) The Bidder should clearly confirm that all the facilities exist in the factory from the where materials to be procured for inspection and testing and these will be made available to the Purchaser or his representative for inspection before any material despatch to work site.

iv) Reports on financial status of the Bidder such as profit and loss statement, balance sheets and auditors report for the past three years, bankers certificate etc.

v) Certificate from Chartered Accountant on supply / execution in any one year i.e. a continuous period of 12 months (as a proof of meeting the requirements).

05.00 Even though the Bidder meets the above qualifying criteria, he is subject to be disqualified if he has (I) made misleading or false representation in the Statements and attachments submitted in proof of qualification requirements and / or (II) record of poor performance such as not properly completing the contract, inordinate delays in supply completion, litigation history or financial failure etc.

06.00 Not withstanding anything stated above, the purchaser reserves the right to access bidder's capability and capacity to perform the contract.

07.0 Bidder participating, if not have facility to manufacture materials required for the work, must submit their vendors list from where they will procure the material with their credential and annual turn over. While choosing vendors the bidder must ensure that vendor must have supplied the equivalent quantity of material in any one year during last three years.

SECTION - IV

GENERAL CONDITIONS OF CONTRACT & TECHNICAL FIELD REQUIREMENTS

01.00 Introduction:

01.01 The State Govt. of Odisha has launched "BIJU GRAM JYOTI Rural Electrification Programme of the state Government" for electrification of villages / habitation which are not scheduled to be covered under Rajiv Gandhi Grameen Vidyutkaran Yojana (RGGVY). Since power supply to BPL consumers are covered under RGGVY 12th Plan and "Power to All" , only system improvement work to be taken up under BGJY 2017-18 & 2018-19.

The scheme envisages up-gradation of capacity of the distribution system in order to cope with additional load which may include.

- Conversion of Single pole to Double pole structure (Excluding DTR)
- Conversion of 2ph 2W 11KV line to 3Ph 3W 11KV line (55 mm2 AAAC).
- Conversion of 1Ph 2W LT AB cable to 3Ph 5W (3x50+1x35+ 1x16) mm2 AB Cable.
- Construction of NEW 11KV 3Ph 3W line.
- Construction of NEW 3Ph 5W (3x50+1x35+ 1x16) AB Cable.
- Up gradation of 11KV line with 100 mm2 Conductor.
- Up gradation of 33KV line with 232 mm2 Conductor.
- New 11KV line for Ring main System.
- New 33KV line for Ring main System.

01.02 Mayurbhanj District has total no **26** Blocks

02.00 APPROACH TO SITE:

02.01 Mayurbhanj District is located in the Northern part of Orissa, NH- 5 & NH- 6 pass through the district.

03.0 SITE:

03.01 The site is spread in **Mayurbhanj** revenue district of **Odisha** state. The Mayurbhanj district is subdivided into **26** Blocks out of which this tender is meant for 26 blocks as detailed below:

S. No	Name of Block
1	Rairangpur
2	Bisoi
3	Bijatala
4	Kusumi
5	Jamda
6	Bahalda
7	Tiring
8	Karanjia
9	Thakurmunda
10	Sukruli
11	Raruan
12	Jashipur
13	Bangriposi

14	Saraskana
15	Kuliana
16	Shamakhnuta
17	Baripada
18	Suliapada
19	Morada
20	Rasgobindpur
21	Betnoti
22	Badsahi
23	Khunta
24	G.B.Nagar
25	Udala
26	Kaptipada

GENERAL CONDITION OF CONTRACT & TECHNICAL FIELD REQUIREMENT

01.00 SCOPE OF WORKS

The scope of works include execution on ***Turnkey Basis*** with complete system design, procurement/manufacture, manufacturer's quality assurance, shop testing (including type testing where specified/required), transportation, storage, erection, including all civil/structural works, site testing, commissioning of all items & materials as elaborated below including all associated activities that though not exclusively specified here in but are required for the completion of the entire works under this package.

01.01 This specification intends to cover but not restrict to the following activities, services and works.

i) Complete design and engineering of all the systems, sub-systems, equipment, material and services.
ii) Providing engineering data, drawings and O&M manuals for Owner's review, approval and records.
iii) Manufacturing, supply, testing, packing, transportation and insurance from the manufacturer's work to the site.
iv) Receipt, storage, insurance, preservation and conservation of equipment at the site.
v) All civil and structural works as required.
vi) Fabrication, pre-assembly (if any), erection, testing and putting into satisfactory operation of all the equipment/material including successful commissioning.
vii) In addition to the requirements indicated in this section (Technical Specifications), all the requirements as stated in other sections shall also be considered as a part of this specification as if completely bound herewith.

viii) The Bidder shall be responsible for providing all material, equipment and services specified or otherwise which are required to ensure operability, maintainability and the reliability of the complete work covered under this specification.

ix) All services & activities required to be given contractually, by the bidder, during warranty period.

01.02 The package envisages following works at different locations in Mayurbhanj district in the state of Orissa

- Conversion of Single pole to Double pole structure (Excluding DTR)
- Conversion of 2ph 2W 11KV line to 3Ph 3W 11KV line (55 mm2 AAAC).
- Conversion of 1Ph 2W LT AB cable to 3Ph 5W (3x50+1x35+ 1x16) mm2 AB Cable.
- Construction of NEW 11KV 3Ph 3W line.
- Construction of NEW 3Ph 5W (3x50+1x35+ 1x16) AB Cable.
- Up gradation of 11KV line with 100 mm2 Conductor.
- Up gradation of 33KV line with 232 mm2 Conductor.
- New 11KV line for Ring main System.
- New 33KV line for Ring main System.

02.00 DETAILED SCOPE

02.01 **Survey**

The scope covers detailed route survey for all existing and proposed 11KV & LT lines, location of tap-off on existing feeders, pole spotting, optimization of pole location, crossing of roads, rail track, rivers, distribution transformer station location etc. The survey shall, as a minimum, identify/cover the following:

02.02 Block wise maps shall be prepared on the background of Survey of India (SOI) map of 1:25000 scales indicating the following.

i. Village boundaries and their respective census codes
ii. Existing and proposed 33/11KV substations & 33 kV Lines.
iii. Existing and proposed 33KV lines and Distribution transformer Stations.

02.03 Village level map shall be created from the map with a scale of 1:5000 or better indicating the following

i) Village geographical features and landmarks with clear depiction and label
ii) All the habitations that exist in the village
iii) Existing & proposed HT & LT lines, DTs
iv) List of individual consumer fed from each pole
v) Estimated loading.
vi) All distance and locations of electrical system from key reference points.

04.0 Construction of Line & Sub-station

04.01 Conversion of Single pole to Double pole structure (Excluding DTR)

Construction of Double pole sub-station from existing single pole substation with 9Mtr 150x150 mm R S Joist pole with 5 nos of earthings.

The Bidder has to Construct DP structure with all new accessories i.e 400Amp 3pole AB Switch and HG fuse, Lightening Arrester (9KV 10KA), Four nos of Stays and all the insulators to be changed.

Both the poles (0.333Cum i.e PCC 1:2:4) and stays (0.1485Cum i.e PCC 1:2:4) are to be concreted.

LT PVC cable is to be upgraded to the required size.

04.02 Conversion of 2ph 2W 11KV line to 3Ph 3W 11KV line (55 mm2 AAAC).

Conversion of existing 2Ph 2W 11KV lines to 3 Ph 3W lines with one no cut-point.

All damaged insulators, cross arm and other line materials to be replaced.

However, bidders is to assess the actual scope of conversion of the 11KV lines while carrying out the route survey.

Aligning / re-erection of tiled / bend poles where found in the route of line along with strengthening of its foundation is in the scope of the bidder.

04.03 Conversion of 1Ph 2W LT AB cable/ Bare Conductor to 3Ph 5W (3x50+1x35+ 1x16) mm2 AB Cable.

The scope includes Conversion of 1Ph 2W LT AB cable/ Bare Conductor to 3Ph 5W (3x50+1x35+ 1x16) mm2 AB Cable with Twelve nos of 8Mtr 125x70 mm R S Joist pole and four nos of stay.

All the poles (0.333Cum i.e PCC 1:2:4) and stays (0.1485Cum i.e PCC 1:2:4) are to be concreted

04.04 Construction of new LT AB Cable Lines

The LT lines shall be of following configurations

Sl No.	Type of line	Conductor	Support	Average span in mtr.
1	3Phase Wire	AB cable of size (3X50+1X35x1x16)sqmm of XLPE INSULATION	8Mtr. 125x70mmRSJoist	40

LT Lines using AB Cable shall be constructed on 8 mtr 125x70mmRS Joist Pole complete with eye hook, suspension/dead end clamp including belting of clamps etc. complete as required for supporting LT AB conductor, earthing arrangement, anti climbing device, danger plate, stay sets as required, bolts, nuts & washers and any other hardware required to complete the work, as finalized during detailed engineering.

The contractor shall provide two nos of Piercing and neutral connectors in each pole for the existing consumers.

All the poles (0.333Cum i.e PCC 1:2:4) and stays (0.1485Cum i.e PCC 1:2:4) are to be concreted.

04.05 **Construction of NEW 11KV 3Ph 3W line.**

The 11KV 3Ph 3W lines shall be of following configurations

Sl No.	Type ofLine	Conductor	Support	Average span in mtr.
1	3Phase 3Wire	55 mm2 AAA Conductor	9Mtr.100x116mmRSJoist	60

Each one Kilometer 11KV Lines 3Ph 3W using 55 mm2 AAA Conductor shall be constructed on 9 mtr 100x116mmRS Joist Pole complete with four nos of Cut point, one DP, double disc arrangement in all cut points, Coil Earthing in each pole, anti-climbing device, danger plate, stay sets as required, bolts, nuts & washers and any other hardware required to complete the work, as finalized during detailed engineering.

All the poles (0.333Cum i.e PCC 1:2:4) and stays (0.1485Cum i.e PCC 1:2:4) are to be concreted.

04.06 **Up gradation of 11KV line with 100 mm2 Conductor.**

Up gradation of each existing 11KV 3Ph 3W line from 34/55 mm2 conductor to 100 mm AAA Conductor shall be constructed on Ten nos of 9 mtr 150x150mmRS Joist Pole complete with three nos of Cut point, one DP, double disc arrangement in all cut points, Coil Earthing in each pole, anti-climbing device, danger plate, stay sets as required, bolts, nuts & washers and any other hardware required to complete the work, as finalized during detailed engineering.

All the poles (0.333Cum i.e PCC 1:2:4) and stays (0.1485Cum i.e PCC 1:2:4) are to be concreted.

04.07 **Construction of NEW 11KV 3Ph 3W line.**

The 33KV 3Ph 3W lines shall be of following configurations

Sl No.	Type Line	Conductor	Support	Average span in mtr.
1	3Phase 3Wire	232 mm2 AAA Conductor	11Mtr.150x150mm RSJoist	60

Each one Kilometer 33KV Lines 3Ph 3W using 232 mm2 AAA Conductor shall be constructed on 11 mtr 150x150mmRS Joist Pole complete with three nos of Cut point, two DP, Coil Earthing in each pole, anti-climbing device, danger plate, stay sets as required, bolts, nuts & washers and any other hardware required to complete the work, as finalized during detailed engineering.

All the poles (0.333Cum i.e PCC 1:2:4) and stays (0.1485Cum i.e PCC 1:2:4) are to be concreted.

04.08 **Up gradation of 33KV line with 232 mm2 Conductor.**

Up gradation of each existing 33KV 3Ph 3W line from 80/100 mm2 conductor to 232 mm AAA Conductor shall be constructed on Ten nos of 11 mtr 150x150mmRS Joist Pole complete with three nos of Cut point, two DP, Coil Earthing in each pole, anti-climbing device, danger plate, stay sets as required, bolts, nuts & washers and any other hardware required to complete the work, as finalized during detailed engineering.

All the poles (0.333Cum i.e PCC 1:2:4) and stays (0.1485Cum i.e PCC 1:2:4) are to be concreted.

All the Dismantling Materials will be return to the Store through Concern Executive Engineer.

05.00 GENERAL REQUIREMENTS & INSTRUCTIONS:

05.01 Sub-stations or Transformers upgraded / installed or RS Joist poles installed and BPL households electrified under this scheme will be inscribed with the name of the scheme i.e "Biju Gram Jyoti" and year of electrification in white paint in the back ground of deep green paint.

05.02 For substation equipment the scope covers survey, structure, soil resistively measurements design, fabrication and supply of all type of structures and including bolts, nuts and washers, hanger. Design, selecting type of foundation for different structures and casting of foundation for structure footing; and erection of structure, tack welding of bolts and nuts, supply and application of zinc rich paint, structure earthing, fixing of insulator string, stringing of conductors, earth wires along with all necessary line accessories and commissioning of the Sub Stations.

05.03 All the raw materials such as steel, zinc for galvanizing, reinforcement steel and cement for foundation, coke and salt for earthing, bolts, nuts, washers, danger plates, phase plate, number plate etc. required for substation & its structures shall be included in the scope of supply. Bidders shall clearly indicate in their offer, the sources from where they propose to procure the raw materials and the components. Vender list must be provided with their credentials.

05.04 In case of augmentation of existing sub-station, the Bidder shall visit site to ascertain the structures and foundations, dismantling and new construction of structures and foundations works to be done before quoting. Bidder must furnish the design and drawings in support of the activities mentioned above that are to be carried out for augmentation of existing sub-station site.

05.05 For HT & LT line the scope covers detailed survey, proposal for feeder bifurcation, pole spotting, optimization of pole location, pole design, testing, fabrication and supply of all type of transmission line poles including cross arms, angles, channels, braces, top brackets, stay sets, bolts, nuts and washers, D-shackle, all types of insulators, and all type of pole accessories like, phase plate, number plate, danger plate, anti-climbing device, stay sets. Guarding arrangements, etc.; design, selection of type of foundation for different poles and casting of foundation for pole footing; and erection of poles, supply and application of zinc rich paint, pole earthing, fixing of insulators, supply of conductors & accessories, stringing of conductors along with all necessary line accessories and testing and commissioning of

05.06 Bidder is required to follow statutory regulations stipulated in Electricity Act 2003, Indian telegraph act 1889, I.E. Act 1910, Electricity (Supply) Act 1948, Indian Electricity Rules 1956 with all amendments till date and other local rules and regulations referred in this specifications.

05.07 The bidder shall comply with all the statutory rules and regulations prevailing in the state including those related to safety of equipment and human beings.

05.08 The successful bidder shall acquire electrical license from the ELBO Bhubaneswar, as required for executing the works.

05.09 The Bidder shall do complete coordination with all local & statutory agencies for execution of complete works including obtaining clearance for energising of the HT systems upon completion of erection.

05.10 Bidder shall obtain approvals & clearances and right of way from all agencies involved. All lines shall generally be routed through public land / along the road.

05.11 The bidder shall be responsible for transportation to site of all the materials to be provided by the Contractor as well as proper storage and preservation of the same at his own cost, till such time the erected line is taken over by the Owner.

05.12 Bidder shall set up required number of stores along the line to expedite quick execution.

05.13 Failure of any equipment to meet the specified requirements of tests carried out at works or at site shall be sufficient cause for rejection of the equipment. Rejection of any equipment will not be held as a valid reason for delay in the completion of the works as per schedule. Contractor shall be responsible for removing all deficiencies, and supplying the equipment that meet the requirement.

06.00 ROUTE SURVEY:

Successful bidder shall carry out detailed survey and prepare the detailed route of 11KV & LT lines, location of Distribution Transformer on topographical sheets / mouja maps available from government agencies. The bidder shall make his own arrangements for obtaining the topographical maps/mouzas maps from the concerned agencies. The final route map for 11KV & LT lines, shall be prepared and submitted by the bidder, showing the proposed pole position, ground clearance, conductor sag and various crossings i.e. railway lines, communication lines, EHT lines, rivers, road and stream crossings on the map to a scale of 1:25000. All LT lines along with pole locations are to be marked on village / mouza maps / patwari maps to a scale 1:5000.

07.00 GENERAL CONSTRUCTIONAL PRACTICES (11KV):

The following types of poles shall be used at respective locations given below.

a) SP (Single Pole support) 0o - 10 o deviation.
b) DP (Double Pole support) 0o – 60 o deviation
c) FP (Four Pole support) 60o – 90 o deviation

Pole Spotting

a) Span

Average span of HT & LT lines with proposed conductors is given in the table below.

Sl No.	Line Class	Support (Height in mtrs / KG class)	Conductor Type	Nominal Conductor size in sq	Max. span in mtrs.
1	11KV 3Ph (for new line & spur line)	PSC (8/200)	AAAC XLPE CABLE	55 55MM^2 SINGLE CORE	68 68
2	LT 3Ph 4W	PSC (8/200)	ABC	3X35+1X25	40
3	LT 3Ph 4W	PSC (8/200)	ABC	3X55+1X50	40
4	LT 1Ph 2W	PSC (8/200)	ABC	1X35+1X25	40

(b) Road Crossing

At all major road crossings, the poles shall be fitted with strain type insulators but the ground clearance at the roads under maximum temperature and in still air shall be such that even with conductor broken in adjacent span, ground clearance of the conductor from the road surfaces shall not be less than 6.1 meters.

(c) Power Line Crossings

Where the proposed lines require to cross over another line of the same voltage or lower voltage, provisions to prevent the possibility of its coming into contact with other overhead lines shall be made in accordance with the Indian Electricity Rules, 1956 as amended from time to time. All the works related to the above proposal shall be deemed to be included in the scope of the Contractor. Where existing lines of higher voltages are to be crossed under another line, the bidder shall take up suitable re-routing so as to obtain necessary sectional clearances, other wise crossing through 11 kV cable shall be proposed.

(d) Telecommunication Line Crossings

The angle of crossing shall be as near to 90 degree as possible. However, deviation to the extent of 30 degree may be permitted under exceptionally difficult situations. HT line shall be routed with requisite suppresion with parallel telecom line to avoid inductance during faults.

(d) Details Enroute.

All topographical details, permanent features, such as trees, telecommunication lines, building etc. 5.5 meter on either side of the alignment shall be detailed on the route plan.

(e) Clearance from Ground, Building, Trees etc.

Clearance from ground, buildings, trees and telephone lines shall be provided in conformity with the Indian Electricity Rules, 1956 as amended upto date. The bidder shall select the height of the poles such that all electrical clearances are maintained. RCC/rail poles shall be used for all road & drain crossings, if required. In case of acceptional terrain, rail pole may be used with the approval of owner.

(f) The minimum planting depth of poles shall be governed by IS : 1678. However, if due to the ground conditions, e.g. water logged area etc. depth of planting of poles shall be suitably increased the bidder will supply the poles of suitable height in order to maintain the required clearances, the vendor will submit the details of the same on case to case basis.

(h) Guarding mesh shall be used in all electric line / telecom line / road / drain / canal crossing and at all points as per statutory requirements. The bidder shall provide & install anti climbing devices and danger plates on all poles and DT stations.

08.00 DESIGN PARAMETERS:

a) Factor of safety 2.0 in Normal condition for 33 kV & 2.5 for 11 kV line & LT line PSC supports.
b) Wind Pressure on Pole & conductor– As per IS 802
c) In addition to wind load on cross-arms, insulators guy-wire etc. shall be considered.
d) Wind load on full projected area of conductors and pole is to be considered for design.
e) Ground clearance shall be minimum 5.2m for 33 kV line & 4.6 m for 11 KV line & LT line for bare conductor at locations other than road crossings.
f) Ground clearance shall be minimum 4m for 11 kV ABC line & LT ABC line.
g) The live metal clearance shall be as per IS: 5613 and shall be min. 330 mm for 33 KV line.

Pole accessories like danger plates, phase plates and number plates shall be provided.

PROVIDING OF GUYS/STRUT POLES TO SUPPORTS

Strut poles/flying guys wherever required shall be installed on various pole locations as per REC construction standards .For selection of guing locations REC guidelines & construction practices shall be followed.

In this work anchor type guy sets are to be used. These guys shall be provided at

i) angle locations
ii) dead end locations
iii) T-off points
iv) Steep gradient locations.
v) Double Pole, & four poles

The stay rod should be placed in a position so that the angle of rod with the vertical face of the pit is 300/450 as the case may be.

G.I. stay wires of size 7/3.15 mm (10 SWG) with GI turn buckle rod of 16 mm dia & 16 mm dia GI stay stay rods, shall be used for 11KV & LT line.

G.I. stay wires of size 7/4 mm with GI turn buckle rod of 20 mm dia & 20 mm dia GI stay stay rods, shall be used for 33 KV line.

For double pole structure (DP), four stays along the line, two in each direction and two stays along the bisection of the angle of deviation (or more) as required depending on the angle of deviation are to be provided. Hot dip galvanised stay sets are to be used.

The anchor plate shall be fixed to 200mm x 200mm MS plate of 6mm thickness. M.S. rod with a bolt arrangement at one end and other end is given shape of 40mm dia circle to bind one end of the stay wire. The anchor plate shall be buried in concrete. The dimensions for concreting & earth & boulder fill shall be as per the drawing mentioned in clause no 3.01.00.

The turn buckle shall be mounted at the pole end of the stay and guy wire so fixed that the turn buckle is half way in the working position, thus giving the maximum movement for tightening or loosening.
If the guy wire proves to be hazardous, it should be protected with suitable asbestos pipe filled with concrete of about 2 m length above the ground level, painted with white and black strips so that, it may be visible at night.

CROSS ARMS

Cross Arms for 33 KV and 11 KV Overhead Power Lines shall be made out of 100x50x6 mm and 75 x 40 x6 mm M.S. channel. Cross Arms made out of M.S. angle shall not be used. Cross arms shall conform to specification given under the head miscellaneous items in this specifications.

Fixing of Cross Arms

After the erection of supports and providing guys, the cross-arms are to be mounted on the support with necessary clamps, bolts and nuts. The practice of fixing the cross arms before the pole erection can also be followed. In case, the cross-arm shall be mounted after the pole is erected, the lineman should climb the pole with necessary tools. The cross-arm shall then tied to a hand line and pulled up by the ground man through a pulley, till the cross-arm reaches the line man. The ground man should station himself on one side, so that if any material drops from the top of the pole, it may not strike him. All the materials should be lifted or lowered through the hand line, and should not be dropped.

INSTALLATION OF LINE MATERIALS

Insulator and Bindings

Prior to fixing, all insulators shall be cleaned in a manner that will not spoil, injure or scratch surface of the insulator, but in no case shall any oil be used for that purpose. Pin insulators shall be used on all poles in straight line and disc or shackle insulators on angle and dead end poles. Damaged insulators and fittings, if any, shall not be used. The insulator and its pin should be mechanically strong enough to withstand the resultant force due to combined effect of wind pressure and weight of the conductor in the span.

Strain insulators shall be used at terminal locations or dead end locations and where the angle of deviation of line is more than 100. Strain insulators shall be used at major crossings.

The pins for insulators shall be fixed in the holes provided in the cross-arms and the pole top brackets. The insulators shall be mounted in their places over the pins and tightened. In the case of strain or angle supports, where strain fittings are provided for this purpose, one strap of the strain fittings is placed over the cross-arm before placing the bolt in the hole of cross-arms. The nut of the straps shall be so tightened that the strap can move freely in horizontal direction.

Handling of Conductor and Earth wire

Running Out of the Conductors: The contractor shall be entirely responsible for any damage to the pole or conductors during stringing. Care shall be taken that the conductors do not touch and rub against the ground or objects, which could scratch or damage the strands.

The sequence of running out shall be from the top to down i.e. the top conductor shall be run out first, followed in succession by the side conductors. Unbalanced loads on poles shall be avoided as far as possible. When lines being erected run parallel to existing energized power lines, the Contractor shall take adequate safety precautions to protect personnel from the potentially dangerous condition.

Monitoring of Conductors during Stringing

The conductor shall be continuously observed for loose or broken strands or any other damage during the running out operations. Repair to conductors, if necessary, shall be carried out with repair sleeves. Repairing of the conductor surface shall be carried out only in case of minor damage, scuff marks, etc. The final conductor surface shall be clean, smooth and free from projections, sharp points, cuts,

abrasions, etc. The Contractor shall be entirely responsible for any damage to the poles during stringing.

CrossingsAll crossings shall be at right angles. Derricks or other equivalent methods ensuring that normal services need not be interrupted nor damage caused to property shall be used during stringing operations where roads, channels, telecommunication lines, power lines and railway lines have to be crossed. The contractor shall coordinate with state electricity board for obtaining work permit and shut down of the concerned line. However. shut down shall be obtained when working at crossings of overhead power lines. The Contractor shall be entirely responsible for the proper handling of the conductor, earthwire and accessories in the field.

Guarding shall be provided at major crossings. The Guardings shall consists of GI guard cross arm of length 2.5 mtrs made out of 75 x 40 x 6 mm channel & shall be hot dipped galvanized generally conforming to IS:2633/72. The clamps shall also be hot dipped galvanized generally conforming to IS:2633/72. Guardings shall be erected with ground & line clearances as per the I.E. rules. The guarding shall be provided with GI wire 8 SWG for 11KV & LT line & 4 SWG for 33KV line. Binding wire & suitable I bolt & nut bolts for cross arm to cross arm. Guard wire shall be separately earthed at both ends. Crossings the roads / canals or any other lines shall be as per the enclosed drawing No. CC: 9404: NESCL: ENGG: RGGVY:LT LINE: 06.For 33KV line guarding arrangement shall be as per REC construction standard M6.

Anti-climbing Devices

Anti Climbing Devices shall be provided with G.I. Barbed wire, they shall be provided and installed by the Contractor for all poles. The barbed wire shall conform to IS:278 (Grade A1). The barbed wires shall be given chromating dip as per procedure laid down in IS:1340.

Painting Materials

All the metal parts except G.I. parts are to be painted with one coat of red oxide and one coat of aluminium paint.

STRINGING OF CONDUCTOR

The works include spreading of conductors or HT/LT AB Cables without any damage and stringing with proper tension without any kinks/damage including binding of conductor at pin points, jumpering at cut points etc. The ground & line clearances at road crossings along roads, L.T. crossings & other crossings shall be as per the relevant I.E. rules.

While transporting conductors drums to site, precautions are to be taken so that the conductor does not get damaged. The drum shall be mounted on cable drum support. The direction of rotation of the drum shall be according to the mark in the drum so that the conductor could be drawn. While drawing the conductor, it shall not rub causing damage. The conductor shall be passed over poles on wooden or alluminium snatch block (pulley) mounted on the poles for this purpose.

The conductor shall be pulled through come-along clamps to stringing the conductor between the tension locations.

Conductor splices shall not crack or otherwise be susceptible to damage in the stringing operation. The Contractor shall use only such equipment / methods during conductor stringing which ensures complete compliance in this regard. All the joints including mid span joints on the conductor and earth-wire shall be of the compression type, in accordance with the recommendations of the manufacturer, for which all necessary tools and equipment like compressors, dies, etc., shall be obtained by the Contractor.

Each part of the joint shall be cleaned by wire brush till it is free of rust or dirt, etc., and be properly greased with anti-corrosive compound, before the final compression is carried out with the compressors. After completing the jointing, tensioning operation shall be commenced.

All the joints or splices shall be made at least 15 meters away from the pole. No joints or splices shall be made in spans crossing over main roads, railways and small river spans. Not more than one joint per sub-conductor per span shall be allowed. The compression type fittings shall be of the self centering type. After compressing the joint, the alluminium sleeve shall have all corners rounded; burrs and sharp edges removed and smoothened.

During stringing of conductor to avoid any damage to the joint, the contractor shall use a suitable protector for mid span compression joints in case they are to be passed over pulley blocks / aerial rollers. The pulley groove size shall be such that the joint along with protection can be passed over it smoothly.

TAPPING ARRANGEMENT FROM EXISTING 11KV LINE

Tapping of existing 11kV line shall be taken by providing a horizontal cross arm below the existing V cross arm of the pole & mounting disc insulators on it. The tapping conductors may be guided by providing pin insulators as required. A new two pole structure shall be erected within 10-15 meters of this tapping pole & the new line will emerge from this two pole structure with disc insulators. The Taping pole to the double pole conductor tension should be such that it avoids looseness & sag to the extent possible & it should avoid extra tension on the tapping pole.

Wherever the proposed spur line length is more than two km after the tapping an AB switch arrangement shall be provided at the double pole for isolation of the line.

Aligning/re-erection of tilted/bent poles wherever found in the route of line along with strengthening of its foundation is in the scope of the bidder.

Before undertaking the Re-conductoring work in the given line, the bidder shall make assessment of type and quantity of the existing conductor in consultation/presence of owner’s representative.

While Re-conductoring of 11 KV line, disconnection/connection of existing Distribution Transformer shall be in the scope of the contractor/bidder. The supply and erection of line material for achieving the DT disconnection and connection shall be in the scope of the contractor.

The empty conductor drums, available after laying of conductor, shall be disposed of by the contractor at his cost. These drums may be used for rewinding of Conductor removed from the line at the later stage of Re-conductoring work.

Any other work not mentioned above exclusively but required for accomplishing desired work will be in the scope of the bidder/contractor.

For all above activities shut down will be provided for the line by owner. Restoring the disturbance/damage caused by above activities to the existing infrastructure e.g. road, water/sewerage pipes, telecommunication lines etc. will be in the scope of the bidder/contractor.

While Repairing & Replacing the equipment, if any equipment gets damaged due to negligent handling of the contractor the same shall be replaced by the contractor, at his cost, to the owner/employer's satisfaction.

Survey of existing lines

Survey shall have to be carried out by the contractor of existing lines.

Due to heavy conductor being used for Re-conductoring, failure containment structures (normally DP/four pole structure) may be required along the entire length shall be provided for HT kV lines. Such structures are generally required at the following points and is in the scope of contractor's work.

i) At the tapping points.
ii) At points where a DT is installed/to be installed.
iii) At angle points i.e. with diversion angle of 10-60 degree.
iv) At the distance of 2 km max. from the last DP or four pole structure.

Four Pole structures shall be use as per REC construction Dwg. No. A-10 (for the diversion angle of 60-90 degree).

Span

Since the work shall be done on the existing line, the existing span shall be maintained. However, if any new pole is required to be erected along the route of existing line, the span should be as near as possible to the basic design span indicated below.

33/11 KV line : 60 meter span

SECTION - V

TECHNICAL SPECIFICATION

TECHNICAL SPECIFICATION FOR 11KV LINE MATERIALS SUPPORT POLES, CROSSARMS AND NUTS & BOLTS

01.00 SCOPE

This Specification covers Design, Engineering, Manufacture, testing, inspection before dispatch, forwarding, packing, transportation to site, Insurance (both during transit & storage), Storage, Erection, Supervision, testing and commissioning of 11KV & 33KV, support Poles, Cross Arms and Bolts & Nuts. for use in the networks of NESCO Utility, Odisha

The equipment offered shall have been successfully type tested and the design shall have been satisfactory operation for a period not less than two years on the date of bid opening. Compliance shall be demonstrated by submitting with the bid, (i) authenticated copies of the type test reports and (ii) performance certificates from the users.

The scope of supply includes the provision of type tests. Rates of type tests shall be given in the appropriate price schedule of the bidding document and will be considered for evaluation. The Collector & District Magistrate, Mayurbhanj reserves the right to waive type tests as indicated in the section on Quality Assurance. Inspection and Testing in this specification.

The line support poles and cross arms shall conform in all respects to highest standards of engineering, design, workmanship, this specification and the latest revisions of relevant standards at the time of offer and the Collector & District Magistrate, Mayurbhanj shall have the power to reject any work or material, which, in his judgment, is not in full accordance therewith.

02.0 GENERAL

The line support poles and cross arms shall be designed to carry the line conductors with the necessary insulators and all other fittings and equipment under the conditions specified.

Poles may be manufactured from concrete (pre stressed) or steel.

Pole cross arms are normally constructed of steel and shall be bolted to the pole.

NESCO use a V- cross arm on the 11KV and 33KV line structures at intermediate and right angle locations to reduce problems from birds bridging insulators. The Bidder’s cross arm design must provide a similar level of protection from bird contact and explain how this is achieved from the offered design.

03.00 DESIGN REQUIREMENT

In order to limit the range of materials required for line construction, maintenance and repair the Contractor shall limit the number of different types of support structures and cross arms as far as possible.

The following are minimum requirements:

- Pole top fixings and cross arms :
  For any particular pole function, the pole top equipment shall be identical regardless of the height of the structure.
- The number of cross arm types for a particular voltage and conductor size shall be limited to three types.
- Fixing bolts and nuts for cross arms and bracing straps shall be limited to two sizes by diameter (M16 and M20)

The line support poles and cross arms shall be designed to the following requirements:

- The wind pressures to be applied to the conductors, poles and cross arms are specified in IS 5613 (Part 1/ Section 1): 1995 and as stipulated in the Service Conditions.
- Three wind zones are found within the state of Odisha and the design of structures shall take account of this fact. The Bidder shall take account of the wind loading regimes together with the respective terrain category necessary for the projects for which he is bidding and shall propose the design of support poles and cross arms which will prove most effective for the project and for the Employer's system.
- The working load on the support poles and cross arms should correspond to those that are likely to come onto the structure during its working life. Existing designs meet system requirements where working loads are applied at a point 600 mm from the top of the pole. The offered design shall meet requirements with the point of application of the load as per bidder's design but not more than 600 mm from the top of the pole.

  The structures shall be planted directly into the ground with a planting depth as per IS 1678: 1978 and as stipulated in this specification.
  All structures shall have a depth mark made at a point 3 meters from the butt end. This mark shall be in the form of a horizontal line with "3m" engraved directly below the line. In the case of steel structures the mark shall be embossed or indented before surface treatment.

  Pole details provided in this specification are indicative of poles used on the NESCO distribution system, or available as standard designs. The Bidder must determine the requirements of the design offered and select suitable poles to deliver the specified performance. The inclusion of a particular size in the specification does not indicate approval of the pole for any function.

R.S Joist Pole

1.0 Scope Of Work:

This specification covers design, manufacture, testing and supply of 150mm x 150mm GI RS Joist 11 Meter long having unit weight of 34.6kg. Per Meter. Thickness of the web shall be 11.8 mm. All steel structures including RS joist for Line & Outdoor structures in Substations shall be Galvanized type.

150x150mm RS joist			
1	150 x 150 mm R.S. Joist length:-11 mtr, 34.6kg/mtr	MT	0.3806

Applicable Standards:

This specification covers the manufacturing, testing before dispatch and delivery of above R.S Joists.

2.0 Standards:

The RS JOISTS shall comply with the requirements of latest issue of IS – 2062 Gr – A except where specified otherwise.

3.0 Climatic Conditions : The climatic conditions at site under which the store shall operate satisfactory, are as follows

Maximum temperature of air in shade 45º c Maximum temperature of air in shade 0 c Maximum temperature of air in shade 50º c Maximum rain fall per annum 2000mm

Maximum temperature of air in shade 45º c Maximum ambient temperature 45º c Maximum humidity 100% Av. No. of thunder storm days per annum 70% Av. No. of dust storm per annum 20% Av. Rain fall per annum

4.0 Rolled Steel Joists

RSJ DESIGNATION	**150 x 150 mm ISHB**
Length of Joist in Mtr with +100mm/- 0%Tolerance	11mtr
Weight kg/m with±2.5% Tolerance	34.6
Sectional Area (cm^2)	44.1
Depth(D) of Section (mm) with +3.0mm/ -2.0mm Tolerance as per IS 1852-1985	150.00
Width (B)of Flange (mm) with ±2.5mm Tolerance for116 x 100 mm ISMB & ±4.0mm Tolerance for 150 x 150 mm ISHB IS 1852-1985	150.00
Thickness of Flange (Tf) (mm) with±1 .5mm Tolerance	9.00
Thickness of Web(Tw) (mm) with±1 .0mm Tolerance	11.8

Corner Radius of fillet or root (R1) (mm)	8.00
Corner Radius of Tow (R2) (mm)	4.00
Moment of Inertia Ixx (cm^4) Iyy (cm^4)	1640.00 495.00
Radius of Gyration (cm) Rxx Ryy	6.09 3.35
Flange Slope(a) in Degree	94.0
Tolerance in Dimension	As per IS:1852

Dimensions and Properties

4.2 MECHANICAL PROPERTIES:

Tensile Test : Requirement as perIS:2062/

4.3. CHEMICAL PROPERTIES:

Yeild Stress(MPa)	Min250
Tensile Strength(MPa)	Min410
Lo=(5.65ISo)Elongation%	Min23
Bend Test	Shall not Crack

Chemical Composition	Requirement as perIS:2062/ 1999 Grade-A	Permissible variation over the Specified Limit,Percent,Max
Grade	A	-
Chemical Name	Fe-410W A	-
Carbon(%Max.)	0.23	0.02
Manganese(%Max.)	1.5	0.05
Sulphur(%Max.)	0.050	0.005
Phosphorous(%Max.)	0.050	0.005
Silicon(%Max.)	0.40	0.03
Carbon Equivalent(%Max.)	0.42	-
De-oxidation Mode	Semi-killed or killed	-
Supply condition	As rolled	-

4.4. However, In case of any discrepancy between the above data & the relevant ISS, the values indicated in the IS shall prevail.

4.5. The Acceptance Tests shall be Carried out as per Relevant ISS.

5.0.150x150mm RS Joists :(9Mtr & 11Mtr)

RS Joists of Specific Weight 30.6kg/mtr with length of each type of pole being 11 mtr pole weighing 336.6Kg for specified number of poles with specified weight in MT as given in the NIT table given above shall have to be supplied as per IS:2062;2006 Grade"A" , IS:808;1989/2001, IS1608:1995 & IS:12779-1989 and their latest amendment if any complying the required Dimension, Weight, Chemical & Mechanical properties confirming to the relevant IS, as per the Tolerrance given Below.

6.0 APPLICABLETOLLERANCES:

1. Length of each pole = + 100mm / - 0 % As per relevant IS: 12779-1989(with proportionate change in no of Poles)

2. Specific Weight of RS Joists = ±2.5% As per relevant IS: 1852/1 985

3. Weight for whole lot of supply for all categories = ±3.0% As per relevant IS: 12779-1989 for both type of RS Joists.

7.0. EMBOSSING ON EACH R.S JOIST :

Following distinct non-erasable embossing is to be made on each R.S Joists

a) Name & Logo of the Manufacturer.
b) B.I.S Logo (ISI Mark) if applicable.
c) Size of the R.S Joists

8.0 Chemical Properties :

Tensile Test :	Requirement as per IS:2062/ 1999 Grade-A	Manufacturer's Data
Yeild Stress(MPa)	Min250	
Tensile Strength(MPa)	Min410	
Lo=(5.65ISo)Elongation%	Min23	
Bend Test	Shall not Crack	

9.0 Mechanical Properties :

Chemical Composition	Requirement as per IS:2062/ 1999 Grade- A	Permissible variation over the Specified Limit, Percent, Max	Manufacturer's Data
Grade	A	-	
Chemical Name	Fe-410W A	-	
Carbon(%Max.)	0.23	0.02	
Manganese(%Max.)	1.5	0.05	
Sulphur(%Max.)	0.050	0.005	
Phosphorous(%Max.)	0.050	0.005	
Silicon(%Max.)	0.40	0.03	
Carbon Equivalent (%Max.)	0.42	-	
Deoxidation Mode	Semi-killed or killed	-	
Supply condition	As rolled	-	

However, In case of any discrepancy between the above data & the relevant ISS, the values indicated in the IS shall prevail.The Acceptance Tests shall be Carried out as per Relevant ISS.The RS Joists shall be manufactured confirming to the relevant IS with Manufacturer's name/ logo & B.I.S Logo if applicable embossed on it.Joints (6mtr + 5 mtr) , (7mtr + 4mtr), (6mtr + 7 mtr), (8mtr + 5mtr) are permissible.

10.00 R.S. Joist (116 x 100 mm) & RS Joist (125 x 70 mm) : –

A) Specification of Materials: - R.S. Joists (116 x 100 mm) & (125 x 70 mm) as per IS : 2062 /2006, Grade – A, IS : 808 / 1989 / 2001 , IS : 1608 / 1995 & IS : 12777 / 1989 & their latest amendments if any

Size of R.S. Joist (mm)	Length of Each Pole (Mtr)	Sp. Weight (Kg / Mtr)	Weight of each Pole (Kg)
116 x 100	9	23.0	207
125 x 70	8	13.0	104

B) Applicable Tolerances For R.S. Joist (116 x 100 mm) & (125 x 70 mm) (with proportionate change in No of Poles) : -

1. Cutting Tolerance / Length of each pole = + 100 mm / – 0 % as per relevant IS: 12779 / 1989 (with proportionate change in No of Poles)
2. Specific Weight of R.S. Joists = ± 2.5 % as per relevant IS: 1852 / 1985
3. The Tolerance on mass per meter of individual section = ± 4 % of specified mass given in IS: 12778 /1989, as per relevant IS: 12779 / 1989.
4. Mass tolerance / Weight for whole lot of supply for all categories = within ± 3 % as per relevant IS: 12779 / 1989.

C) Embossing (Non – Erasable) on each RS Joist (116 x 100 mm) & (125 x 70 mm): -

1. Name & Logo of the Manufacturer
2. B.I.S. logo (ISI Mark), if applicable
3. Size of R.S. Joist

TECHNICAL SPECIFICATION FOR STEEL MATERIALS

100X50x6 MM MS CHANNEL
75x40x6 MM M S CHANNEL
50X50X6 MM MS ANGLE

01.00 **Scope:**

This specification covers the manufacturing, testing before dispatch and delivery at destination at site stors of Baipada Circle area under NESCO.

100X50x6 MM MS CHANNEL
75X40x6 MM MS CHANNEL
50X50X6 MM MS ANGLE

As per I.S :2062 and its later amendments for grade A

02.00 **Standards:**

The steel materials shall comply with the requirements of latest issue of IS – 2062 Gr – A except where specified otherwise.

03.00 **Climatic Conditions:**

The climatic conditions at site under which the store shall operate satisfactory, are as follows:

Maximum temperature of air in shade		45 c
Maximum temperature of air in shade		0 c
Maximum temperature of air in shade		50 c
Maximum rain fall per annum		2000mm
Maximum temperature of air in shade		45 c
Maximum ambient temperature		45 c
Maximum humidity	100%	
Av. No. of thunder storm days per annum	70%	
Av. No. of dust storm per annum	20	
Av. Rain fall per annum		150mm

04.00 'V' CROSSARMS

The cross-arm shall normally be constructed of steel and it will be the contractor's responsibility to ensure that the conductor spacing at the cross arms is adequate to prevent phase clash while supporting the loads generated, as per the Contractor's line design, by conductor weight, by wind, and by conductor tension for maximum wind span and worst design conditions, for all pole duties and for all permitted line deviations.

Cross-arms shall be fixed to the pole in a manner which prevents rotations in any plane even if the bolts are not fully tightened.

The cross-arm dimensions and characteristics given in this specification are intended to describe typical distribution structures and to maintain the general look of the existing network and take advantage of the familiarity of the Employer's staff with these kind of arrangements.

04.01 **Cross-arm Design Calculations**

The contractor shall design the cross-arm length and section configuration. He shall provide calculations to satisfy the Collector & District Magistrate, Angul that the choice of length complies with the requirements of 11KV lines in respect of conductor phase spacing and to avoid conductor clashing for the span lengths and tension limitations specified or designed.

The cross-arm sections shall be determined by taking cognisance of the design wind and weight spans, cross-arm length, as well as calculated conductor tension limits under worst design conditions and wind pressure.

04.02 **Fabrication**

Cross-arms for 11KV construction at intermediate and light angle poles shall be fabricated from grade 43A mild steel of channel section and for heavy angle poles, end poles and section poles fabricated from grade 43 A mild steel of angle section.

The grades of structural steel shall conform to ISO/R/630/1967 or IS – 226: 1975. they shall be hot dip galvanized as per specification.

The cross-arm shall be drilled to accommodate pole bolts and any insulator fittings included in the Contractor's design.

Except where otherwise indicated all dimensions are subject to the following tolerances:

- Dimensions up to and including 50mm : + 1 mm ; and
- Dimensions greater than 50 mm : + 2%

All steel members and other parts of fabricated material, as delivered, shall be free of warps, local deformations, unauthorized splices, or unauthorized bends. Bending of flat strap shall be carried out cold. Straightening shall be carried out by pressure and not by hammering. Straightness is of particular importance if the alignment of bolt holes along a member is referred to its edges.

Holes and other provisions for field assembly shall be properly marked and cross referenced. Where required, either by notations on the drawings or by the necessity of proper identification and fitting for field assembly, the connections shall be match marked.

A tolerance of not more than 1 mm shall be permitted in the distance between the center lines of bolt holes. The holes may be either drilled or punched and, unless otherwise stated, shall be not more than 2 mm greater in diameter than the bolts. When assembling the components, force may be used to bring the bolt holes together (provided neither members nor holes are thereby distorted) but all force must be removed before the bolt is inserted. Otherwise strain shall be deemed to be present and the structure may be rejected even though it may be, in all other respects, in conformity with the specification.

The backs of the inner angle irons of lap joints shall be chamfered and the ends of the members cut where necessary and such other measures taken as will ensure that all members can be bolted together without strain or distortion. In particular, steps shall be taken to relieve stress in cold worked steel so as to prevent the onset of embitterment during galvanizing .

Similar parts shall be interchangeable.

Shapes and plates shall be fabricated and assembled in the shop to the greatest extent practicable. Shearing, flame cutting, and chipping shall be done carefully, neatly, and accurately. Holes shall be cut, drilled, or punched at right angles to the surface and shall not be made or enlarged by burning. Holes shall be clean-cut without torn or ragged edges, and burrs resulting from drilling or reaming operations shall be removed with the proper tool.

Shapes and plates shall be fabricated to tolerances that will permit field erection within tolerances, except as otherwise specified. All fabrication shall be carried out in a neat and workmanlike manner so as to facilitate cleaning, painting, galvanizing and inspection and to avoid areas in which water and other matter can lodge.

Contact surfaces at all connections shall be free of loose scale, dirt, burrs, oil and other foreign materials that might prevent solid seating of the parts.

04.03 **Cross-arm Replacement**

Where rehabilitation of existing networks requires the replacement of a 'V' or horizontal cross-arm or replacement of a pole with a 'V' or horizontal cross-arm then the replacement unit shall be matched to the original so as not to change the general look of the line.

Only in instances, where large sections of the line may require replacement or the original design is no longer available or desirable, shall be contractor, with the permission the, replace the original cross-arm configuration with a new design.
The replacement cross-arm shall conform to the requirements of the fabrication section of this specification.

04.04 Other Associated Steelwork

Other steelwork may be required for mounting line equipment such as AB Switch, surge arresters and Insulators.
The contractor is expected to design the steelwork and to accompany the bid with the relevant drawing and substantiating design calculations.

The steel work shall be fabricated from grade 43 A mild steel as per ISO/R/630/1967 or IS-226:1975 and it shall be hot dip galvanized as per the Surface Treatment section of this specification.
All required fixing nuts, bolts and washers shall be supplied alongwith cross arms.

05.00 BOLTS AND NUTS

All bolts and nuts shall comply with ISO 272, 885, 888, 4759/1 and the washer shall conform with ISO/R/887. All hardware shall be galvanized as per the Surface Treatment.
All bolts, studs, screw threads, pipe threads, bolts heads and nuts shall comply with the appropriate Indian Standards for metric threads, or the technical equivalent.
All bolts, nuts and washers placed in outdoor positions shall be treated to prevent corrosion and electrolytic action between dissimilar metals.
Protective washers of suitable material shall be provided front and back on the securing screws.
The dimensions and characteristics given are intended to describe typical ISO metric bolts, nuts and washers, such as are commonly used in the construction of distribution lines and other distribution plant and equipment. However , the bidder is free to propose alternative hardware.
Furthermore, it shall be the Bidder's responsibility to ensure that the bolts, screws, nuts, washers, clips, fasteners of any description and any other hardware, are capable of supporting the loads action on them, as per the bidder's design, by wind, vibration and short circuit forces for all permitted line and plant duties.
The ISO metric galvanized black hexagon bolts list in the table of Bolt Threaded Depth in this specification shall be used either as pole bolts, namely, where the bolt is required to pass through the center of the pole, or as assembly bolts. The bolts shall comply with ISO 272, 885,888, 4759/1 and shall also conform with the dimensions given in the table of Bolt Threaded Depth Nuts shall be in accordance with ISO 272, 885,888,4759/1.
Unless otherwise specified, each bolt shall be supplied with one full nut and one washer. Individual nuts may also be used for special purposes, such as lock nuts. These nuts shall also conform with ISO 272, 885,888,4759/1.Bolt threaded length

Diameter	Length (mm)	Threaded Length (mm)
M12	80 140 200 220 230 260	30 70 70 70 70 80
M16	40 45 110 200 220 230 260 280	Fully Threaded Fully Threaded 38 70 70 70 80 80
M20	40 220 280	Fully Threaded 70 80
M22	40	Fully Threaded

Screw threads shall be parallel throughout their length. They shall be so formed that, after galvanizing, the nut can be easily screw by hand over the whole threaded length, without excessive play. Before dispatch from the work s one washer shall be fitted to each bolt and a nut shall be screwed on the whole threaded length and left in this position.

05.01 **Permissible Loads**

The safe working shear stress of bolts is 118N/mm^2, with the area of the bolt measured at the root of the thread. The following table referenced Bolts Safe Working Loads shows the ultimate tensile strength and the tensile stress areas, as per ISO 272, 885, 888, 4759/1 and the safe working tensile and safe working shear loads for the bolts covered by this specification. The ultimate shear strength has been assumed to be 75% of the ultimate tensile load and a factor of 2.5 has been applied:

Bolts safe working loads

Bolt Size	Ultimate Tensile Stress (N/mm^2)	Tensile Stress Area (mm^2)	Ultimate Tensile Strength (kN)	Safe Working Tensile Load (kN)	Safe Working Shear Load (kN)
M12	392	84.3	33.05	13.22	9.91
M16	392	157.0	61.54	24.62	18.46
M20	392	245.0	96.04	38.42	28.81

05.02 **Eye Bolts and Nuts**

M20 eye bolts shall preferably be of drop forged manufacture and shall be supplied complete with one full nut.

Eyebolts shall be manufactured from steel to ISO 272, 885, 888, 4759/1 and shall meet the requirements for mechanical properties detailed in ISO 272, 885, 888, 4759/1.

Where a welding process is used in the manufacture, each eye bolt shall be individually proof tested by the manufacturer in accordance with ISO 272, 885, 888, 4759/1 to 125% of its safe working tensile load that is to 48 kN. The safe working tensile load shall be the ultimate axial tensile strength divided by the factor of safety of 2.5.

The eye shall be permanently and legibly stamped with the letter METRIC in letters not less than 3 mm high.

The safe working load of any eye bolt is that load which may be safely carried in an axial direction. If loaded in any other direction the safe working load is reduced and reference shall be made to the following table for safe working loads of M20 eye bolts and eye nuts.

Safe working loads of M20 eye bolts and eye nuts

Angle between Direction of Load and Axis of Bolt	**Safe Working Load (KN)**
0	38.42
5	30.55
10	25.52
15	22.05
20	19.54
25	17.67
30	16.24
35	15.13
40	14.26
45	13.58
50	13.06
55	12.68
60	12.40
65	12.23
70	12.15
75	12.17
80	12.28
85	12.49
90	12.81

05.03 **Tie Rods**

Tie rods shall be supplied with four full nuts. The material of the rods shall be steel to ISO 272, 885, 888, 4759/1 and shall meet the requirements for mechanical properties detailed in ISO 272, 885,888, 4759/1. Associated nuts shall comply with ISO 272, 885, 888, 4759/1.

05.04 **Washers**

Washers shall be of the following different types :

- Round, flat, mild steel washers and having the dimensions shown in the following table: Round flat washer dimensions.
- Tapered, squared (curved) malleable iron washers.
- Square (curved) mild steel washers;
- Square, flat, mild steel washers, in accordance with ISO/R/887 or IS –2016 : 1967.
- Tapered, D shaped, malleable iron washers, in accordance with ISO/R/887 or IS-2016:1967.

Round flat washer dimensions

Type	Internal Diameter (mm)	External Diameter (mm)	Thickness (mm)
M12	14	28	2.5
M16	18	34	3.0
M20	22	39	3.0
M22	24	44	3.0

These washers shall comply with ISO/R/887

05.05 **Screws**

Screws may be:

- Coach screws of galvanized mild steel, gimlet pointed, in accordance with BS 1494. the screws shall be 10mm in diameter and supplied in lengths of 38mm, 76mm and 152mm; or
- Roundhead drive screws of galvanized mild steel, 63 mm long and with 6.3 mm diameter and in accordance with BS 1494-1.

TECHNICAL SPECIFICATION FOR DISC INSULATORS

1.0 SCOPE.

This specification covers the manufacturing, testing and supply of 33kV & 11kV Disc Insulators.

These insulators are to be used in suspension and tension insulator strings.

The Bidder shall **upload** the first page of the **Type test certificate** duly signed by the bidder showing the evidence of successful test, along with the bid.

2.0 STANDARDS:

2.1 Except as modified in this specification, the disc insulators shall conform to the following Indian Standards, which shall mean latest revisions and amendments.

Sl. No.	Indian Standard	Title.	International Standard
1.	IS: 206	Method for Chemical Analysis of Slab Zinc.	
2.	IS: 209	Specification for Zinc.	BS: 3436
3.	IS: 731	Porcelain insulators for overhead power lines with a normal voltage greater than 1000V	BS: 137(I&II);

4.	IS: 2071 Part-(I), Part-(II)	Method of High Voltage Testing.	
5.	IS: 2121 (Part-I)	Specification of Conductors and Earth wire Accessories for Overhead Power lines. Armour Rods, Binding wires and tapes for conductor.	
6.	IS: 2486	Specification for Insulator fittings for overhead power lines with a nominal voltage greater than 1000V.	
	Part – I	General Requirement and Tests.	BS: 3288
	Part – II	Dimensional Requirements.	IEC: 120
	Part – III	Locking devices.	IEC: 372
7.	IS: 2629	Recommended practice for Hot Dip	
8.	IS: 2633	Testing for Uniformity of Coating of	
9.	IS: 3138	Hexagonal Bolts & Nuts.	ISO/R 947 &
10.	IS: 3188	Dimensions for Disc Insulators.	IEC: 305
11.	IS: 4218	Metric Screw Threads	ISO/R 68-1969
12.	IS: 6745	Determination of weight of zinc coating on	
13.	IS: 8263	Methods of RIV Test of HV insulators.	IEC 437
14.	IS: 8269	Methods for switching impulse test on HV	IEC: 506
15.		Thermal mechanical performance test and	IEC: 575

3.0 PRINCIPAL PARAMETERS:

3.1 DETAILS OF DISC INSULATOR / STRING:

The Insulator strings shall consist of standard discs for use in three phase, 50 Hz 33/11KV S/s & Lines in a moderately polluted atmosphere. The discs shall be Ball and Socket type (Cap & Pin type) and have arrangement as shown in Table-I.

The size of disc insulator, minimum creepage distance the number to be used in different type of strings, their electromechanical strength and mechanical strength of insulator string along with hardware shall be as follows: **table I**

Sl. No	Type of String.	Size of disc. Insulator (mm)	Minimum creep age distance of each disc(mm)	No. of standard discs 11KV	No . of standard discs 33KV	Electro-mechanical strength of insulator string fittings (KN)
1.	Single Tension	255x145	430	1x2	1x4	70
2.	Double Tension	-do-	-do-	2x2	2x4	2x70

3.2 **SPECIFICATION / DRAWINGS**:

The specification in respect of the disc insulators are described. These specification for information and guidance of the Bidder. The drawings to be furnished by the supplier shall be submitted to Engineer-in-charge.

3.3 Insulator units after assembly shall be concentric and coaxial within limits as permitted by Indian Standards.

3.4 The strings design shall be such that when units are coupled together there shall be contact between the shell of one unit and metal of the adjacent unit.

4.0 GENERAL TECHNICAL REQUIREMENTS:

4.1 **Porcelain:**

The porcelain used in the manufacture of the shells shall be ivory white nonporous of high dielectric, mechanical and thermal strength, free from internal stresses blisters, laminations, voids, forgone matter imperfections or other defects which might render it in any way unusable for insulator shells. Porcelain shall remain unaffected by climatic conditions ozone, acid, alkalis, zinc or dust. The manufacturing shall be by the wet process and impervious character obtained by through verification.

The insulator shall be made of highest grade, dense, homogeneous, wet-process porcelain, completely and uniformly vitrified throughout to produce uniform mechanical and electrical strength and long life service. The porcelain shall be free from warping, roughness, cracks, blisters, laminations, projecting points foreign particles and other defects, except those within the limits of standard accepted practice. Surfaces and grooves shall be shaped for easy cleaning. Shells shall be substantially symmetrical.

4.2 **Porcelain glaze**:

Surface to come in contact with cement shall be made rough by stand glazing. All other exposed surfaces shall be glazed with ceramic materials having the same temperature coefficient of expansion as that of the insulator shell. The thickness of the glaze shall be uniform throughout and the colour of the glaze shall be Bown. The Glaze shall have a visible luster and smooth on surface and be capable of satisfactory performance under extreme tropical climatic weather conditions and prevent ageing of the porcelain. The glaze shall remain under compression on the porcelain body through out the working temperature range.

5.0 METAL PARTS:

(i) Cap and Ball Pins:

Ball pins shall be made with drop forged steel caps with malleable cast iron. They shall be in one single piece and duly hot dip galvanized. They shall not contain parts or pieces joined together welded, shrink fitted or by any other process from more than one piece of materials. The pins shall be of high tensile steel, drop forged and heat-treated. The caps shall be cast with good quality black heart malleable cast iron and annealed. Galvanizing shall be by the hot dip process with a heavy coating of zinc of very high purity. The bidder shall specify the grade composition and mechanical properties of steel used for caps and pins. The cap and pin shall be of such design that it will not yield or distort under the specified mechanical load in such a manner as to change the relative spacing of the insulators or add other stresses to the shells. The insulator caps shall be of the socket type provided with nonferrous metal or stainless steel cotter pins and shall provide positive locking of the coupling.

(ii) Security Clips:

The security clips shall be made of phosphor bronze or of stainless steel.

6.0 FILLER MATERIAL:

Cement to be used, as a filler material be quick setting, fast curing Portland cement. It shall not cause fracture by expansion or loosening by contraction. Cement shall not react chemically with metal parts in contact with it and its thickness shall be as small and as uniform as possible.

7.0 MATERIALS DESIGN AND WORKMANSHIP:

7.1 GENERAL:

All raw materials to be used in the manufacture of these insulators shall be subject to raw material quality control and to stage testing/ quality control during manufacturing stage to ensure the quality of the final end product. Manufacturing shall conform to the best engineering practices adopted in the field of high voltage transmission. Bidders shall therefore offer insulators as are guaranteed by them for

satisfactory performance. The design, manufacturing process and material control at various stages be such as to give maximum working load, highest mobility, best resistance to corrosion,

good finish elimination of sharp edges and corners to limit corona and radio interference voltages.

7.2 INSULATOR SHELL:

The design of the insulator shells shall be such that stresses due to expansion and contraction in any part of the insulator shall not lead to deterioration. Shells with cracks shall be eliminated by temperature cycle test followed by mallet test. Shells shall be dried under controlled conditions of humidity and temperature.

7.3 METAL PARTS:

1) The pin and cap shall be designed to transmit the mechanical stress to the shell by compression and develop uniform mechanical strength in the insulator. The cap shall be circular with the inner and outer surfaces concentric and of such design that it will not yield or distort under loaded conditions. The head portion of the pinball shall be suitably designed so that when the insulator is under tension the stresses are uniformly distributed over the pinhole portion of the shell. The pinball shall move freely in the cap socket either during assembly of a string or during erection of a string or when a string is placed in position.
2) Metal caps shall be free from cracks, seams, shrinks, air holes, blowholes and rough edges. All metal surfaces shall be perfectly smooth with no projecting part or irregularities, which may cause corona. All load bearing surfaces shall be smooth and uniform so as to distribute the loading stress uniformly. Pins shall not show any microscopically visible cracks, inclusions and voids.

7.4 GALVANIZING:

All ferrous parts, shall be hot dip galvanized in accordance with IS: 2629. The zinc to be used for galvanizing shall conform to grade Zn 99.5 as per IS: 209. The zinc coating shall be uniform, smoothly adherent, reasonably light, continuous and free from impurities such as flux, ash, rust stains, bulky white deposits and blisters. Before ball fittings are galvanized, all die flashing on the shank and on the bearing surface of the ball shall be carefully removed without reducing the designed dimensional requirements.

7.5 CEMENTING:

The insulator design shall be such that the insulating medium shall not directly be engaged with hard metal. The surface of porcelain and coated with resilient paint to offset the effect of difference in thermal expansions of these materials. High quality Portland cement shall be used for cementing the porcelain to the cap & pin.

7.6 SECURITY CLIPS (LOCKING DEVICES)

The security clips to be used as locking device for ball and socket coupling shall be 'R' shaped hump type to provide for positive locking of the coupling as per IS: 2486 (Part-IV). The legs of the security clips shall allow for spreading after installation to prevent complete withdrawal from the socket. The locking device shall resilient corrosion resistant and of sufficient mechanical strength. There shall be no possibility of the locking device to be displaced or be capable of rotation, which placed in position, and under no circumstances shall it allow separation of insulator units and fittings. 'W' type security clips are also acceptable. The hole for the security clip shall be counter sunk and the clip shall be of such design that the eye of the clip may be engaged by a hot line clip puller to provide for disengagement under energized conditions. The force required for pulling the clip into its unlocked positions shall not be less than 50
N (5 kg.) or more than 500 N (50 kgs.).

7.7 BALL AND SOCKET DESIGNATION:

The dimensions of the ball and sockets for 70 KN discs shall be of 16 mm designation in accordance with the standard dimensions stated in IS: 2486 (Part-II).

8.0 DIMENSIONAL TOLERANCE OF INSULATOR DISCS:

It shall be ensured that the dimensions of the disc insulators are within the limits specified below:

a) Diameter of Disc (mm):-

	Standard	Maximum	Minimum
70 KN Disc	255	266	244 b)

Ball to Ball spacing :-
Between Discs (mm)

	Standard	Maximum	Minimum
70 KN Disc	145	149	141

9.0 INTERCHANGEABILITY:

The insulators inclusive of the ball and socket fittings shall be of standard design suitable for use with hardware fittings of any make conforming to relevant Indian Standards.

10.0 FREEDOM FROM DEFECTS:

Insulators shall have none of the following defects:

1) Ball pin shake.
2) Cementing defects near the pin like small blow holes, small hair cracks lumps etc.
3) Sand fall defects on the surface of the insulator.

11.0 TESTS (FOR DISC INSULATORS) :

The following tests shall be carried out on the insulator string and disc insulators.

11.1 TYPE TEST:

This shall mean those tests, which are to be carried out to prove the design, process of manufacture and general conformity of the material and product with the intents of this specification. These tests shall have been conducted on a representative number of samples.

11.2 ACCEPTANCE TESTS:

This shall mean these tests, which are to be carried out on samples taken from each lot offered for pre-despatch inspection for the purpose of acceptance of the lot.

11.3 ROUTINE TESTS:

This shall mean those tests, which are to be carried out on each insulator to check the requirements, which are likely to vary during production.

11.4 TESTS DURING MANUFACTURE:

Stage tests during manufacture shall mean those tests, which are to be carried out during the process of manufacture to ensure quality control such that the end product is of the designed quality conforming to the intent of this specification.

11.5 TEST VALUE:

For all type and acceptance tests the acceptance values shall be the value guaranteed by the bidder in the guaranteed technical particulars of the acceptance value specified in this specification of the relevant standard whichever is more stringent for that particular test.

11.6 TEST PROCEDURE AND SAMPLING NORMS:

The norms and procedure of sampling for the above tests shall be as per the relevant Indian Standard or the Internationally accepted standards. This will be discussed and mutually agreed to between the supplier and Owner before placement of order. The standards and normal according to which these tests are to be carried out are listed against each test. Where a particular test is a specific requirement of this specification, the norms land procedure for the same shall be as mutually agreed to between the supplier and the Owner in the quality assurance programme.

11.7 TYPE, ROUTINE & ACCEPTANCE TESTS:

The following type test shall be conducted on a suitable number of individual unit components,materials or complete strings.

1. On complete insulator string with hardware fittings

a) Power frequency voltage withstand test rings under wet condition.

Standards

BS:137(Part-I)

b)	Impulse voltage withstand test under dry condition.	IEC: 383
c)	Mechanical strength test.	As per this specification.
2.	**On Insulators:**	
a)	Verification of dimensions.	IS: 731
b)	Thermal mechanical performance test:	IEC:575
c)	Power frequency voltage withstand and flashover (I) dry (ii) wet.	BS: 173
d)	Impulse voltage withstand flashover test (dry)	: IEC: 383
e)	Visible discharge test (dry)	: IS:731
	All the type tests given under clause No.5.14 above shall be conducted on single suspension and Double Tension insulator string along with hardware fittings.	
3.	**ACCEPTANCE TESTS:**	
	For insulator:	
a)	Visual examination	: IS:731
b)	Verification of dimensions.	: IS:731
c)	Temperature cycle test.	: IS:731
d)	Galvanizing test.	: IS:731
e)	Mechanical performance test.	: IEC:575
f)	Test on locking device for ball and socket coupling.	: IEC:372
g)	Eccentricity test.	As per this specification.

h) Electro-mechanical strength test. :

i) Puncture test. : IS:731

j) Porosity test. : IS:731

4. ROUTINE TESTS:

For insulators:

a) Visual inspection. : IS:731

b) Mechanical routine test. :

c) Electrical routine test. : IEC:383

5. TEST DURING MANUFACTURE:

Chemical analysis, hardness test and magnetic particle inspection for forgings.

11.8 ADDITIONAL TESTS:: As per this specification.he Owner reserves the right for carrying out any other tests of a reasonable nature at the works of the supplier/ laboratory or at any other recognized laboratory/ research institute in addition to the above mentioned type, acceptance and routine tests at the cost of the Owner to satisfy that the material complies with the intent of this specification.

11.9 CO-ORDINATION FOR TESTING:

For insulator strings, the supplier shall arrange to conduct testing of their disc insulators with the hardware fittings to be supplied to the Owner by other suppliers. The supplier is also required to guarantee overall satisfactory performance of the disc insulator with the hardware fittings.

12.0 ACCEPTANCE AND ROUTINE TEST:

12.1 All acceptance and routine tests as stipulated herein shall be carried out by the supplier in the presence of owner's representative.

12.2 Immediately after finalisation of the programme of acceptance/ routine testing, the supplier shall give sufficient advance intimation to the Owner to enable him to depute his representative for witnessing the tests.

12.3 In case of failure of the complete string in any tests, the supplier whose product has failed in the tests, shall get the tests repeated at his cost. In case of any dispute, assessment of the owner as to the items that has caused the failure in any of the type tests shall be final and binding.

12.4 **MECHANICAL TEST**:

a) The complete insulator string along with its hardware fitting excluding arcing horn corona controlling/grading ring and suspension assembly/dead end assembly shall be subject to a load equal to 50% of the specified minimum ultimate tensile strength (UTS) which shall be increased already rate to 68% of the minimum UTS specified. The load shall be held for five minutes and then removed. After removal of the load, the string components shall not show any visual deformation and it shall be possible to disassemble them by hand,. Hand tools may be used to remove cotter pins and loosen the nuts initially. The string shall then be reassembled and loaded to 50% of UTS and the load shall be further increased at a steady rate till the specified minimum UTS and held for one minute. No fracture should occur during this period. The applied load shall then be increased until the failing loads reached and the value recorded.

12.5 **VIBRATION TEST:**

The suspension string shall be tested in suspension mode, and tension string in tension mode itself in laboratory span of minimum 30 meters. In the case of suspensions string a load equal to 600 Kg. shall be applied along with the axis of the suspensions string by means of turn buckle. The insulators string along with hardware fittings and two sub conductors throughout the duration of the test vibration dampers shall not be used on the test span. Both the sub- conductors shall be vertically vibrated simultaneously at one of the resonance frequencies of the insulator string (more than 10Hz) by means of vibration inducing equipment. The amplitude of vibration at the antipode point nearest to the string shall be measured and the same shall not be less than 120.4 being the frequency of vibration. The insulator strings shall be vibrated for five million cycles then rotated by 90 deg and again vibrated for 5 million cycles without any failure, after the test, the disc insulators shall be examined for looseness of pins and cap or any crack in the cement. The hardware fittings shall be examined to fatigue fatter and mechanical strength test. There shall be no deterioration of properties of hardware components and disc insulators after the vibration test. The disc insulators shall be subjected to the following tests as per relevant standards.

Test.	Percentage of disc to be tested
a) Temperature cycle test followed by Mechanical performance test.	60
b) Puncture test (for porcelain insulator only)	40

13.0 IDENTIFICATION MARKING:

(a) Each unit of insulator shall be legibly and indelibly marked with the trade mark of the supplier, the year of manufacture, the guaranteed combined mechanical and electrical strength in kilo-newtons abbreviated by ‘KN’ to facilitate easy identification and proper use.

(b) The marking shall be on porcelain for porcelain insulators. The marking shall be printed and not impressed and the same shall be applied before firing.

14.0 CHEMICAL ANALYSIS OF ZINC USED FOR GALVANIZING.

Samples taken from the zinc ingot shall be chemically analysed as per IS: 209. The purity of zinc shall not be less than 99.95%.

15.0 TEST FOR FORGINGS:

The chemical analysis hardness tests and magnetic particle inspection for forgings will be as per the internationally recognized procedures for these tests. The sampling will be based on heat number and heat treatment batch. The details regarding test will be as discussed and mutually agreed to by the supplier and owner in quality assurance programme.

16.0 TEST ON CASTING:

The chemical analysis mechanical and metallographic tests and magnetic particle inspection for castings will be as per the internationally recognized procedures for these tests. The samplings will be based on heat number and heat treatment batch. The details regarding test will be as discussed and mutually agreed to by the supplier and Owner in quality assurance programme.

17.0 HYDRAULIC INTERNAL PRESSURE TEST ON SHELLS:

The test shall be carried out on 100% shells before assembly.

18.0 THERMAL MECHANICAL PERFORMANCE TEST:

The thermal mechanical performance test shall be carried out on minimum 15 number of disc insulators units as per the procedure given in IEC 575. The performance of the insulator unit shall be determined by the same standard.

19.0 ECCENTRICITY TEST:

The insulator shall be vertically mounted on a future using dummy pin and socket. A vertical scale with horizontal slider shall be used for the axial run out. The pointer shall be positioned in contact with the bottom of the outermost petticoat of the disc. The disc insulators shall be rotated with reference to the fixture and the slider shall be allowed to move up and down on the scale but always maintaining contact with the bottom of the outer most petticoats. After one full rotation of the disc the maximum and minimum position the slider has reached on the scale can be found out. Difference between the above two readings shall satisfy the guaranteed value for axial run out.

Similarly using a horizontal scale with veridical slider the radial run out shall be measured. The slider shall be positioned on the scale to establish contact with the circumstance of the disc insulator and disc insulator rotated on its future always maintaining the contact. After one full rotation of the disc the maximum and minimum position the slider has reached on the scale can be found out. Difference between the above two readings shall satisfy the guaranteed value for axial run out.

20.0 CRACK DETECTION TEST:

Crack detection test shall be carried out on each ball and pin before assembly of disc unit. The supplier shall maintain complete record of having conducted such tests on each and every piece of ball pin The bidder shall furnish full details of the equipment available with him for crack test and also indicate the test procedure in detail.

POST INSULATOR (PIN TYPE & STATION TYPE)

1.0 STANDARDS

Post insulator (Pin Type & Station Type) shall conform in general to IS 2544, IEC 168 and IEC 815.

Technical Parameters

SI No.	Parameters	33kV	11kV
1	Type	Confirming to IEC 273 (solid core)	Confirming to IEC 273 (solid core)
2	Voltage class (kV)	36	12
3	Dry and wet one minute withstand voltage (kV rms)	70	28
4	Dry lightning impulse withstand voltage (kV p)	170	75
5	Wet switching surge withstand voltage (kV p)	NA	NA
6	Max. RIV at corona extinction voltage (micro volts)	NA	NA
7	Corona extinction voltage (kV rms)		
9	Total minimum cantilever strength (kg)	Not < 300	Not < 300
10	Minimum torsion moment	As per IEC 273	As per IEC 273
11	Total height of insulator (mm)	508	254
12	Minimum PCD (mm) top/bottom	76	57
13	No. of bolts top/bottom	4/ 8	4/ 8
14	Diameter of bolt holes (mm) top/bottom	M12	M12
15	Pollution level as per IEC 815	Heavy	Heavy
16	Minimum total creepage distance (mm)	900	300

Sl No 12 & 13 , is not applicable for Pin type Post Insulator.The size of the pin shall given as per IS & should be of galvanized with necessary nuts & washers.

2.0 Constructional features

Post type insulators shall consist of a porcelain part permanently secured in a metal base to be mounted on the supporting structures. They shall be capable of being mounted upright and be designed to with stand any shocks to which they may bed subjected to by the operation of the associated equipment. Only solid core insulators will be acceptable.

Porcelain used shall be homogeneous, free from lamination, cavities and other flaws or imperfections that might after the mechanical or dielectric quality and shall be thoroughly vitrified, tough and impervious to moisture.

Glazing of the porcelain shall be of uniform brown in colour, free from blisters, burrs and other similar defects.

The insulator shall have alternate long and short sheds with aerodynamic profile. The shed profile shall also meet the requirements of IEC 815 for the specified pollution level.

When operated at normal rated voltage there shall be no electric discharge between conductor and insulators which would cause corrosion or injury to conductors or insulators by the formation of substance produced by chemical action.

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.

All ferrous parts shall be hot dip galvanized in accordance with the latest edition of IS: 2633, and IS: 4579. The zinc used for galvanizing shall be grade Zn 99.95 as per IS: 209. The zinc coating shall be uniform, adherent, smooth, reasonably bright, continuous and free from imperfections such as flux ash, rust stains, bulky while deposits and blisters. The metal parts shall not produce any noise generating corona under the operating conditions. Flat washer shall be circular of a diameter 2.5 times that of bolt and of suitable thickness. Where bolt heads/nuts bear upon the beveled surfaces they shall be provided with square tapered washers of suitable thickness to afford a seating square with the axis of the bolt.

Bidder shall make available data on all the essential features of design including the method of assembly of shells and metals parts, number of shells per insulator, the manner in which mechanical stresses are transmitted through shells to adjacent parts, provision for meeting expansion stresses, results of corona and thermal shock tests, recommended working strength and any special design or arrangement employed to increase life under service conditions.

3.0 TEST DETAILS

The following Type, acceptance and routine tests shall be carried out and results given along with certification as appropriate in the Technical Data Schedule and Test Certificates Schedule of this specification**.**

3.1 TYPE TESTS:

The post insulators shall be subjected to the following type test :

- Visible discharge test
- Impulse voltage withstand test
- Dry power frequency voltage withstand test
- Wet power frequency voltage withstand test
- Mechanical strength test for post insulators as per IEC 168 / IS: 2544.

3.2 Acceptance Tests

The test samples having withstood the routine tests shall be subjected to the following tests according to the sampling procedure of IEC 383 clause 23:

- Verification of dimensions
- Temperature cycle test
- Mechanical strength test for post insulators as per IEC 168/ IS 2544
- Porosity test on post insulators
- Puncture test
- Test for galvanization of ferrous parts

3.3 Routine Tests

- Visual examination
- Power frequency voltage dry test
- Tests to prove mechanical strength.

4.00 STAY INSULATORS (11 KV)

The insulators shall be suitable for use on the **NESCO** distribution system with conditions as shown in the sections on Service Conditions and System Conditions 11 KV Stay insulators shall be used on L.V stays.

4.01 **Performance Characteristic shall be strictly as per relevant IS.**

4.02 Materials

The insulators shall be brown glazed porcelain.

4.04 **Markings**

All insulators shall be clearly marked with the name or trademark of the manufacturer and the year of manufacture. These markings shall be legible and indelible. The markings may be printed or impressed, provided such impressions do not impair the performance of the insulator. Marking shall be applied before firing.

4.05 **Tests**

The insulators shall be subjected to the following type, acceptance and routine tests in accordance with IS –5300 : 1969.

4.06 **Type Tests**

The following type tests are required:

Dry power frequency voltage withstand test;

Wet power frequency voltage withstand test;

Mechanical strength test;

4.07 **Acceptance tests**

The test samples having withstood the routine tests shall be subjected to the following tests according to the sampling procedure of IEC 383 clause 23;

Verification of dimensions

- Mechanical or Electro – Mechanical failing load test;
  Mechanical load shall be applied under conditions reproducing service conditions as closely as possible.
- **Porosity test;**
  Power frequency puncture test.

4.08 **Routine Tests**

The following routine tests shall be conducted on each insulator:

- **Visual examination**
- **Mechanical load test**

TECHNICAL SPECIFICATION FOR 11 KV LINE FITTINGS

01.0 SCOPE

This Specification covers Design, Engineering, Manufacture, testing, inspection before dispatch, forwarding, packing, transportation to site, Insurance (both during transit & storage), Storage, Erection, Supervision, testing and commissioning of 11KV Line Fittings for use in the networks of NESCO, Orissa.

The equipment offered shall have been successfully type tested and the design shall have been in satisfactory operation for a period not less than two years on the date of bid opening. Fittings which are components of insulator assemblies shall have been in satisfactory operation for a period not less than five years. Examples of such fittings are spindles for pin insulators, and hooks, conductor clamps, armour rods, and yoke plates for strain and suspension disc insulators. Compliance shall be demonstrated by submitting with the bid (i) authenticated copies of the type test reports and (ii) performance certificates from the users.

The scope of supply includes the provision of type tests. Rates for type tests shall be given in the appropriate price schedule of the bidding document and will be considered for evaluation.

The line fittings shall conform in all respects to highest standards of engineering, design, workmanship, this specification and the latest revisions of relevant standards at the time of offer.

02.00 STANDARDS

Except where modified by the specification, the fittings shall be designed, manufactured and tested in accordance with the latest editions of the following standards.

IEC/ISO/ or other International Standard	**IS**	**Title**
	IS-2486	Metal fittings of insulators
ISO/R/630/1967	IS-2062:1992	Steel for general structural purposes
ISO 2092 –1/2	IS-5082 :1981	Wrought aluminum and aluminum alloys
DIN 6796		Conical washers
IEC 1284	IS-2121	Overhead power line fittings
BS 3288		Insulator and Conductor fittings performance
IEC 1089	IS –398	Aluminum conductors
IEC 502		Insulated power cables 1 –33 KV
ASTM D1000 IEC 454		Test methods of pressure sensitive, adhesive coated taps for electrical and electronic applications
BS 183		General purpose Galvanised Steel Wire
BS 4429		Turnbuckles for general engineering purposes

BS EN 10218-1 : 1994		Mechanical tests on steel wire
ISO 9000		Quality Management Systems
ISO 8501-1		Shot blasting
	IS –6005	Phosphating of iron and steel
ISO 1460	IS –2629	Hot dip galvanizing
	IS- 2633	Galvanised steel tests
BS 1924		Tests on materials before stabilization
ISO 68, 261, 262, 724, 965/1, 965/3, BS- 3643		Metric screw threads
BS 1387		Screwed and Socketed steel tubes
	IS –2141	Hot dip galvanized stay strand

This list is not be considered exhaustive and reference to a particular standard or recommendation in this specification does not relieve the Contractor of the necessity of providing the goods complying with other relevant standards or recommendations.

03.00 GENERAL

This specification covers the design, manufacture, testing, supply, delivery and performance requirements of insulator fittings / hardware, conductor splices, terminating connectors, binding and stay wire materials as required by the lines.

The dimensions and characteristics given in this specification are intended to described typical distribution overhead line fittings and hardware which will maintain the general look of the existing network and will take advantage of the availability of tools and the familiarity of the employers staff with these kind of arrangements.

However, the bidder is free to propose alternative fittings and hardware provided the bid respects the general requirements of this specification.

Furthermore, it will be the bidder's responsibility to ensure that all the fittings, hardware and accessories are capable of supporting the mechanical and electrical loads imposed on them by climatic conditions, conductor tensions and structure loads under worst design conditions as stated in the specification.

The bidder is referred to the associated NESCO Technical Specifications for additional information.

04.00

INSULATOR FITTINGS AND HARDWARE

Insulator fittings and hardware for use in line terminations or anchor points shall be capable of withstanding a tension force at least equal to the breaking loads of the insulators which are as follows:

04.01 Conductors nominal breaking load

Conductor	**Actual AAAC cross sectional area (mm^2)**	**Nominal Breaking Load(KN) of Conductor**	**Nominal Breaking Load (KN)of Insulator**
Rabbit Equivalent	55 AAAC	16.03	70 KN
Racoon Equivalent	80 AAAC	23.41	90 KN
Dog Equivalent	100 AAAC	29.26	90 KN
Panther Equivalent	232 AAAC	68.05	120 KN

04.02 **Disc Insulator Fittings**

The insulators shall be cap and pin type with ball and socket couplings. The hardware for insulator strings, whether suspension or strain insulators, together with ball and socket fittings shall be of standard design. This hardwares shall be interchangeable and suitable for use with disc insulators of any make conforming to relevant Indian and International Standards.

Fully dimensioned drawing of the complete insulator string hardware and their components parts should show clearly the following arrangements.

1. Attachment of hanger or strain plate
2. Suspension assembly.
3. Dead end assembly
4. Yoke plates.
5. Hardware fittings of ball and socket type for interconnecting units to the yoke plate.
6. Anchor links for connection of tension strings to crossarms with suitable fittings.

6.2.1 (a) Ball and socket designation

The designation should be in accordance with the standard dimensions stated in IS: 2486 (part–II)/ IEC : 120. The dimensions shall be checked by appropriate gauge after galvanizing .

04.03 **Ball Ended Hooks**

Ball ended hooks , together with section straps, shall be used to attach the ball and socket chain of insulators to the angle, section and end pole crossarm.

Ball ended hooks shall be manufactured to comply with ISO/R/630/1967 or IS – 2026:1992 and shall be hot dip galvanized to conform with the section on Surface Treatment in this specification .The dimensions of the ball ended hook shall be compatible with those of the section strap.

04.04 **U Bolt Shackles**

Where the requirements of the line design requires a double set of tension insulators, then a U bolt shackle, together with a ball ended eye link and a socket clevis, may be used to attach a combination of dual yoke plates, double chain of tension insulators and conductor clamp to the cross-arm of the pole.

U bolt shackles shall be made to comply with ISO/R/630/1967 or IS – 2062 :1992 and shall be hot dip galvanized to conform with the section on Surface Treatment.

The dimensions of the U bolt shackle shall be compatible with those of the ball ended eye link and the crossarm, specified in the NESCO specification.

04.05 **Ball Ended Eye Links**

Where the requirements of the line design requires a double set of tension insulators, a ball ended eye link, together with an U bolt shackle and a socket clevis, shall be used to attach a combination of dual yoke plates, double chain of tension insulators and conductor clamp to the cross-arm of the intermediate H pole. In general, ball ended eye links shall be used to attach ball and socket combinations to other associated hardware.

Ball ended eye links shall be made to comply with ISO/R/630/1967 or IS-2062:1992 and shall be hot dip galvanized to conform with the section on Surface Treatment.

The dimensions of the ball ended eye link shall be compatible with those of the insulators and those of the U bolt and socket clevis.

04.06 **Socket Clevises**

Socket clevises may be used at 33 KV and 11 KV termination points to attach the compressed termination to the closest insulator in the chain. They shall also be used where lines require a duplicate chain of tension or suspension insulators. In this case a socket clevis may be required to attach the bottom insulator to the bottom dual yoke plate and the ball ended hook or eye link to the top dual yoke plate.

Socket clevises shall be made to comply with ISO/R/630/1967 or IS –2062:1992 and all ferrous parts shall be hot dip galvanized in conformity with the section on surface treatment. The socket clevises shall be delivered complete with phosphor bronze security clip, mild steel pin and washer and stainless steel split pin.

The dimensions of the socket clevis shall be compatible with the ball end in strain insulator pins and in other hardware and with the dimensions of the dual yoke plate.

Dual Yoke Plates

04.07

Dual yoke plates may be used where 33 KV line require a duplicate chain of tension or suspension insulators. The dual yokes may be required to attach the insulators to the cross-arm on the one hand and to the conductor termination or suspension clamp on the other.

Dual yoke plates shall be made to comply with ISO/R/630/1967 or IS-2062:1992 and all ferrous part shall be hot dip galvanized in conformity with the section on surface treatment.

The dimensions of the dual yoke plate shall be compatible with those of the ball elevis and of the socket clevis, respectively.

04.08 **Ball Clevises**

Ball clevises may be used where lines require a duplicate chain of tension of suspension insulators. The ball clevises may be required to attach the first insulator in the chain to the first dual yoke plate.

Ball clevises shall be made to comply with ISO/R/630/1967 or IS-2062:1992 and all ferrous parts shall be hot dip galvanized in conformity with the section on surface treatment. The ball clevises shall be delivered complete with mild steel pin and washer and stainless steel split pin.

The dimensions of the ball clevis shall be compatible with those of the dual yoke plate.

04.09 **Socket Tongues**

Socket tongues may be sued where lines require a duplicate chain of suspension insulators. The socket tongue may be required to attach the suspension clamp to the lower dual yoke plate by means of a ball ended eye link. Alternatively, the suspension clamp may be attached directly to the dual yoke plate.

Socket tongues shall be made to comply with ISO/R/630/1967 or IS-2062:1992 and all ferrous parts shall be hot dip galvanized in conformity with the section on surface treatment. The socket tongues shall be delivered complete with phosphor bronze security clip.

The dimensions of the socket tongue shall be compatible with those of the suspension clamp.

04.10 **Pin Insulator Fittings**

05.00 Insulator Pin

Pin insulator pins shall be made from grade 43A steel complying with ISO/R/630/1967 or IS – 2062:1992 and shall be hot dip galvanized to conform with the section on Surface Treatment. The pins shall also comply with the requirements of IS – 2486 (parts 1 & 2)

The collar which is required in straight pins shall not be welded to the stalk. The complete pin shall be forged out of a single piece of material. The lower surface of the collar must be perpendicular to the axis of the stalk.

Each straight pin shall be fitted with one hexagonal ISO metric nut and washer comply with the section reference Bolts, Nuts and Washers in the NESCO specification.

The threads shall cover the whole of the stalk to ensure that the same pin insulator can be used both on channel and angle cross-arms. They shall be ISO metric complying with ISO 68, 261, 262,724, 965/1, 965/3 coarse threaded series, and shall be formed before galvanizing to such a depth that , in the finished state, the nut can be easily screwed by hand over the whole threaded length of the pin without excessive play. The bid shall state by what process the threads are formed.

05.01 **11 KV Pin insulator**

The 11 KV pin insulator assembly complete is for use with the requisite cross-arm and structure in an intermediate or light angle pole position. The galvanized steel pin when used with the 11 KV pin insulator described in the NESCO specification of 33 KV, 11 KV Insulators, the combination shall meet the following requirements:

- Conductor clearance to cross-arm shall be a minimum of 220 mm;
- The minimum creepage distance shall be not less than 320 mm;
- The insulator pin shall fit the steel channel or angle cross-arms outlined in the specification.
- When fitted to the steel channel or angle cross-arms shall have a mechanical failing load (MFL) of at least , 10 KN.
- The deflection of the top of the pin at the specified failing load shall be less than 1.5 mm.

However, the strength of the proposed insulator assembly shall be capable of supporting the loads generated as per the Bidder’s line design, by wind acting on the conductor and insulators, by conductor tensions for maximum wind span and worst design conditions and for all insulator duties and permitted line deviations. Design calculations shall determine the strength of the insulator assembly offered.

06.00 TERMINATIONS AND CONNECTORS

All splice or termination connectors shall be capable of being used with AAAC conductors complying with the NESCO Technical Specification for all Alluminium Alloy Conductors, the sizes stipulated in this specification.

The barrel of each fitting shall be packed with an abrasive, neutral, high melting point, soft grease and shall be delivered with the ends sealed. The quantity of grease shall be approximately half the volume of the bore.

The bore shall be tapered at each end for a distance of 5 mm. Tension splices shall be chamfered off leaving a minimum wall thickness at the ends of 2 mm.

All straight through tension and non tension connectors shall be provided with a conductor stop at the center of the tube.

In the lug terminals, the palm faces shall be flat and the barrel length shall correspond to half the appropriate non tension connector.

If lugs have to be used with PVC covered conductors, an additional barrel length of 20 mm shall be provided and the lugs counter bored to accommodate the PVC covering.

The palm faces of the lug connections shall be protected with an oil impregnated strippable plastic or other suitable coating.

The maximum tolerance in connector tubes shall be + 0.15 mm in internal and external diameters and +0.35 mm in concentricity.

The connectors offered shall be suitable for application by compression.

All terminations and splices shall be capable of being made with hand operated compression tool. The dies shall be removable from and interchangeable with the respective tools. For all AAAC conductors up to a cross section of 100 MM^2 die-less compression tools can be used.

A one piece tension connector shall be used and it shall be possible to compress the alluminium conductor without a requirement for destranding.

All connectors shall perform without distress under normal, cyclic loading and fault conditions and shall not limit the rating of the conductor on which they are used.

Conductor connectors shall be able to accommodate typical variations in dimensions of conductors supplied by different manufacturers and shall be of a material which will not react chemically with the conductors to which they are attached.

Tension connectors for use in line terminations of anchor points shall be capable of withstanding a tension force of at least 90% of the breaking loads of the conductors as given in the section referenced Conductors nominal breaking loads in this specification.

06.01 Tension or Dead End Terminations

These terminations shall be manufactured from aluminium and be of the compression type, factory filled with a special grease compound to give optimum electrical and mechanical performance. They shall be used to terminate the main conductor under full tension at heavy angle, section and end pole position.

Conductor	**All Aluminium Alloy Conductor Cross Section (mm^2**	**Overall Diameter (mm)**
Rabbit Equivalent	55 AAAC	9.45
Racoon Equivalent	80 AAAC	11.43
Dog Equivalent	100 AAAC	12.78
Panther Equivalent	232 AAAC	19.70

The dead end assembly shall be compression type with jumper connection terminal at one end. The jumper terminal shall be set such that the jumper will leave the clamp at an angle of 60 degrees to the axis of the main conductor. The area of bearing surface on all the connections shall be sufficient to ensure positive electrical and mechanical contact and avoid local heating due to I^2R losses. The resistance to the clamp when compressed on conductor shall not be more than 75% of the resistance of equivalent length of conductor.

Die compression areas shall be clearly marked on each dead-end assembly designed for continuous die compressions and shall bear the words 'COMPRESS FIRST' suitably inscribed near the point on each assembly where the compression begins. If the dead end assembly is designed for intermittent die compressions it shall bear identification marks 'COMPRESSION ZONE' AND 'NON-COMPRESSION ZONE' distinctly with arrow marks showing the direction of compressions and knurling marks showing the end of the zones. The letters, number and other markings on the finished clamp shall be distinct and legible.

The assembly shall not permit slipping of damage to or failure of the complete conductor or any part thereof at a load less than 90% of the ultimate tensile strength of the respective conductors.

06.02 **Non Tension Terminations**

These fittings shall consist of palm type lug terminals and shall be used to terminate line jumpers and other non tension conductors on to equipment terminals, such as pole mounted transformers. Lugs shall be of two types: aluminium and bimetal. In the bimetal lugs the bimetal junction within the palm shall be of such design as to afford adequate protection against electrolytic corrosion.

All bolts, nuts and washers used to connect aluminium lugs shall be made of galvanized steel. Lugs with an aluminium palm shall be supplied with conical washers. The conical washer shall conform to DIN 6796 or equivalent.

The lugs shall be suitable for conductors having overall diameters as shown in the above table.

Lugs shall be suitable for fitting to 10 mm , 13 mm and 17 mm studs and the lug palm shall be of adequate dimension to accommodate the current rating of the conductor.

06.03 **Tension Connectors**

Tension connectors shall be used for making conductor splices under full tension and shall consist of an aluminium sleeve, factory filled with a special grease compound to give optimum electrical and mechanical performance.

These connectors shall be capable of being used to make splices in midspan and shall therefore be capable of supporting tension loads at least equal to the maximum conductor breaking load, as listed in table reference Conductor nominal breaking load in this specification.

The fullest possible use shall be made of maximum conductor lengths and therefore tension joints shall be minimized but where they are not avoidable they shall preferably of the compression type and in accordance with the requirement of IEC-1284, IS –2121 and IS –2486.

06.04 **Non Tension Connectors**

Non tension connectors comprise tap off connectors and straight through non tension connectors.

The tap off connectors shall be used for branching off a main line and shall consist of a "C" shaped barrel which can be compressed on to the main conductor and in electrical contact with another closed barrel, holding the branch conductor forming a tee configuration. Both the closed and "C" shaped barrels shall be factory filled with a special grease compound to give optimum electrical and mechanical performance.

The straight through non tension connectors shall be used to splice jumpers and other non tension conductors and shall consist of an aluminium sleeve, factory filled with a special grease compound to give optimum electrical and mechanical performance. They shall preferably be of the compression type.

The range of connectors shall be of the AAAC listed in the section on Tension Terminations in this specification.

06.05 **Compression Tooling**

The range of connectors offered for conductors up to and including 232 mm^2 AAAC shall be capable of being compressed by a hand operated tool. The employer is already committed to the use of die-less hand operated mechanical compression tools on overhead line work. Use of this method of jointing will be preferred. However where the bidder offers other types of compression jointing and connecting systems, details of the tools, dies and methods shall be submitted with the bid.

Full details of jointing methods and quality control system shall be included in the Quality Assurance Plan.

06.06 **Materials**

The alluminium portion in all connectors shall be 99.5% pure alluminium, conforming with IS – 5082: 1981: Wrought alluminium and alloy bars.

Compounds and greases for improving contact between connectors and conductor strands shall used. They shall however, be chemically neutral to the connector and conductor materials and must be present in position in the delivered connectors.

The quantity of grease shall be approximately half the volume of the bore. As a rule of thumb to check that sufficient quantity is present, grease should be squeezed out of the conductor barrel entry point as the conductor is fully inserted. The grease in the connectors shall be protected from accumulating dust and other debris by means of plastic plugs, or equivalent.

06.07 **Markings**

The manufacturer's name or trademark shall be clearly stamped on every fitting.

In addition, the following information shall be provided on connectors:

- Metric conductor size for which the connector is suitable;
- The die number suitable for compressing the connector;
- The points on the connector surface to be compressed;
- The sequence of die action i.e the order in which different parts of the connector shall be compressed;
- The insertion length for the conductor with the location of any blocked off portions in the connector center.

All markings shall be legible and indelible.

06.08 **Tests**

06.09 **Type tests**

The mechanical type test shall comply with BS 3288 part 1, whereas the electrical type test shall conform with IEC 1284/IS – 2486

06.10 **Tensile type tests on tension connectors.**

For these tests a connector shall be compressed onto the Employer's conductor in accordance with the manufacturer's installation instructions. The assembly shall be mounted in a tensile test rig and anchored in a manner approximating, as nearly as possible, the arrangement to be used in service, precautions being taken to avoid conductor bird caging. The length of conductor between the connector and any other joint or clamp in the test assembly shall be not less than 100 times the overall diameter of the conductor.

A tensile load of 50% of the breaking load of the conductor shall be applied and the conductor marked in such a way that movement relative to the connector can easily be detected. The tensile load shall be steadily increased to 95% of the break load of the conductor and then reduced to 90% and maintained at that level for one minute. During this period there shall be no movement of the conductor relative to the connector and no connector failure.

The load shall then be steadily increased until failure occurs. The load reading at which the failure occurs shall be recorded as a percentage of the nominal breaking load of the conductor.

This test shall be repeated successfully on three identical connectors.

06.11 **Tensile type tests on non tension connectors.**

This test shall be similar to the tensile test on tension connectors, except that the one minute test will take place at 10% of the nominal breaking load of the conductor.

For tap off connectors the tension shall be applied between the main and the tap off conductor and failure shall be recorded as a percentage of the nominal breaking load of the tap off rather than the main conductor.

06.12 **Electrical type tests**

These tests shall be in accordance with the full electrical requirements of the latest edition of IEC 1284/IS-2486

06.13 **Acceptance Tests**

Sample tests are intended to verify the quality of the materials and workmanship. They are made on connectors taken at random from batches about to be delivered. If required the sample test shall be carried out on a sample of 0.4 percent of the quantity in the consignment subject to a minimum of three units.

In the event of a sample not meeting the test requirements, twice the original number of samples shall be tested. If all these samples meet the test requirements the consignment will be acceptable, but if any fail to do so, the consignment in total will be deemed to be

unacceptable and shall be rejected.

Sample inspection however will be carried out, during which the following requirements shall be checked out on the chosen connector samples:

- That the connector dimensions correspond with those shown on the manufacture's drawing. The maximum tolerance allowable shall be +2%;

That the ends of the connectors are suitably chamfered or coned to facilitate insertion of the conductors without damage;

- That the connectors are smooth, seamless and free from any defects likely to cause them to be unsatisfactory in service;
- That all identification marks are clearly legible;
- That galvanized parts are in accordance with the section on Surface Treatment;
- That adequate quantities of grease are present in the connectors.

The number of samples to be checked shall be determined by the following algorithm :

$s = 4$ for $100<n<500$

$s = 4+1.5n/1000$ for $500<n<20,000$

$= 19 + 0.75n/1,000$ for $n>20,000$

Where s = number of samples selected; and n= number of connectors in the consignment

Tests shall be carried out on all units. Mechanical routine testing shall comply with BS 3288 part 1, whereas electrical routine testing shall conform with IEC 1284/IS-2486.

The bid shall be accompanied by test certificates giving successful results of the type tests carried out on connectors identical in all details and representative of the range offered.

The test certificate must contain the following details :

- Type of connector;
- Manufacturer;
- Textual and photographic description of test arrangements;
- Description of conductors used;
- Details of tools and dies used;
- Details of grease or compound used;
- Test results;
- Level and duration of load current; and
- Level and duration of short circuit current.

07.00 BOLTS AND NUTS

Bolts, nuts and washers shall conform to the section on Bolts and Nuts in the specification.

08.00 LINE BINDING ACCESSORIES

Line binding accessories consisting of soft aluminum binding wire, aluminum binding stirrups, semi conducting tape and anticorrosive tape are required for the line.

The aluminum binding wire & stirrups are for use to bind bare aluminum conductor to the insulators in the construction of new lines and Reconductoring of line.

Semi conducting tape shall be used under the bind with 11 KV PVC covered conductors.

Anticorrosive tape shall be used as a barrier against ingress of moisture wherever copper and aluminum are spliced together, such as at the interface between aluminium conductors and the copper or brass terminals of equipment connected to the line. It may also be used to seal the ends of PVC covered conductor.

08.01 **Aluminium Binding Wire**

08.02 **Physical Characteristics**

The binding wire shall be EC grade hard-drawn aluminium rods of 3.53 mm diameter complying with IEC 1089/IS-398. The material comprising the wire shall have the following chemical composition :

Aluminium 99.5% minimum

- Copper, silicon and iron 0.5% maximum

The surface of the wire shall be smooth and free from all irregularities and imperfections. Its cross section shall closely approximate that of a true circle.

Characteristics of Aluminium Binding Wire

08.03

Diameter of wire (mm)			Cross sectional area of nominal dia. wires (mm)	Weight of wire kg/km	Breaking Load (KN)
Minimum	Nominal	Maximum			
3.51	3.53	3.55	9.787	26.45	1.57

08.04 **Inspection and Tests**

The following routine checks and tests shall be carried out on 10% of the coil of aluminium binding wire. If any one sample fails to pass any one of the tests nominated for that wire, then samples shall be taken from every coil in the consignment and any coil from which a sample proves defective shall be rejected. On no account shall any rejected material be presented for test again.

- Physical properties

The surface of the finished wire shall be checked to ensure that it is smooth, free from all irregularities, imperfections and inclusions and that its cross section approximates closely that of a true circle.

The wire shall be checked to ensure that its diameter and weight are within the values given in the table above : Characteristics of aluminium binding wire.

- Ultimate tensile strength

When tested on a standard tensile testing machine, the value obtained for the ultimate tensile stress shall not be less than 1.57 KN.

- Wrapping test

The wire shall withstand one cycle of a wrapping test as follows :
The wire shall be closely wrapped round a wire of its own diameter to form a close helix of eight turns. Six turns shall then be unwrapped and again closely rewrapped in the same direction as the first wrapping. The wire shall not break or crack when subjected to this test.

Delivery

08.05

The aluminium binding wire shall be delivered in 30 m coils, with a permitted tolerance of +5%. Randdom or non standard lengths shall not be permitted.
Each coil shall be adequately guarded against damage due to transportation and handling and shall have an outer layer of tightly wound polythene tape or be contained in a suitable, transparent plastic bag.
The internal diameter of the wound coil shall not be such as to result in a permanent set in the conductor.

08.06 **Aluminium Binding Stirrups**

Physical Characteristics

08.07

The following types shall be required :

- Intermediate pole binding stirrups for 33 KV and 11 KV; and
- Light angle pole binding stirrups for 33 KV and 11 KV.

It shall be the responsibility of the bidder to ensure that the stirrups match the insulators.
Each aluminium stirrup shall be made of a 7 mm diameter aluminium rod complying with ISO 209-1/2.
The tensile strength of the stirrups shall be between 135N/mm^2 and 170 N/mm^2

08.08 **Fabrication**

Stirrups shall be cold formed on a suitable mandrel such that the bends are smooth and the surfaces free from indentations.
The stirrups for intermediate positions shall be formed through the following steps:

- The U shape shall be formed first around a mandrel of the appropriate diameter;
- The 90^0 bend in one plane and 45^0 bend in the other plane shall then be formed simultaneously with the ends of the rod free. This is to ensure that torsion stresses are not induced in the material during this forming operation; and
- The legs shall then be formed through 45^0 and finally the ends of the stirrup shall be bent through 90^0.

08.09 **Inspections and Tests**

The binding stirrups shall be inspected for surface indentations and irregularities. All bends shall be smooth and even.

08.10 **Semiconducting Tape**

08.11 **Physical and Other Characteristics**

The semiconduting tape shall be used to relieve 11 KV PVC covered conductor from electrical stress at insulator positions.

This tape shall be a soft, semiconducting, ethylene propylene rubber based, high voltage tape, used for binding 11 KV PVC covered conductor.

The semiconducting tape shall be non vulcanizing stable at temperatures upto 130^0 C, highly resistant to cracking, moisture and ultra violet radiation, unaffected by vibration and compatible with hydrocarbon and chlorinated solvents.

In addition, it shall be a semiconducting, self amalgamating tape, highly conformable to irregular shapes and compatible with solid dielectric cable insulation.

Specifically, the type offered shall be suitable for use with the 11 KV PVC covered conductors : AAA conductors and it shall comply with IEC 502 or equivalent.

The tape shall be indelibly and legibly marked along its length with a suitable legend, such as, "caution: semiconducting". The tape shall be suitable for outdoor locations exposed to severe climatic conditions including ultraviolet rays, rain and wind. The tape shall have the characteristics shown in the following table.

Characteristics	**Characteristic Value**
Physical	
Thickness	0.75 mm
Tensile strength	1.00 kg/cm^2
Elongation	800 %

Normal conditions temperature	90^0 C
Emergency conditions temperature	130^0 C
Electrical	
Ac resistivity	750 ohm-cm
Dc resistivity	750 ohm –cm
Maximum capacity	5 mA

In addition, all these tapes shall be ozone resistant (even when stretched 500%), they shall be resistant to ultraviolet radiation and they shall be compatible with ketones and hydrocarbon and chlorinated solvents.

09.00 Inspection and Tests

The semiconducting tapes shall be tested in accordance with ASTM D 1000: Test methods for pressure sensitive, adhesive coated tapes used for electrical and electronic applications, or equivalent.

09.01 **Anticorrosive Tape**

This tape shall be used to protect bimetal connections from the ingress of moisture and to seal the ends of PVC covered conductor. Therefore, the anticorrosive tape offered shall retain its composition and plasticity over a wise temperature range.

The anticorrosive tape shall be non cracking and non hardening and shall not be affected by vibration. The tape shall be highly impermeable to water and highly resistant to mineral acids, alkalis and salts.
In general, the anticorrosive tape offered shall comply with IEC 454 or equivalent.

09.02 **Markings**

The tape cores shall be marked with :i) the manufacturer's name or trademark ; and ii) the product reference.

10.00 STAY ASSEMBLIES

The stay assemblies are required for 33 KV, 11KV & L.V Line.
It will be the bidder's responsibility to ensure that the stay assembly and each of the components offered in this bid are capable of supporting the loads generated, as per the bidder's line design, by wind acting on the pole and by conductor tension for maximum wind span and worst design conditions, for all pole duties and for all permitted line deviations and stay angles.
The designs should be such that the number of stays used on any structure shall be kept to a minimum and in any event shall not be more than three for all structures except double end structures and section structures.

10.01 **Stay wire**

10.02 **Design**

The stay wire must be so designed and manufactured that it will withstand satisfactorily the thermal, mechanical and environmental stress to which it will be subjected during installation and throughout its lifetime in service on the employer's electrical networks. They stay wire covered by this specification is required for use on stays from concrete and steel poles on the Employer's overhead distribution networks. It may be used in localities close to the sea and where service corrosion conditions apply. Stay wires shall comply with the requirements of IS:2141 for Grade 4 steel wire. The minimum failure load shall be no less than the values shown in the following tables.

10.03 **Minimum Breaking Load**

Type of wire	Number of wires and construction	Nominal Wire diameter (mm)	Minimum breaking load of single wire before stranding KN	Minimum breaking load of the stranded wire KN
Grade 4	7 (6/1)	4.00	8.79	58.45

10.04 **Manufacture**

The stay wire in this specification shall be drawn from steel which shall conform to BS 183 or IS-2141:1992. Galvanising shall comply with the requirements of IS 4826 for Heavy Coating or IEC 888 Class 2. The coating shall not be less than 490 g/m^2.

The wire shall be stranded galvanized steel wire, comprising seven wires, each having a nominal diameter of 4.0 mm.

Each wire shall be circular in section and shall contain no weld, joint or splice whatever. It shall be free from any scale, inequalities, spills, splits or any other defects.

Each wire shall be completely and smoothly galvanized before stranding . The stranding shall be carried out in such a way that if an evenly distributed pull is applied at the ends of the completed strand, each wire shall take an equal share of the pull.

The lay of the wires shall be right handed. The length of lay, which shall be defined as the axial length of one complete turn of the helix, shall be 12 to 18 times the strand diameter.

10.05 **Stay wire Coils**

Normally, the stay wire shall be smoothly and uniformly coiled in standard 100 m coils with a tolerance of + 5%.

The coils shall have a minimum diameter of 520 mm. To prevent damage during transportation, handling or storage, the coils shall be lagged with paper and hessian or with hessian laminated paper, or in other alternative manner suggested by the contractor at the time of bidding and demonstrably safe.

10.06 **Labeling**

Each coil shall be clearly labeled with a metallic tag securely attached to the inner part of the coil and marked with the following information :

Manufacture's name;

Size of wire;

Length of wire in meters ; and

Weight of wire in kilograms.

11.00 Pole Brackets

The pole bracket shall be made of mild steel to grade 43A conforming to ISO/R/ 630/1967 or IS –2062:1992 and galvanized in accordance with the section on Surface Treatment in this specification. Pole brackets shall be suitable for use on steel or concrete poles. The minimum strength of the bracket shall be equal to the design breaking load of the stay wire.

All bolts, nuts an washers shall be supplied with the stay assemblies, and shall conform to the requirements. Bolts shall have a metric thread and a 20 mm diameter.

11.01 **Stay thimbles**

Stay thimbles shall be made of mild steel, crescent shaped, steel bar conforming to ISO/R/630/1967 or IS-2062:1992 and galvanized in accordance with specification. The minimum strength of the thimble shall be equal to the design breaking load of the stay wire.

Thimbles shall have no sharp points and will normally supplied closed, in position with the fittings to which they are associated.

11.02 **Stay rods**

Stay rods shall be made of a steel bar of grade 43A, complying with ISO/R/630/1967 or IS –2062:1992 and galvanized in accordance with the specification.

The stay rod shall be adjustable by means of a turnbuckle complying with BS 4429 and shall be supplied complete with one lock nut and two thimbles. The tube portion of the turnbuckle shall be manufactured from heavy gauge steel tube, complying with BS 1387. The threads shall be cut to BS 3643, coarse pitch.

Alternatively a fixed length stay rod with eye end may be supplied, in which case a

separate turn buckle shall be supplied. The turn buckle shall be of the type shown in Sketch in this specification.

The stay rod shall come with a steel plate for bearing on the stay block. The steel plate shall be made to ISO/R/630/1967 or IS – 2062: 1992 and galvanized in accordance with the specification.

The minimum strength of the say rod shall be equal to the design braking load of the stay wire. The stay rod shall be at least 1800 mm long.

12.00 Bolts and Nuts

All bolts, nuts and washers shall conform to the section on Bolts and Nuts in the specification.

12.01 **Tests**

12.02 **Stay wire**

Sampling of stay wire shall be in accordance with IS – 2141

The wires shall be subjected to the following tests before manufacture and in accordance with BS 443, BS 4545 and IS –2141 : 1992

Ductility test

Tolerance on wire diameter

The completed strand shall be tested as follows and in accordance with BS 443, BS 4545 and IS – 2141: 1992, IS 4826

Tensile and elongation test

Chemical analysis

Galvanising test

The results of the tests shall conform to the values given in the following table

Measurements and Tests for Stay Wire

12.03

Description	**Required Value (Grade 4)**
Nominal size of stay wire:	7/4.00 mm
Nominal Diameter of Individual Wires :	4.00 mm
Minimum Diameter of Individual Wires :	3.90 mm
Maximum Diameter of Individual Wires:	4.10 mm
Minimum ultimate tensile strength of individual wires	700 N
Minimum percent elongation at rupture before stranding	5%
Minimum percent elongation at rupture after stranding	4.25%
Wrapping test for ductility : Turns on and off its own diameter	8
Lay ratio of finished strand	19 to 21
Minimum weight of zinc coating before stranding	490 g / mm^2
Minimum weight of zinc coating after stranding	475 g/ mm^2
Chemical test : Sulphur and phosphorus content	Less than or equal to 0.060 % each

TECHNICAL SPECIFICATION FOR ALL ALUMINIUM ALLOY CONDUCTOR (AAAC)

01.00 SCOPE

This specification covers design, Engineering, Manufacture, Testing, Inspection before dispatch, forwarding, packing, transportation to sites, Insurance (both during transit & storage), storage, erection, supervision testing & commissioning of all sizes of All Aluminum Alloy Conductors of the aluminum – magnesium- silicon type for use in the distribution overhead power lines of NESCO of Orissa.

The equipment offered shall have been successfully type testes and the design shall have been satisfactory operation for a period not less than two years on the date of bid opening. Compliance shall be demonstrated by submitting with the bid, (i) authenticated copies of the type test reports and (ii) performance certificates from the users.

The scope of supply includes the provision of type test, Rates of type tests shall be given in the appropriate price schedule of the bidding document and will be considered for evaluation.

The Aluminum Alloy Conductor shall conform in all respects to highest standards of engineering, design, workmanship, this specification and the latest revisions of relevant standards at the time of offer.

02.00 STANDARDS

Except where modified by the specification, the Aluminum Alloy Conductor shall be designed, manufactured and tested in accordance with latest editions of the following standards.

IEC/ISO/ Other International Standard	**IS**	**Subject**
IEC :1089		Round wire concentric lay overhead electrical standard conductors
	IS 398	Alluminium Alloy Stranded Conductors
	IS 9997	Alluminium Alloy redraw rods for electrical purposes
IEC 502 : 1994		Extruded solid dielectric insulated power cables for rated voltages 1.0 KV up to 30 KV
IEC 104		Alluminium Magnesium Silicon alloy wire for overhead line conductors
	IS 1778	Reels and drums of bare conductor.
BS : 6485-1971		PVC covered conductors for overhead power lines.

This list is not to be considered exhaustive and reference to a particular standard or recommendation in this specification does not relieve the contractor of the necessity of providing the goods complying with other relevant standards or recommendations.

03.00 GENERAL

The wires shall be of heat treated alluminium, magnesium silicon alloy containing approximately 0.5% magnesium and approximately 0.5% silicon and having the mechanical and electrical properties specified in the table and be smooth and free from all imperfections, such as, spills, splits and scratches.

Neutral grease shall be applied between the layers of wires. The drop point temperature of the grease shall not be less than 120^0 C.

03.01 **Mechanical and Electrical Characteristics of Aluminum Alloy Wires used in the Construction of Stranded Aluminum Alloy Conductors**

Nominal Diameter	Minimum Diameter	Max. Diameter	Cross Sectional Area	Mass	Minimum Breaking Load		Maximum Resistance at 20^0 C
					Before stranding	After stranding	
1	2	3	4	5	6	7	8
Mm	mm	mm	mm^2	Kg/km	KN	KN	ohms/km
2.00	1.98	2.02	3.142	8.482	0.97	0.92	10.653
2.50	2.47	2.53	4.909	13.25	1.52	1.44	6.845
2.89	2.86	2.92	6.560	17.71	2.03	1.93	5.106
3.15 *****	3.12	3.18	7.793	21.04	2.41	2.29	4.290
3.31	3.28	3.34	8.605	23.23	2.66	2.53	3.882
3.40	3.37	3.43	9.079	24.51	2.80	2.66	3.677
3.45	3.42	3.48	9.348	25.24	2.89	2.75	3.571
3.55	3.51	3.59	9.898	26.72	3.06	2.91	3.390
3.66	3.62	3.70	10.52	26.41	3.25	3.09	3.187
3.71	3.67	3.75	10.81	21.19	3.34	3.17	3.101
3.81*****	3.77	3.85	11.40	30.78	3.52	3.34	2.938
3.94 *****	3.90	3.98	12.19	32.92	3.77	3.58	2.746
4.00	3.96	4.04	12.57	33.93	3.88	3.69	2.663
4.26 *****	4.22	4.30	14.25	38.48	4.40	4.18	2.345

Maximum resistance values given in column 8 have been calculated from the maximum values of the resistivity as specified and the cross sectional area based on the minimum diameter.

The minimum breaking load is calculated on nominal diamter at ultimate tensile strength of 0.309 KN / mm^2 for wire before stranding and 95% of the ultimate tensile strength after stranding.

04.00 PHYSICAL CONSTANTS FOR ALUMINIUM ALLOY WIRES

04.01 **Resistivity :**

For the purpose of this specification, the standard value of resistivity of alluminium alloy wire which shall be used for calculation is to be taken as 0.0325 ohm mm^2 /m at 20^0 C. the maximum value of resistivity of any single wire shall not , however, exceed 0.0328 ohm. mm^2/m at 20^0 C

04.02 **Density :**

At a temperature of 20^0 C, the density of aluminum alloy wire is to be taken as 2700 kg/m^3.

04.03 **Temperature Coefficient of Linear Expansion :**

The temperature coefficient of linear expansion of aluminum alloy wire is to be taken as 23 x 10^{-6} / ^{0} C

04.04 **Constant – Mass Temperature Coefficient**

At a Temperature of 20^0 C, the constant – mass temperature coefficient of resistance of aluminum alloy wires, measured between two potential points rigidly fixed to the wire, is taken as 0.00360/^{0} C

05.00 STANDARD SIZES

05.01 **Nominal Sizes of Wires**

The aluminum alloy wires for standard constructions covered by this specification shall have the diameters as specified in the table and a tolerance of ±1% shall be permitted on the nominal diameter.

05.02 **Standard Conductors**

The sizes, resistance and masses (excluding the mass of grease) of stranded aluminum alloy conductors shall be as given in table. The NESCO preferred sizes are highlighted in the table.

Mechanical and Electrical Characteristics of Aluminum Alloy Stranded Conductors

05.03

Sl. No.	Actual Area	Stranding and Wire Dia	Approx. Overall Dia	Approx. Mass	Calculated Maximum Resistance at 20^0 C	Approx Calculated Breaking Load
1	2	3	4	5	6	7
	Mm^2	mm	mm	kg/km	ohms/km	KN
1	22	7/2.00	6.00	60.16	1.5410	6.45
2	34	7/2.50	7.50	94.00	0.9900	10.11
3	55*****	7/3.15	9.45	149.20	0.6210	16.03
4	80*****	7/3.81	11.43	218.26	0.4250	23.41
5	100*****	7/4.26	12.78	272.86	0.3390	29.26
6	125	19/2.89	14.45	342.51	0.2735	36.64
7	148	19/3.15	15.75	406.91	0.2290	43.50
8	173	19/3.40	17.00	474.02	0.1969	50.54
9	200	19/3.66	18.30	549.40	0.1710	58.66
10	232*****	19/3.94	19.70	636.67	0.1471	68.05
11	288	37/3.15	22.05	794.05	0.1182	84.71
12	346	37/3.45	24.15	952.56	0.0984	101.58
13	400	37/3.71	25.97	1101.63	0.0829	117.40
14	465	37/4.00	28.00	1280.50	0.0734	136.38
15	525	61/3.31	29.79	1448.39	0.0651	146.03
16	570	61/3.45	31.05	1573.71	0.0598	158.66
17	604	61/3.55	31.95	1666.0	0.0568	167.99
18	642	61/3.66	32.94	1771.36	0.0534	178.43
19	695	61/3.81	34.29	1919.13	0.0492	193.25
20	767	61/4.00	36.00	2115.54	0.0446	213.01

05.04 **Increase in Length due to Stranding**

When straightened out, each wire in any particular layer of a stranded conductor, except the central wire, is longer than the stranded conductor by an amount depending on the lay ratio of that layer.

05.05 **Resistance and Mass of Conductor**

The resistance of any length of stranded conductor is the resistance of the same length of any one wire multiplied by a constant as set out in the table below.

The mass of each wire in any particular layer of the stranded conductor, except the central wire, will be greater than that of an equal length of straight wire by an amount depending on the lay ratio of that layer. The total mass of any length of an aluminium stranded conductor is, therefore, obtained by multiplying the mass of an equal length of straight wire by an appropriate constant as mentioned below. In calculating the stranding constants as mentioned in the table below, the mean lay ratio, that is the arithmetic mean of the relevant minimum and maximum values in table for lay ratio has been assumed for each layer.

05.06 **Calculated Breaking Load of Conductor**

- For a conductor containing not more than 37 wires, 95% of the sum of strength of the individual wires calculated from the values of the minimum breaking load given in this specification.
- For a conductor containing more than 37 wires, 90% of the sum of the strengths of the individual wire calculated from the values of the minimum breaking load given in this specification.

05.07 **Calculated Area and Maximum Resistance of Conductor**

The actual area of a stranded conductor has been taken as the sum of the cross-sectional areas of the individual wires of nominal diameter.

Maximum resistance values of stranded conductor have been calculated on the basis of maximum resistivity and the cross-sectional area based on the minimum diameter of wires.

05.08 **Stranding Constants**

Number of Wires in Conductor	**Stranding Constants**	
	Mass	Electrical Resistance
(1)	(2)	(3)
7	7.091	0.1447
19	19.34	0.05357
37	37.74	0.02757
61	62.35	0.01676

06.00 JOINTS IN WIRES

06.01 **Conductor containing seven wires**

There shall be no joint in any wire of a stranded conductor containing seven wires, except those made in the base rod or wire before final drawing.

06.02 **Conductors containing more than seven wires**

In stranded conductors containing more than seven wires, joints in individual wires are permitted in any layer except the outermost layer (in addition to those made in the base rod or wire before final drawing) but no two such joints shall be less than 15 m apart in the complete stranded conductor. Such joints shall be made by cold pressure butt welding. They are not required to fulfill the mechanical requirements for unjointed wires.

07.00 STRANDING

The wire used in the construction of a stranded conductor shall, before and after stranding, satisfy all the relevant requirements of this standard.

The lay ratio of the different layers shall be within the limits given in the table for lay ratio.

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

In aluminum alloy stranded conductors having multiple layers of wires, the lay ratio of any layer shall not be greater than the lay ratio of the layer immediately beneath it.

07.01 Lay Ratios for Aluminum Alloy Stranded Conductors

Number of Wires in Conductor	LAY RATIOS							
	3/6 Wire Layer		12 Wire Layer		18 Wire Layer		24 Wire Layer	
	Min	Max	Min	Max	Min	Max	Min	Max
7	10	14	---	---	---	---	---	---
19	10	16	10	14	---	---	---	---
37	10	17	10	16	10	14	---	---
61	10	17	10	16	10	15	10	14

NOTE: For the purpose of calculation the mean lay ratio shall be taken as the arithmetic mean of the relevant minimum and maximum values given in this table

08.00 LENGTHS AND VARIATIONS IN LENGTHS :

Unless otherwise agreed between the Employer and the Contractor, stranded aluminium alloy conductors shall be supplied in the manufacturer's usual production lengths to be indicated in the bid Schedule. The Employer reserves the right to specify particular lengths of conductor such that certain drum lengths will be shorter than others. There will in both cases be a permitted variation of –0 + 5% in the length of any one conductor length.

09.00 PVC COVERED CONDUCTOR

Where the AAAC is required to be covered with Polyvinyl Chloride (PVC) then the requirements for the covering shall be in accordance with BS 6485: 1971 or other International Standard.

The PVC covering shall comply with the requirements of IEC 502 for Type ST1 or ST2 compound and shall be green in colour. The minimum thickness of the PVC covering at any point shall not be less than 1.6 mm.

All PVC covered conductors shall be subjected to the spark test described in BS 6485: 1971 and there shall be no breakdown of the PVC covering during this test at an r.m.s voltage of 12 KV. The same test may be completed with a DC voltage of 18 KV

In addition each sample shall be subjected to high voltage, insulation resistance and thickness of covering tests as defined in the BS 6485: 1971 standard**.**

The PVC covering of each of the samples subjected to the high voltage test shall withstand a r.m.s voltage of 25 KV for 5 minutes and those samples subjected to the insulation resistance test shall have a resistance, at 20^0 C, not less than the equivalent of 10 M ohm for a 1 Km length.

10.00 TESTS

10.01 **Type Tests**

The following tests shall be carried out once on samples of completed line conductor during each production run of up to 500 kms. of the conductor from each manufacturing facility.

10.02 **Ultimate Tensile Strength Test**

This test is intended to confirm not only the breaking strength of the finished conductor but also that the conductor has been uniformly stranded.
A conductor sample of minimum 5 m length fitted with compression dead end clamps at either end shall be mounted in a suitable tensile test machine. Circles perpendicular to the axis of the conductor shall be marked at two places on its surface. Tension on the conductor sample shall be increased at a steady rate up to 50% of the minimum UTS specified and held for one minute. The circles drawn shall not be distorted due to relative movement of the individual strands. Thereafter the load shall be increased at a steady rate to the specified minimum UTS and held at that load for one minute. The conductor sample shall not fail during this period. The applied load shall then be increased until the failing load is reached and the value recorded.

10.03 **D.C Resistance Test**

On a conductor sample of minimum 5 m length two contact clamps shall be fitted with a pre-determined bolt torque. The resistance between the clamps shall be measured using a Kelvin double bridge by initially placing the clamps at zero separation and subsequently one meter apart. The test shall be repeated at least five times and the average value recorded. The value obtained shall be corrected to the value at 20^0 C, which shall conform to the requirements of this specification.

10.04 **Routine Tests**

10.05 **Selection of Test Samples**

Samples for the tests specified in this specification shall be taken by the manufacturer before stranding, from not less than 10% of the individual lengths of alluminium alloy wire included in any one final heat-treatment batch and which will be included in any one consignment of the stranded conductors to be supplied.

Samples shall then be obtained by cutting 1.2 meters from the outer end of the finished conductor from not more than 10% of the finished reels or drums.

Tests for electrical and mechanical properties of aluminum alloy wire shall ordinarily be made before stranding since wires un laid from conductors may have different physical properties from those of the wire prior to stranding because of the deformation brought about by stranding and by straightening for test.

Spools offered for inspection shall be divided into equal lots, the number of lots being equal to the number of samples to be selected, a fraction of a lot being counted as s complete lot. One sample spool shall be selected at random from each lot.

The following test shall be carried out once on samples of completed line conductor during each production run of up to 500 kms of the conductor from each manufacturing facility.

10.06 **Breaking Load Test**

The breaking load of one specimen, cut from each of the samples taken shall be determined by means of a suitable tensile testing machine. The load shall be applied gradually and the rate of separation of the jaws of the testing machine shall be not less than 25 mm / min and not greater than 100mm /min.

10.07 **Elongation Test**

The elongation of one specimen cut from each of the samples taken shall be determined as follows :

The specimen shall be straightened by hand and an original gauge length of 200 mm shall be marked on the wire. A tensile load shall be applied as described above and the elongation shall be measured after the fractured ends have been fitted together. If the fracture occurs outside the gauge marks, or within 25 mm of either mark, and the required elongation is not obtained, the test shall be disregarded and another test should be made.

When tested before and after stranding, the elongation shall not be less than 4% on a gauge length of 200 mm

10.08 **D.C Resistance Test**

The electrical resistance test of one specimen cut from each of the samples taken shall be measured at ambient temperature. The measured resistance shall be corrected to the value at 20^0 C by means of the formula

$$R_{20} = R_T \left(\frac{1}{1 + \square\ (T-20)} \right)$$

where,

R_{20} = resistance corrected at 20^0 C

R_T = resistance measured T^0C

$\square$ = constant – mass temperature coefficient of resistance, 0.0036, and

T = ambient temperature during measurement.

The resistance corrected at 20^0 C shall not be more than the maximum values specified.

.09 **Chemical Analysis of Aluminum Alloy**

Samples taken from the alloy coils / strands shall be chemically / spectrographically analyzed. The results shall conform to the requirements stated in this specification. The Contractor shall make available material analyses, control document documents and certificates from each batch as and when required by the E.E. (Elect.) Store Division, Balasore.

10.10 **Dimensional and Lay Length Check**

The individual strands of the conductors shall be dimensionally checked and the lay lengths checked to ensure that they conform to the requirements of this specification.

Ten percent drums from each lot shall be rewound in the presence of the E.E. (Elect.) Store Division, Balasore. or his representative to allow visual checking of the conductor for joints, scratches or other surface imperfections and to ensure that the conductor generally conforms to the requirements this specification. The length of conductor would on the drum shall be re-measured by means of an approved counter / meter during the rewinding process.

10.11 **Visual and dimensional Checks on the Conductor Drums.**

The drums shall be visually and dimensionally checked to ensure that they conform to the requirements of this specification and of IS 1778: Specification for reels and drums of bare conductors. For wooden drums, a suitable barrel batten strength test procedure is required. The Bidder shall state in his bid the tests to be carried out on the drums and shall include those tests in the Quality Assurance Programme.

11.00 REJECTION AND RETESTS

11.01 **Type Tests**

Should the conductor fail any of the type tests specified will not be accepted any conductor manufactured from the material, nor conductor made by the manufacturing methods used for the conductor, which failed the test.

The manufacturer shall propose suitable modifications to his materials and techniques in order that he can produce conductor which will satisfactorily pass the type test requirements.

11.02 **Routine Tests**

Should any one of the test pieces first selected fail the requirements of the tests, two further samples from the same batch shall be selected for testings, one of which shall be from the length from which the original test sample was taken unless that length has been withdrawn by the manufacturer.

Should the test pieces from both these additional samples satisfy the requirements of the tests, the batch represented by these samples shall be deemed to comply with the standard. Should the test pieces from either of the two additional samples fail, the batch represented shall be deemed not to comply with the standard.

If checks on individual strand diameters, conductor lay lengths and conductor surface condition indicate non-compliance with the requirements of the specification, the particular drum will be rejected. Inspection will then be carried out on two further drums within the same batch. If the conductor on either of the drums is non-complaint, the complete batch will be rejected.

11.03 **Rejection of Conductor**

The rejection of conductor due to its failure to pass either type or routine tests shall not permit the Contractor to apply for any extension to the time period within which he has contracted to complete the project.

11.04 **TENSILE LOAD TEST**

The tensile load test for the mains to mains tap off connector shall be made with the maximum and minimum sizes of tap conductor, that is a test with the $50mm^2$ section conductor and a test with the $95mm^2$ section conductor (two separate tests).

The tensile load test for the mains to service cable tap off connector shall be made with the maximum and minimum sizes of mains tap conductor and maximum and minimum sizes of service cable (four separate tests).

12.00 **SPARE PARTS AND SPECIAL TOOLS**

The Bidder shall provide a list of recommended spare parts, special erection and installation tools/ equipment together with their individual prices. This list shall identify all essential spares items for any recommended maintenance for a period of five years after commissioning.

The Project Manager may order all or any of the spare parts/erection/ installation tools listed at the time of contract award and the parts so ordered shall be supplied as part of

the definite works. The Project Manager may order additional spares at any time during the contract period at the rates stated in the Contract Document.

A spare parts catalogue with price list shall be provided and this shall form part of the drawings and literature to be supplied.

The Bidder shall give an assurance that spare parts and consumable items will continue to be available through the life of the equipment, which shall be 25 years minimum. However, the Contractor shall give a minimum of 12 months notice in the event that the Contractor or any sub-contractors plan to discontinue manufacture of any component used in this equipment.

Any spare apparatus, parts or tools shall be subject to the same specification, tests and conditions as similar material supplied under the Contract. They shall be strictly interchangeable and suitable for use in place of the corresponding parts supplied with the plant and must be suitably marked and numbered for identification.

Spare parts shall be delivered suitably packed and treated for long periods in storage. Each pack shall be clearly and indelibly marked with its contents, including a designation number corresponding to the spare parts list in the operation and maintenance instructions.

13.00 SUBMITTALS

13.01 Submittals required with the bid

The following shall be required in duplicate:

- Completed technical data schedule;
- Descriptive literature giving full technical details of equipment offered;
- Outline dimension drawing for each component showing mounting arrangement details;
- Type test certificates, where available, and sample routine test reports;
- Detailed reference list of customers already using equipment offered during the last 5 years with particular emphasis on units of similar design and rating;
- Details of manufacturer's quality assurance standards and programme and ISO 9000 series or equivalent national certification;
- Deviations from this specification. Only deviations approved in writing before award of contract shall be accepted;
- List of recommended spare parts for five years of operation with prices and spare parts catalogue with price list for future requirements.

TECHNICAL SPCIFICATION FOR 11 KV 400 AMPS 3 POLE AB SWITCH.

01.00 **SCOPE:-** This specification covers manufacturing testing and supply of 11 KV 400 AMPS 50 Hz Air Break switches for out door installation in horizontal configuration. The switches are suitable for operation under off load conditions only and are intended for use on Distribution Sub- stations and tapping sectionalizing points of 11 KV lines.

02.00 DESCRIPTION OF THE MATERIALS:-

The 11 KV A.B. Switch sets shall confirm to the following parameters:-

i) Number of poles	3
ii) Number of Post insulator per pole	2 nos. 12 KV post insulator
iii) Nominal system voltage	11 KV
iv)Highest System Voltage	12 KV
v) Rated frequency	50 Hz
vi) System earthling	effectively earthed.
vii) Rated nominal current	400 amps
viii) Altitude of installation.	Not exceeding 1000 M

The post insulators used in the A.B. Switches shall have the following ratings

i) Power frequency withstand voltage (dry).	35 KV (RMS)
ii) Power frequency withstand voltage(wet)	35 KV(RMS)
iii) Impilse withstand voltage (dry)	75 KV peak
iv) Power frequency puncture withstand voltage.	1.3 times the actual dry Flashover voltage of the unit

03.00 **STANDARDS:-** The AB Switch Set shall conform to the following standards:-

a) IS-9920 (Part-I to V.)

b) IS-2544/1973 (for porcelain post insulators)

c) Is-2633, (for galvanisation of ferrous parts.) or its latest amendments if any.

04.00 **INSULATOR MAKE:-**

1. 12 KV post Insulators complete with post and cap duly cemented to be used in the AB Switch Set conforming to IS-2544/1973

The tenderer shall furnish the type test certificate of the post insulators from their manufacturer for reference and scrutiny.

The tenderers shall mention make, type of insulation materials, metal fittings, Creepage distance, protected Creepage distance, tensile strength, compression strength, torsion strength and cantilever strength.

05.00 CLIMATIC CONDITIONS:- The A.B. Switch set shall be suitable for operation under the following climatic conditions.

1. Maximum ambient air temperature.	45 ^{0} C
2. Maximum daily average air temperature	35 ^{0} C
3. Maximum yearly average ambient air temperature	30 ^{0} C
4. Maximum temperature attainable by a body Exposed to the sun.	50 ^{0} C
5. Minimum ambient air temperature	o ^{0} C
6. Maximum relative humidity.	100%
7. Minimum number of rainy days per annum	70
8. Average number of rainy days per annum	120
9. Average annual rain fall.	150 cm.
10. Number of months of tropical monsoon conditions	4
11. Maximum wind pressure.	260 Kg./ mm^2
12. Degree of exposure to atmospheric pollution.	Normally polluted atmosphere.

06.00 **TECHNICAL DETAILS:-**

6.1 General:- The 11 KV A.B. Switch Set shall be the gang operated rotating single air break type having 2 post insulator per phase.. The operating mechanism shall be suitable for manual operation from the ground level and shall be so designed that all the three phases shall open or close simultaneously. The Switches shall be robust in construction, easy in operation and shall be protected against over travel or straining that might adversely effect any of its parts. The required base M.S. Channel (hot dip galvanised) phase coupling rod, operating rod with intermediate guide braided with flexible electrolytic copper, tail piece of required current carrying capacity and operating mechanism with 'ON' & 'OFF' positions shall be provided. The operating rod shall be medium gage of 32mm diameter nominal bore G.I. pipe single length 6 meters. The phase coupling rod for gang operation shall be of medium gauge 25mm dia nominal bore G.I. Pipe. The Rotating post insulators shall be provided with suitable bearing mounted on a base channel with 8 mm dia thrust coller and 6mm split pin made out of stainless steel. The operating down rod shall be coupled to the spindle (minimum dia - 32mm) for gang operation through another suitable bearing by two numbers 10mm dia stainless steel bolts with double nuts. All the bearings shall be provided with grease nipples. All metal (ferrous) parts shall be galvanised and polished. The pipe shall be galvanised in accordance with IS-4736/1968. The post insulators should be fixed with the base channel using Galvanised Nuts and Bolts.

06.01 Mounting:- The A.B. Switches shall be suitable for horizontal mounting in double pole sub-station structures.

06.02 Switching Blades:- It shall be made out of electrolytic copper with silver plated. The approximate size shall be 220mm x 50 x 8mm.The switch shall have such a spring mechanism so as to ensure that the speed of the opening of contact is independent of speed of manual operation.

06.03 Fixed Contracts:- The fixed jaw type female contracts shall be made of electrolytic copper (minimum 95 % copper composition) duly electroplated controlled by Phospher bronze high pressure spring housed in roubust G.I. Cover.

06.04 It is essential that provision shall be made in fixed female contracts to take the shock arising from the closing of moving contract blade without the same being transmitted to the post insulator. The arrangement made in this regard shall be specifically shown in the drawing.

06.05 Arcing Horn:- As the switches are generally meant for isolating transmission line and distribution transformers, suitable arcing horns shall be provided for breaking the charging current horn shall be made of 10 mm dia G.I. Rod with spring assisted operation.

06.06 Terminal Connectors:- Terminal connectors shall be robust in design. The size of fixed connector shall be (80 x 50 x8 mm) and size of movable connector shall be of (80 x 50) x (80 x 50) x 8 mm of copper casting with uniform machine finishing duly silver plated made out of minimum 95 % copper composition with 2 nos. 12 mm dia holes provided with suitable brass bolts and double nuts, flat washers & 2 nos. biometallic solderless sockets suitable upto 80 mm^2 conductor.

06.07 Spacing:- The minimum clearance between phase to the switch shall be 760 mm. The operating down rod shall be at a transverse distance of 300 mm from the outer limb of the switch. The centre spacing between two post insulators of the same phase shall be 380 mm. In the open position of the A.B. Switches the moving blade shall rotate through 90^0 This shall be exhibited in the drawing.

06.08 Sample, Drawing & Literatures:- Samples of each item 11 KV 400 amps. A.B. Switch shall be furnished and three copies of drawings item similar to the sample shall be furnished alongwith the tender.

The details of construction and materials of different parts of the A.B. Switch shall clearly be indicated in the tender and illustrative pamphlet/ literature for the same shall be submitted alongwith the tender.

07.00 **TESTS & TEST CERTIFICATE:-**

Type Test:- Certificates for the following type tests conducted within five years proceeding to the date of opening of tender) on a prototype set of A.B Switch in a Govt. Approved Testing Laboratory preferably at CPRI Bangalore shall have to be submitted for reference.

Dielectric Test (impulse and one minute wer5 power frequency withstand voltage test.)

- Temperature rise test (for contracts and terminals)
- Short Time current and peak withstand current test.
- Mainly active load breaking capacity test.
- Transformer off-load breaking capacity test
- Line charging breaking capacity test
- Cable charging breaking test
- Operation and mechanical endurance test
- Mechanical strength test for post insulator, as per Is-2544/1973 shall be furnished.
- Test for galvanisation of metal (ferrous) parts.

Routine Tests:- The following routine tests shall have to be conducted on each sets and results are to be furnished for consideration of deputing inspecting officer for inspection and conducting testing of the materials.

1.Power frequency voltage dry test.
2.Measurement of resistance of main circuit
3.Tests to prove satisfactory operation.
4.Dimension check
5.Galvanisation test.

08.0 **GUARANTEED TECHNICAL PARTICULARS:-**

The tenderer shall furnish the guaranteed technical particulars duly filled in the proforma along with the tender.

09.00 **COMPLETENESS OF EQUIPMENT:-**

All fittings, accessories or apparatus which may not have been specifically mentioned in this specification but which are usual or necessary in equipment of similar plant shall be deemed to be included in the specification and shall be supplied by the Tender without extra charge. All plant and equipment shall be completed in all details whether such details are mentioned in the specification or not.

10.00 **INSPECTION:-**

Routine tests shall be conducted at the place of manufacturer. The tenderers are requested to furnish details of equipment which will be used for testing alongwith tender. The tenderers of those manufacturers who do not have adequate testing facilities for conducting routine and acceptance test are liable for cancellation. The successful bidder has to furnish routine test certificate and guaranteed certificate for approval prior to offer of materials for inspection for each consignment of offer.

TECHNICAL SPECIFICATION FOR 11 KV 200 AMP THREE POLE H.G. FUSE SETS.

01.00 SCOPE: - This specification covers the manufacture, testing and supply of 11 KV, 200 Amps 3 pole, H.G. Fuse Sets.

02.00 (a) The 11 KV H.G. Fuses shall be suitable for out door operation in horizontal configuration under the climatic conditions specified. It shall be of the following ratings:-

1.	Number of Poles	3
2.	No. of insulator per pole	2 nos. 12 KV post insulators
3.	Nominal system voltage	11 KV
4.	Highest system voltage	12KV
5.	Rated frequency	50 Hz
6.	System Earthing	Effectively earthed
7.	Rated normal current	200 Amps
8.	Altitude of installation	Not exceeding 1000 M.

The post insulator used in the H.G. Fuse set shall have the following ratings:-

1.	Power frequency withstand voltage (dry)	35KV (RMS)
2.	Power frequency withstand voltage (wet)	35 KV (RMS)
3.	Impulse withstand voltage (dry)	75 KV (Peak)
4.	Power frequency puncture Withstand voltage	1.3 times the actual dry flashover voltage of the unit.

03.00 **STANDARDS:-**

The H.G. Fuse set shall conform to the following standards.
IS-9385-1980 (for high voltage expulsion fuses and similar fuses)
IS-2544-1973 (for porcelain post insulators or its latest amendments if any
IS-2633-1979 (for Galvanization of ferrous parts)

04.00 **INSULATOR MAKE:**-12 KV post insulator complete with pedestal cap duly cemented to be used in 11 KV H.G. Fuse sets confirming to IS-2544/1973

05.00 **TECHNICAL DETAILS:-** The H.G. Fuses shall have adjustable arcing horns made of solid copper rod having 7.62 mm dia. The horns shall be fitted with screwing devices with flynuts for fixing and tightening the fuse wire. It shall have robust terminal connector 5s of size 80mm x50 mm x 6 mm made of copper casting (95% minimum copper composition) duly silver plated with two numbers of 12mm dia brass bolts and double nuts with flat brass washers. The connector should be capable of connecting crimpable conductor up to 80 Sq.mm. size (ACSR/Alloy) with bimetallic solder less sockets .The H.G. Fuse Set shall suitable for horizontal mounting on sub-station structures. The minimum clearance between the adjacent phases of the fuse set shall be 760 mm and the center to center (distance between two post insulators of the same phase) shall be 410 mm. All metal (ferrous) parts shall be galvanized and polished. Only 12 KV post insulator (original cemented and not pin insulators shall be used for the H.G. Fuse Set.

06.00 **CLIMATIC CONDITIONS: -** The H.G. Fuse Set shall be suitable for operation under the following climatic conditions:-

1	Maximum ambient air temperature.	45 ^{0} C
2	Maximum daily average air temperature	35 ^{0} C
3	Maximum yearly average ambient air temperature	30 ^{0} C
4	Maximum temperature attainable by a body Exposed to the sun.``	50 ^{0} C
5	Minimum ambient air temperature	o ^{0} C
6.	Maximum relative humidity.	100%
7.	Average number of thunderstorm days per annum	70 days
8.	Average number of rainy days per annum	120
9.	Average annual rain fall.	150 cm.
10.	Number of months of tropical monsoon conditions	4
11.	Maximum wind pressure.	260 Kg./ mm^2
12.	Degree of exposure to atmospheric pollution.	Normally polluted atmosphere.

07.00 **TESTS & TEST CERTIFICATE:-** Certificate for the following type test conducted (within 5 years preceding to the date of opening of Tender) on a prototype set of H.G. Fuse set in a Govt. approved Testing Laboratory preferably at CPRI, Bangalore shall have to be submitted for reference and Scrutiny.

1. Dielectric test (impulse & one minute wet power frequency withstand voltage test.)
2. Temperature rise test (for terminals).
3. Mechanical strength test for the post insulator as per IS-2544/1973.
4. Test for galvanization of metal (ferrous) parts.

08.00 **ROUTINE TESTS: -** The following routine tests shall have to be conducted on each test and results are to be furnished for consideration for acceptance of deputing inspecting Officer for inspection & conducting testing of the materials.

1. Power frequency voltage dry test.
2. Dimension check
3. Galvanization test.

d) GUARANTEED TECHNICAL PARTICULARS: - The tenderers are required to furnish the guaranteed technical particulars duly filled in the proforma along with the tender.

e) COMPLETENESS OF EQUIPMENT: - Any fittings accessories or apparatus which may not have been specifically mentioned in this specification but which are usually necessary in equipment of similar plant shall be deemed to be included in the specification and shall be supplied by the Tenderer without extra charge. All plant and equipment shall be complete in all details whether such details are mentioned in the specification or not.

f) INSPECTION:- Routine and acceptance test shall be conducted at the place of manufacturer. The tenderers are requested to furnish details of equipment which will be used for testing along with tender. The tenders of these manufacturers who do not have adequate testing facilities for conducting routine and acceptance test are liable for cancellation. The successful bidder has to furnish routine test certificate and guarantee certificate for each consignment of materials to be inspected at the time of offer of materials for inspection.

g) NATURE OF PRICE:- The nature of price shall be " FIRM " .

TECHNICAL SPECIFICATION FOR 33 KV & 11 KV SURGE ARRESTOR (L.A)

01.00 SCOPE

This Specification covers Design, Engineering, Manufacture, testing, inspection before dispatch, forwarding, packing, transportation to site, Insurance (both during transit & storage), Storage, Erection, Supervision, testing and commissioning of 33 KV & 11 KV Surge Arrestor (L.A) for use in the networks of NESCO, Orissa.

The equipment offered shall have been successfully type tested and the design shall have been satisfactory operation for a period not less than two years on the date of bid opening. Compliance shall be demonstrated by submitting with the bid, (i) authenticated copies of the type test reports and (ii) performance certificates from the users.

The scope of supply includes the provision of type test, Rates of type tests shall be given in the appropriate price schedule of the bidding document and will be considered for evaluation.
The Surge Arresters shall conform in all respects to highest standards of engineering, design, workmanship, this specification and the latest revisions of relevant standards at the time of offer.

02.00 STANDARDS

Except where modified by the specification, the Surge Arresters shall be designed, manufactured and tested in accordance with the latest editions of the following standards.

IEC/ISO/BS	IS	Subject
IEC 99 – Part-1	IS 3070- Part 1	Non linear resistor gapped surge arresters for a.c. systems.
IEC 99- Part 4	IS 3070- Part 3	Metal-oxide surge arresters without gaps for a.c systems.
	IS 5621	Hollow insulators for use in electrical equipment.
IEC 233		Tests on hollow insulators for use in electrical equipment.
IEC 270		Partial discharge measurement
IEC 455		Guide for solvent less polymerisable resinous compounds used for electrical insulator.
IEC 815	IS 13134	Guide for selection of insulators in respect of polluted conditions.
BS 729 ISO 1460,	IS 2629, IS 4736 IS 2633	Hot dip galvanizing. Method of testing uniformity of zinc coated articles.

This list is not be considered exhaustive and reference to a particular standard or recommendation in this specification does not relieve the Contractor of the necessity of providing the goods complying with other relevant standards or recommendations.

03.00 TECHNICAL

The Station Class Surge Arrestor shall be heavy duty, metal oxide, gapless type generally for installation on the 33 KV and 11 KV sides of 33/11 KV Primary substations and 11/0.4 KV Distribution Substation.

The performance requirements are as follows:

Performance Characteristics of Surge Arresters

Nominal System Voltage	**11 KV**	**33 KV**
Class	**Station Class**	**Station Class**
• Arrestor voltage rating	12 KV	30 KV
• Rated frequency	50 Hz	50 Hz
• Continuous operating voltage, rms	9.6 KV	24 KV
• Leakage current through arrestor at operating voltage	Less than 1 mA	Less than 1mA
• Long duration discharge class	Class 2	Class 2
• Nominal 8/20μs discharge current – peak	10 kA	10 kA
• Maximum Lightning impulse residual voltage with 8/20μs discharge current peak	32KV(31KV*)	85KV (78 KV*)
• Maximum switching impusse residual voltage peak	28 KV (24 KV*)	70 KV (60 KV*)
• Maximum residual voltage with steep current peak	38 KV (34 KV*)	93 KV (85 KV*)
• High current impulse test value (4/10μs wave)	100 KA	100 KA
• Insulator housing impulse withstand voltage, 1.250μs wave-peak	41.6 KV	110.5 KV
• Insulator housing power frequency voltage withstand capability for one minute (wet) – peak	29.68 KV	74.2 KV
• Minimum creepage distance of insulator	380 mm	900 mm
• Minimum protected creepage distance	Not Applicable	450 mm

* Figures shown in bracket are preferred ratings. Insulation withstand voltage of arrester housing shall be related to the residual voltages in accordance with clause 5.1 of IEC : 99.4

04.00 **GENERAL CONSTRUCTIONAL FEATURES**

The surge arresters shall be single phase gapless units suitable for outdoor installation . They shall consist of non- linear blocks of metal oxide assembled in series in hollow porcelain or polymer insulator housings. Bidder shall offer either porcelain or polymeric insulators with the equipment.

04.01 **Springs**

In order to arrest the longitudinal vibrations, sturdy spring assemblies are to be provided on either end of the metal oxide stacks inside the arresters.

04.02 **Galvanizing**

All ferrous parts excluding the springs shall be of steel casting and hot dip galvanized with heavy coating as set out in the section on Surface Treatment.

04.03 **Base and mounting**

The station class surge arresters shall be complete with fittings suitable for mounting in a vertical position on mild steel channels.

The drawing showing the mounting arrangement shall be submitted with the bid and the arrangement shall be subject to approval of the A.G.M. (Elect.) Store Division, Cuttack

04.04 **Other features**

- Live parts shall be designed to avoid sharp point edges and other corona producing surfaces as far as possible.
- Hermetic sealing shall be provided to prevent ingress of moisture. The sealing shall not be affected during the maximum line discharge current over the life of the arrester which shall be 25 years minimum.

Disconnections are not required with the arresters.

05.00 INSULATOR HOUSING

The housing of the arrester packs which are under continuous electrical stress shall be brown glazed hollow porcelain or polymeric insulator. The creepage and flashover distances of the insulators shall be dimensioned and the type and profile designed in accordance with IEC :815; IS:13134 and shall be suitable for the worst environmental conditions. The creepage distance to earth shall suit the outdoor service conditions mentioned in the relevant standards for heavily polluted atmosphere and shall not be less than 900 mm in case of 33 KV and 380 mm in case of 11 KV surge arresters. The projected creepage distance of the insulators of 33 KV arresters shall be minimum 450 mm. The internal surfaces of hollow porcelain insulators shall also be glazed.

All porcelain used on the surge arresters shall have the following properties : high strength , homogeneity, uniform glaze, free from cavities and other flaws and high quality uniform finish. Porcelain components shall withstand the maximum expected static and dynamic loads to which the surge arresters may be subjected during their service life. Porcelain insulators shall conform to IS 5621 and shall be subjected to and successfully pass the tests listed in this standard and in IEC 233.

If polymeric insulators are offered, they shall conform to the requirements of the relevant parts of IEC : 455.

06.00 **TERMINATION**

The surge arresters shall be supplied with electrical connection terminals on the top of size and rating appropriate for all the duties, including overload duty specified for the equipment. The terminals shall be of the bi-metallic type, suitable for connection of all aluminum alloy conductor (AAAC) or aluminum conductor steel reinforced (ACSR). The 33 KV and 11 KV station class arresters shall have terminals suitable for 55 MM^2 to 232 MM^2 or Panther ACSR. In general connections using palm type solder less sockets shall be preferred. Where the terminals are of the clamp type, they shall be suitable for taking a range of conductors.

All nuts , bolts, washers and spring washers required to complete the connection shall be supplied with the equipment

The proposed method of connection shall be stated in the offer.

06.01 **Earthing terminal**

An earthling terminal adequate for the full rated discharge current having clamping bolts complete with nuts, washers and spring washers shall be provided on the base of the arrester.

The earthling terminals shall be identified by means of appropriate symbol marked in a legible and indelible manner adjacent to the terminals.

07.00 **PRESSURE RELIEF DEVICE**

The 33 KV station class surge arresters with porcelain housings shall be fitted with pressure relief device class 20(B) as defined in IEC : 99- Part 1, to relieve excessive internal pressure in the event of arrester's failure to prevent explosive shattering of porcelain causing damage to the nearby equipment and operating personnel. In the even of such an explosion and the shattering of the porcelain housing, the parts shall fall within the radius stipulated in IEC : 99 – Part 1.

The 11 KV arresters shall be fitted with pressure relief devices as under :

Station Class - 10 (C)

08.00 **PARTIAL DISCHARGE**

The intensity of partial discharge of the surge arresters shall not exceed 50 pico coulomb (PC) at 1.05 times the continuous operating voltage;

09.00 **RATING PLATE**

Each surge arrester shall be provided with a non ferrous nameplate, fixed in a suitable location on the arrester and bearing the following information, in a legible and indelible manner:

- Manufacturer's name and Trade mark
- Type and identification of arrester;
- Employer's name;
- Type and identification of arrester;
- Year of manufacturer;
- Rated Voltage;
- Continuous operating voltage;
- Nominal discharge current;
- Pressure relief class;
- Long duration discharge class or duty type;

10.00 **TESTS**

10.01 **Type Tests**

The type tests are required in conformity with IEC : 99-4; IS:3070-3 and other relevant standards. The tests shall include the followings

- Insulation withstand tests, including lightning impulse voltage withstand test and power frequency voltage withstand test;
- Residual voltage tests, including steep current impulse residual voltage test, lightning impulse residual voltage test and switching impulse residual voltage test (for 10 KA station class only) :
- Long duration current impulse withstand test;
- Operating duty tests, including accelerated ageing test, heat dissipation behaviour test, high current impulse operating duty test, switching surge operating duty test (for 10 KA station class only) and tests to evaluate thermal stability;

- Pressure relief tests, including high current pressure relief test and low current pressure relief test as per IEC: 99-1;
- Seal leakage test. The bid shall describe the sensitive checking method adopted by the manufacturer.
- Partial discharge tests;
- Temperature cycle test on porcelain housing ;
- Porosity test on porcelain housing;
- Hot dip galvanizing test;

Mechanical strength test of porcelain housing;

10.02 **Acceptance tests**

Acceptance tests shall be carried out, in conformity with IEC 99-4, on the nearest lower whole number to the cube root of the number of surge arresters to be supplied. The tests shall include the following :

- Measurement of power frequency voltage on the complete arrester at the reference current measured at the bottom of the arrester;
- Lightning impulse residual voltage on the complete arrester at nominal discharge current or at a suitable lightning impulse value, depending on the manufacturer's choice of routine test procedure;
- Partial discharge test;
- Temperature cycle test on porcelain housing;
- Porosity test on porcelain housing;
- Mechanical strength test on porcelain housing;
- Hot dip galvanizing test.

10.03 **Routine Tests**

The minimum requirement for routine tests shall be :

- Visual examination
- Measurement of reference voltage
- Residual voltage test for lightning impulse current in the range between 0.01 and 2 times the nominal discharge current ;
- Check for satisfactory absence from partial discharges and contract noise, in conformity with IEC 270;
- Leakage current tests;
- Leakage check on the housing seals;

GUARANTEED TECHNICAL PARTICULARS OF 11 KV 400 AMPS A.B. SWITCHES

Sl.No	particulars	33 KV 400 Amps A.B. Switches (desired value)	particulars as offered by the tender.
1	2	3	4
1.	Maker's name and country or origin.	To be specified by the By the tenderer.	-
2.	Type of Switch	Rotating type only	-
3.	Suitable for mounting	Horizontal only	-
4.	Number of supporting post insulator per phase	2 nos.12 KV Post Insulator per phase as per ISS-2544/1973.	-
5.	Post Insulator.		
(a)	Maker's name & country of origin	To be specified By the tenderer	-
(b)	Type of cemeting	To be quoted original cemented only.	
(c)	One minute power fre-Quency withstand voltage Dry	35 KV RMS.	-
(d)	One minute power fre-Quency withstand voltage Wet.	35 KV RMS.	-
(e)	Visible discharge voltage	9 KV RMS.	-
(f)	Dry Flashover Voltage	To be specified by the tenderer	-
(g)	Power frequency puncture withstand voltage	1.3 times of actual dry flash over voltage.	
(h)	Creepage distance	230 mm minimum. (actual creepage distance for which type test have been conducted is to be specified by the tenderer.	
6.	Impulse withstand voltage for positive and negative polarity (1.2/50) mircro second wave).	-	-
a)	Across the isolating distance	85 KV (peak)	-

b)	To earth & between poles	75 KV (peak)	-
7.	One minute power frequency withstand voltage		
(a)	Across the isolating distance	32 KV (RMS)	-
(b)	To earth and between poles	28 KV (RMS)	-
8.	Rated normal current and rated frequency.	400 amps. 50 Hz	
9.	Rated short circuit making capacity.	25 KA (peak)	
10.	Rated short time current.	16 KA (RMS)	
11	Rated peak withstand current	40 KA (RMS)	
12	Rated mainly active load breaking capacity	10 A	
13	Rated Transformer off load breaking capacity	6.3 A(rms)	
14.	Rated line charging breaking capacity	2.5 A (RMS)	
15.	Rated cable charging breaking capacity	10 A (rms)	
16.	Minimum clearance between adjacent phases		
(a)	Switch Closed. (centre to centre)	760 mm	
(b)	Switch opened. (centre/edge of blade)	380 mm	
17.	Temperature rise:		
(a)	Temperature rise should not exceed to maximum limit as specified below at an ambient temperature not exceeding in 40 ^{0} C	65 ^{0} C	
	Copper contacts silver faced Terminal of switch intended to be connected to external conductor by bolts or screw at an ambient temperature at 40 ^{0} C should not exceed .	50 ^{0} C	

18. Vertical Clearance from top of insulator cap to mounting channel — 254 mm (minimum)

19. Type of contact

a) Self aligned, high pressure jaw type fixed contacts of electrolytic copper of size 80 x 50 x 8 mm duly silver plated. Each contact should be reverted with three nos. Copper rivets with a bunch (minimum 3 mm thick) consisting of copper foils, each may vary from 0.15 mm to 0.25 mm. These total thickness of copper foils per jaw should be 6 mm. Jaw assembling are to be bolted through stainless steel bolts and nuts with stainless steel flat and spring washer.

b) Solid rectangular blade type moving contact of electrolytic copper size 220 mm x 50 mm x 8 mm duly silver plated.

c) Pressure spring to be used in jaw contacts shall be phosphorous bronze having 8 nos of turn x 28 mm height x 14.4 mm diameter with 14 SWG wire (minimum six nos springs shall be used.)

20. Connectors.

Terminal connectors for both movable and fixed should be of copper casting (minimum 95 % copper composition. The fixed connector shall of size 80 x 50 x 8 mm and the size of movable connector shall be size 80 x 50 x 8 mm with machine finishing duly silver plated with 2 nos. 12 mm dia holes provided with suitable brass bolts and double nuts with brass flat washers and 2 nos solder less bimetallic sockets for each connector suitable up to 80 Sq.mm conductor.

21. Moving Contact

Movable contact is to be supported by galvanized angle of 50 x 50 x 5 mm in each phase and the moving contact are to be bolted through 2 nos stainless steel bolts and nuts with stainless steel flat and spring washers, suitable.

22. Galvanization

a) Iron parts shall be not deep galvanized as per IS-2633/1972.
b) The pipe shall be galvanized as per IS-4736/1968.

23. Details of phase :-

(a) Coupling Rod — 25 mm nominal bore G.I. pipe medium gauge.

(b) Operating Rod — 32 mm nominal bore G.I. pipe medium gauge single length 6 mtrs. The detailed dimension of the G. I. pipe as per IS-1239 (Pt.I) are mentioned below :-

Nominal Base	Outside diameter	Diameter thickness

	Max.	Min.	
25 mm	34.2 mm	33.3 mm	3.25 mm
32 mm	42.9 mm	42 mm	3.25 mm

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c) Arcing Horn — 10 mm dia G.I. Rod with spring assisted operation.

d) Force of fixed — contact spring To be specified by the tenderer

e) Copper braided flexible topes — 320 mm length of flexible electrolytic copper tape or braided chord (with tin coated) having minimum weight 450 gms. Per meter and both ends shall be crimped with copper sockets through brass bolts and nuts with brass flat washers. two nos of suitable copper sockets shall be used at both ends. The minimum no. of flexible wires should be 1536 of 36 SWG for each flexible chord.

f) Quick break device: — Lever mechanism

g) Bearings — 4 nos. self lubricant bearing to be provided with grease nipple including 4 the bearing being a thrust bearing.

h) Locking arrangement:- — Pad Locker & Key arrangement at both 'ON' & 'OFF' position.

i) Earth Terminal :- — To be provided at base channels.

24. Supporting Channels — 75 mm x 40 mm M.S. Channel hot deep galvanized.

25. Weight of each pole complete:- — To be specified by the tender

N.B. i) Ferrous parts shall be duly galvanized as per IS-2633/1972 & Non-ferrous parts shall be silver plated.

ii) Certificate from a Govt.Approved Laboratory regarding composition of copper in electrolytic copper casting of materials should be submitted during inspection of materials at the cost of tenderer.

GUARANTEED TECHNICAL PARTICULARS FOR H.G. FUSE SET
11 KV 400 AMPS, 3 POLE

Sl.No	particulars	(Desired Value)	Values offered By the tender.
1	2	3	4
1.	Name of the manufacturer and country of origin.	To be specified by the By the tenderer.	-
2.	Operating voltage	11 KV	-
3.	Number of insulators per phase	2 nos.12 KV Post Insulator per phase	-
4.	Rated normal current and normal frequency.	200 Amps.50 Hz	
5.	Vertical clearance from top of insulator cap to mounting Channel	254 mm (minimum)	
6.	Height of the riser for carrying the horns.	150 mm from the cap (top) of insulator.	
5.	Post Insulator.		
(a)	Name of the manufacturer & country of origin	To be specified By the tenderer	-
(b)	Type of cemeting	To be quoted original cemented only.	
(c)	One minute power fre-Quency withstand voltage Dry	35 KV RMS.	-
(d)	One minute power fre-Quency withstand voltage Wet.	35 KV RMS.	-
(e)	Visible discharge voltage	9 KV (RMS)	
(f)	Dry Flashover Voltage	To be specified by the tenderer	-
(g)	Power frequency puncture withstand voltage	1.3 times of actual dry flash over voltage.	
(h)	Creepage distance	230 mm minimum. (actual creepage distance for which type test have been conducted is to be specified by the tenderer	
8	Impulse withstand voltage (1.2/50 micro second wave		

positive & negative polarity.

(a)	Across the isolating distance.	85 KV (peak)
(b)	To earth & between poles	75 KV (peak)

9.	One minute power frequency withstand voltage		
(a)	Across the isolating distance	32 KV (RMS)	-
(b)	To earth and between poles	28 KV (RMS)	-

11.	Details of Arcing Horns	Solid Copper rod having 7.62 mm dia silver plated provided with screwing arrangement on the fuse carrier made of copper casting for fixing fuse wire. (Total length 63 5mm). All the bolts, nuts and washers should be made out of brass.
12.	Riser Unit (150 mm total height).	a) Riser cum connector made out of copper Casting (with minimum 95% copper composition) having riser size 50 mm height x 30mm width x 8 mm thickness and connector size 80x 50x 6 mm duly silver plated and machine finishing provided with 2 nos.12 mm dia brass bolts & brass double nuts with flat brass washer and 2 nos. solder less bimetallic sockets per each connector suitable up to 80 mm sq. conductor. b) 100 mm height G.I. riser made of 19 mm nominal bore medium gauge G.I. pipe welded with 2 nos G.I. Flat of 30 x 5 mm at both ends fixed with 10 mm dia stainless steel, bolts and nuts with flat stainless steel spring washers.
13.	Supporting Channels	75 x 40 x 6 mm M.S. Channel (galvanized)
14.	Galvanization	All ferrous parts should be galvanized as per IS-2633/1972 & all non-ferrous parts should be duly electroplated with silver.
15.	Weight of each pole complete).	To be specified by the tenderer.

N.B. :- Certificate from a Govt. Approved Laboratory regarding composition of copper in electrolytic copper casting and galvanization as per ISS may be furnished during inspection of materials at the cost of tender.

. TECHNICAL SPECIFICATION OF LV OVERHEAD AB CABLE

1.0 SCOPE:

This specification covers the design, manufacturing, testing, supply, delivery and performance requirements of LV overhead ISI marked Aerial Bunched Cable (ABC) of different sizes indicated in our Schedule of Requirements for use in the LV network of NESCO.

The materials offered shall have been successfully type tested and the design shall have been in satisfactory operation for a period of not less than two years on the date of bid opening. Compliance shall be demonstrated by submitting with the bid (i) authenticated copies of the type test reports and (ii) performance certificates from the users.

However where the bidder offers similar but not identical material but higher size to that which has been type tested, the difference shall be stated in Test Certificate Schedule. The purchaser shall adjudge whether to accept or reject the offered material and type test data presented.

The scope of supply includes the provision of type tests. Rates for type tests shall be given in the appropriate price schedule of the bidding document and shall be considered for evaluation. The purchaser reserves the right to waive type tests as indicated in the section on Quality Assurance, Inspection and Testing in this specification.

The Aerial Bunched Cable shall conform in all respects to highest standards of engineering, design, workmanship, this specification and the latest revisions of relevant standards at the time of offer and the Purchaser shall have the power to reject any work or material, which, in his judgment is not in full accordance therewith.

2.0. STANDARDS:

Except where modified by this specification, the Aerial Bunched Cable shall be designed, manufactured and tested in accordance with the latest editions of the following standards.

IES/ISO	Indian Standard	Material
IEC: 1089	IS: 398/1994	Round wire concentric lay Overhead electrical Stranded Conductors.
	IS: 398(Part-4)/1994	All Aluminum Alloy Conductors, Quality
ISO: 9000		Management Systems.
	IS: 8130/1984	Conductors for insulated Electric cables.
	IS: 10810/1984	Method of Tests for cables.
IEC: 502	IS:7098/1998	XLPE Insulated PVC. Sheathed power cables.
	IS:14255/1995	Aerial Bunched Cables for working voltage up to and including 1100 volts.

The Bidder may propose alternative standards, provided it is demonstrated that they give a degree of quality and performance equivalent to or better than the referenced standards. The purchaser shall adjudge whether to accept or reject any standards.

The Bidder shall furnish a copy of the alternative standard proposed along with his bid. If the alternative standard is in a language other than English, an English translation shall be submitted with the standard.

In case of conflict the order of the precedence shall be (1) IEC or ISO standards, (2) Indian Standards, (3) Other alternative standards. This list is not to be considered exhaustive and reference to a particular standard or recommendation in this specification does not relieve the Contractor or the necessity of providing the goods complying with other relevant standards or recommendation.

3.0 SERVICE CONDITIONS:

The service conditions shall be as follows:

- Maximum altitude above sea level 500m
- Maximum ambient air temperature 50^0C
- Maximum daily average ambient air temperature 35^0C
- Maximum ambient air temperature 5^0C
- Maximum temperature attainable by an object exposed to sun 60^0C
- Maximum yearly weighted average ambient temperature 32^0C
- Maximum relative humidity 100%
- Average number of thunderstorm days per annum 70
- Average number of rainy days per annum 120
- Average annual rainfall 150cm
- Wind pressure as per IS:5613(Part-I/Sec.I) 1985

Wind Zones IS:5613 Part-I/Sec-I	Light	Medium	Heavy
Terrain Category	100 Kg/m^2	150 Kg/m^2	200 Kg/m^2

Environmentally, the region where the work will take place includes coastal areas, subject to high relative humidity, which can give rise to condensation. Onshore winds will frequently be salt laden. On occasions, the combination of salt and condensation may create pollution conditions for outdoor insulators.

Therefore, outdoor material shall be designed and protected for use in exposed, heavily polluted salty corrosive and humid coastal atmosphere.

4.0 SYSTEM CONDITIONS:

The materials shall be suitable for installation in supply systems of the following characteristics.

Frequency	50Hz
Nominal System Voltage	400/230V
Maximum System Voltage LV System	440/250 V
Minimum LV Voltage	370 V
Power frequency one minute withstand (set & dry)	2KV
Neutral Earthing arrangement LV System	Solidly earthed

Part-2: TECHNICAL

5.0 ENERAL/TECHNIL

The design of Aerial Bunched Cable offered shall comprise a compacted, standard, hard drawn H2 / H4 grade aluminum phase conductor as applicable under IS-8130 / 84 with cross linked polyethylene (XLPE) insulation 0.65 to 1.1. KV class, having of carbon black content 2.5% ± 0.5%.

The sizes and number of cores required are:

- $3x50mm^2 + 1x16mm^2 + 1x35mm^2$ (catenaries type)

$3x35mm^2 + 1x16mm2 + 1x25mm^2$ (catenaries type)

$3x35mm^2+1x25mm^2$

$1x35mm^2+ x25mm^2$

The type of Bunched Cables shall be three phase and street lighting insulated bundled. All Aluminum Conductors combined with a neutral and catenaries (bare) which shall be of heat treated aluminum magnesium silicon alloy wires containing approximately 0.5% each of magnesium and silicon respectively. The catenaries must have an ultimate tensile stress of not less than that specified in the table of technical requirements.

The Bidder shall specify the standard to which this bundle shall be manufactured.

The conductor bundle offered shall be designed to meet the requirements set out in this specification taking note of safety factors pertaining to conductor or catenary tensioning and NESC specification: General Technical Requirements for LV overhead lines.

However, a bid of Aerial Bunched Cables shall not be considered, unless it is accompanied by a list of all special tools and equipments necessary to complete the installation.

6.0 CONDUCTOR:

(a) The phase & street light conductors shall be of multi-stranded aluminum of compacted circular cross section. The aluminum shall comply with IS 8130:1984. The messenger conductor shall be of multi-stranded Aluminum Alloy conforming to IS 398 (Part 4) – 1994.

In addition to meeting all requirement of relevant ISS the LT XLPE AB Cables supplied shall satisfy following general requirements.

FOR PHASE AND STREET LIGHT CONDUCTORS

Sl. No.	Specified Cross Sectional Stran Areads (mm2)	No. of	Minimum Dia Of each strand in mm	Minimum. Over all dia. Of conducting part of the compacted conductor. (mm)	Maxm. D.C Registance at 20 degree centigrade.(Ohm / Km)	Nominal Insulation thickness (mm)
1	16	7	1.75	5.25	AS PER ISS / GTP	1.2
2	25	7	2.14	6.42		1.2
3	35	7	2.54	7.6		1.2
4	50	7	3.05	9.15		1.5
5	70	19	2.18	10.9		1.5
6	95	19	2.54	12.7		1.5

FOR MESSANGER CONDUCTORS

Sl. No.	Phase Conductor Size of the LT AB Cable in mm2	Specified Cross Sectional Area of the Messange r	No. of Strands	Nominal dia Of each strand	Appx. Over all dia. Of conducting part of the compacted	Maxm. D.C Resistance of the messenger at 20 degree centigrade. (Ohm /	Appx. Mass (Kg / Km.) for the messanger
1	16	25	7	2.14	5.2	AS PER ISS/GT	65
2	50	35	7	2.54	7.6		95
3	70	50	7	3.05	9.15		136
4	95	70	7	3.6	10.8		191.8

6.0 (b) The bidder must take required precaution to ensure that the average diameter of each strand of conductor shall be ascertained through physical measurement of dimensions of finished cables at ambient temperature during pre-dispatch inspection or / and verification at NESCO, WESCO & SOUTHCO Store by consignee and the value so obtained shall have a tolerance limit with reference to the nominal diameter of each strand of conductor as stated in the tables above.

7.0 TOLERANCES:

The measurement of strand diameter of the finished AB Cable shall not be less 0.03mm for strands up to and including 3.00mm diameter. For strands above that size, measurement of strand diameter shall not be less than 1% of the nominal strand diameter.

For the purpose of checking compliance with the above requirement, the diameter shall be determined by two measurements at right angles taken at the same cross section. The physical measurement of strands shall be conducted after opening the strands of a finished AB Cable offered for inspection.

8.0 SPLICES IN WIRES:

Splices in Wires shall generally comply with requirements of IEC 1089.

The aluminum alloy rods may be spliced by cold pressure but welding before drawing provided the manufacturer can guarantee that the splice can develop 90% of the tensile strength of the un sliced rod. Wires which break during stranding may be sliced by cold pressure butt-welding provided that:

No two splices in the completed conductor occur within 15m of each other and no two splices in any individual wire are less than 150m apart.

The splice shall be done with high skilled workmanship. The finished splice shall be smooth and at no point shall the cross sectional area be less than that of the un sliced wire.

Splicing of the alloy wires on the stranding machine in order to utilize lengths of wires on reels shall not be permitted.

9.0 STRANDING AND CORE LAY:

The conductor cores shall be stranded and the direction of lay must be as defined in IEC:
1089.

10.0 INSULATION:

The Aerial Bunched Cables shall be insulated for a voltage class of 0.65/1.1 KV and shall be capable of operating permanently at 1.2KV.

The insulation wall thickness shall be determined in accordance with Table-4 (Clause-7.2 and Clause 7.3) of IS:
14255/1995.

The insulating material shall be black and suitable to resist ultra violet radiation, salt laden sprays, chemical pollution, ageing effects, abrasion and mechanical shocks and mechanical and electrical stress at temperature up to 90°C in normal operation and 250^0C under short circuit conditions per IEC: 502/1994.

The carbon black content in the XLPE insulation shall be 2.5% ± 0.5%

11.0 PHASE IDENTIFICATION:

The individual insulated conductors within a bundle shall be identified by means of longitudinal projections.

The three phase conductors shall be marked by one, two or three longitudinal projections, indicating the red, yellow and blue phases.

The projections shall have the following dimensions.

The distance between the tips of two adjacent projections, where there is more than one,shall be between 1.0 and 1.5.

The width of the projection at the base shall be 1.0mm; and

The height of the projections shall be 0.5mm.

12.0 INSULATION MARKINGS:

Each individual conductor comprising a bundle shall have the range of non-erasable distinct markings listed below legibly printed on the insulation surface at one meter intervals. The embossing should be very clear & easily visible to naked eye.

- ISI Mark, IS 14255-95, Manufacturer‟s B.I.S License No. legibly embossed on the insulation.

Name of the Purchaser.

P.O No. & Date

Manufacturer‟s trademark identification for example "UCXLPE50"

Year of manufacture: last two digits are sufficient:

Designation of conductor type

Size: for example "3x50"

Shape of conductor.

Rated voltage class: 0.65/1.1KV

Back up conductor identification: conductors with one, two and three projections shall be marked R, Y and B respectively. The conductor with no projection shall be marked N and

The height of the printed lettering shall be not less than 20% of the overall diameter of the conductor.The markings shall be made in the sequence indicated above. Thus if the manufacturer were XY, the aerial bunched cable had been manufactured in 1994, size 3x50mm^2 + 1x35mm^2 + 1x16mm^2 with conductors of circular cross section and with a bundle of the self supporting type, manufactured to a recognized international standard then the core with two projections would be marked as follows:

XY-04-NFA4X50+1X16-r-m-
0.65/1.1KV-Y

Where, N is the international standard, F indicates overhead cable, A is aluminum alloy conductor and 2X refers to XLPE insulation, „r" means round core, „m" self-supporting and „y" the phase identification.

13.0 TWIST:

The direction of lay of the conductors comprising the bundle shall be left-handed and the lay ration shall comply with IEC: 1089.

With a bare catenaries configuration the insulated phase cables together with the street lighting cores shall be twisted round the neutral catenaries to form the ABC. This cable bundle is then strung directly onto the distribution poles supported by the catenaries with standard approved hardware.

14.0 CABLE DRUM LENGTH:

The cable shall be supplied in 500m . Drum Lengths as the case may be for different sizes of LT XLPE AB Cable.

15.0 TESTS:

15.1 General

Where not specified, all tests and test results shall conform to the requirements of IEC 502/1994 or IS 7098 (Part-I) 1998, IS 10810/1984, IS: 398(Part-IV) and IS: 14255/1

955.

Unless expressly stated otherwise, the ambient temperature for routine tests as well as voltage tests shall be 20 ± 15^0C and for all other tests be 20 ± 15^0C.

The frequency of the alternating test voltage shall be 49 Hz to 51Hz. The voltage wave form should be sinusoidal.

15.2 Type Tests

The test sample shall be 10m to 15m in length. All cores of the bundles shall be tested.

Insulation resistance at ambient temperature.

Insulation resistance at operating temperature.

AC voltage test.

The insulation resistance test at ambient temperature shall be carried out in a water bath at ambient temperature.

The insulation resistance test at a operating temperature shall be conducted in a water bath at 90^0C.

The longitudinal projections used for phase identification shall be ignored. The results of this test shall be used to calculate the volume receptivity and the results conform to the requirements of IEC:502/1994 or IS 10810 (Part-43).

The AC voltage test shall be carried out by applying 1.95KV ($3U_0$) for four hours to the sample, which shall be submerged in a water bath at ambient temperature, having been steeped for a period not less than one hour. The test shall only be deemed to have been passed if no breakdown occurs.

Furthermore, the following non-electrical type tests shall also be carried out:

- Insulation wall thickness: the longitudinal projections used for phase 1identifications shall be ignored as per IS 10810 (Part-6);
- Ageing test, consisting of an evaluation of the retention of the mechanical properties of the insulation after ageing.
- Wrapping test: as per IS 10810 (Part-3)
- Tests for bleeding and blooming of pigment as per IS 10810 (Part-9)
- Thermal expansion of insulation
- Measurement of carbon black content as per IS 10810 (Part-32).

- Water absorption by the XLPE insulation, shrinking of the XLPE insulation.
- Tensile test: adhesion between conductor and insulation.

15.7 Rejection and Retests

Should any one of the test pieces first selected fail to pass the tests, two further samples from the same batch shall be selected for testing, one of which shall be from the length from which the original test sample was taken unless the length has been withdrawn by the supplier.

Should the test pieces from both of these additional samples satisfy the requirements of the tests, the batch represented by these samples shall be deemed to comply with the standard. Should the test pieces from either of the two additional samples fail, the batch represented shall be deemed to have failed.

16.0 COMPLIANCE WITH SPECIFICATION:

The Aerial Bunched Cable shall comply in all respects with the requirements of this specification. However, any minor departure from the provisions of the specification shall be disclosed at the time of bidding in the Non-compliance Schedule of this document.

17.0 COMPLIANCE WITH REGULATIONS:

All the cables shall comply in all respects with the Indian Regulations and Acts in force. The cables and connections shall be designed and arranged to minimize the risk of fire and any damage, which might be caused in the event of fire.

18.0 Non-conforming Product

The Purchaser reserves the right for decisions regarding acceptance, modification or rejection of non-conforming items.

19.0 Inspection and Testing

The Purchaser or his authorized representative has free entry at all times, while work on the contract is being performed, to all parts of the manufacturer‟s works which

concerns the processing of the cables ordered. The manufacturer shall afford the thepurchaser or his authorized representatives without charge, all reasonable facilities to ensure that the cable being furnished is in accordance with these specifications.

The cables shall successfully pass all the type tests, routine tests & acceptance Tests referred to in the section on tests and those listed in the most recent edition of the standards given in the specification.

The Purchaser reserves the right to reject any of the cables if the test results do not comply with the values specified or with the date given in the Technical data schedule.

Type tests shall be carried out at an independent testing laboratory or at the manufacturer‟s works if such facilities are available and to be witnessed by the

purchaser. The contractor, at no extra cost at the manufacturer‟s work shall carry out routine and Acceptance tests in presence of the Purchaser‟s representatives.

Type Test Certificates for the tests conducted earlier shall be submitted with the bid for evaluation. The requirements of additional type tests will be at the discretion of the Purchaser

The Purchaser may witness routine and type tests. In order to facilitate this, the contractor shall give the purchaser of 15days notice that the material is ready for inspection & testing. The supplier shall extend all assistance to the representative of the Purchaser during his inspection & testing of samples at his works. The materials shall be dispatched only after approval of such Test Reports and issue of

Despatch clearance by the Purchaser. However the Purchaser reserves the right to retest the materials after delivery at any NABL Accredited Testing Laboratory in case of any disputes regarding size & quality of supplied materials at a later date during guarantee period. The cost of such retesting shall be borne by the supplier.

All costs in connection with the testing, including any necessary retesting shall be borne by the Contractor, who shall provide the Purchaser with all the test shall have the right to select the samples for test and shall also have the right to ensure that the testing apparatus is correct. Measuring apparatus for routine tests shall be calibrated at the expense of the contractor at an approved laboratory and shall be approved by the purchaser before testing.

The Contractor shall be responsible for the proper testing of the materials supplied by sub- Contractor to the same extent as if the materials were completed or supplied by the contractor.Any cost incurred by the Purchaser in connection with inspection or retesting as a result of failure of the equipment under test or damaged during transport or off loading shall be to the account of the Contractor.

The Contractor shall submit to the Purchaser three signed copies of the test Certificates, giving the results of the tests as required. No materials shall be dispatched until the Purchaser has received the test certificate and the contractor has been informed that they are acceptable.

The test certificate must show the actual values obtained from the tests, in the units used in this specification, and most merely confirm that the requirements have been met.

In the case of components for which specific type tests or routine tests are not given in this specification, the Contractor shall include a list of the tests normally required for these components. All materials used in the Contract shall withstand and shall be certified to have satisfactorily passed such tests.

No inspection or lack of inspection or passing by the Purchaser‟s representative of

equipment or materials whether supplied by the Contractor or sub- Contractor, shall relieve the contractor from his liability to complete the contract works in accordance with contract or exonerate him from any of his guarantees.

20.0 GUARANTEE:

The contractor shall guarantee the following:

Quality and strength of materials used. Satisfactory operation during the guarantee period of 24 months from the date of commissioning or 30 months from the date of receipt of the cables at NESCO,whichever is earlier.

Performance figures as supplied by the bidder in the technical data sheet.

21.0 PACKING AND SHIPPING:

The cable shall be wound on strong drums or reels capable of withstanding all normal transportation and handing.

22.0 PERMANENT EMBOSSING:

All equipments and materials supplied/erected shall bear distinct mark of " NESCOand Purchase Order No & Date "by way of embossing/punching/casting etc.including other information mentioned in GTP. This should be clearly visible to naked eye.

GUARANTEED TECHNICAL PARTICULARS FOR LT XLPE AB CABLES

Sl No	Description	3X35 + 1X16 +1X25mm2	3X 50 + 1X16 +	3X 35 + 1X25	1x35+1x25 mm^2
		Requirement	Requirement	Requirement	Requirement
1	Ref. ISS / IEC	IS 14255/95, IS	IS 14255/95, IS	IS 14255/95, IS	IS 14255/95
2	Phase Conductor material / Insulation type	H2 / H4 E.C grade aluminium as per IS 8130/84 / XLPE	H2 / H4 E.C grade aluminium as per IS 8130/84 / XLPE	H2 / H4 E.C grade aluminium as per IS	H2 / H4 E.C grade aluminium as per IS 8130/84 / XLPE insulation
3	Material of Neutral Catenary	Aluminum lloy as per IS 398 Pt - IV	Aluminum alloy as per IS 398 Pt - IV	Aluminum alloyas per IS 398 Pt - IV	Aluminum alloy as per IS398 Pt - IV
4	Voltage Class	0.65/1.1 KV	0.65/1.1 KV	0.65/1.1 KV	0.65/1.1 KV
	No. of Strands of Phase	7	7	7	7
5	No. of strands/ Average/Minimum Strand Dia. In mm. (Finished Phase	7/2.52	7/3.05	7/2.52	7/2
6	Approximate Overall Dia. Of compacted phase conductor after removal of	7.0	9.15	7.0	7.
7	No. Of Strands / Average Strand Dia. In	7 / 2.15	7/2.54	7/2.15	7/
8	Minimum Overall Dia. Of compacted Bare Neutral Caternary (in	6.0	7.62	6.0	6.
9	No. Of Strands / Average strand dia. / Nomunal cross sectional area of	7 /1.75 / 16mm2	7 /1.75 / 16mm2	N.A	N.
10	Minimum average thickness of insulation of phase	1.2	1.5	1.2	1
11	Minimum thickness of insulation of Phase Cond. At any point	0.98	1.25	0.98	0.
12	Minimum thickness of insulation at any	0.98	0.98	N.A	N
13	Maximum DC resistance of Phase conductor at 20 ^{o} C	0.868	0.64	0.868	0.868

14	Maximum DC resistance of street light	1.91	1.91	N.A	N .
15	Maximum DC resistance of neutral cond. Ω / Km	1.38	0.98 6	1.38	1.38
16	Ultimate tensilestrength of neutral	7	14	7	7
17	Maximum temperature (Continuou	90°C for phase and	90°C for phase and	90°C for phase and 75 °C for	90°C for phase and 75 °C for neutral
18	Embossing on insulation at each one meter interval	Distinct Non-erasable ISI Mark, IS 14255-95, Manufacturer"s B.I.S License No., Name of the Purchaser, Name of the manufacturer, Size of cable, voltage Grade along with sequential	Distinct Non-erasable ISI Mark, IS 14255-95, Manufacturer"s B.I.S License No., Name of the Purchaser, Name of the manufacturer, Size of cable, voltage Grade along with sequential	Distinct Non-erasable ISI Mark, IS 14255-95, Manufacturer"s B.I.S License No., Name of the Purchaser, Name of the manufacturer, Size of cable, voltage Grade along with sequential	Distinct Non-erasable ISI Mark, IS 14255-95, Manufacturer"s B.I.S License No., Name of the Purchaser, Name of the manufacturer, Size of cable, voltage Grade along with sequential
19	Cable drum length	500 m	500 m	500m	500 m
20	Volume Resistivity of	$1X10^{13}$Ω - cm min.	$1X10^{13}$Ω - cm min.	$1X10^{13}$Ω - cm	$1X10^{13}$Ω - cm
21	Volume Resistivity of	$1X10^{11}$Ω - cm min.	$1X10^{11}$Ω - cm min.	$1X10^{11}$Ω - cm	$1X10^{11}$Ω - cm

N.B : 1) For values not available in relevant ISS, values indicated in our GTP/ Tender Specification shall be valid.
2) In case of discrepancies between values of ISS & GTP, better will prevail.
3) Average diameters of strands of each cable shall be ascertained by physical measurement after opening the strands of each phase of a finished AB Cable offered for inspection.

TECHNICAL SPECIFICATION OF LT AND HT STAY SET

SCOPE: This specification covers design, manufacture, testing and dispatch of LT Stay Sets of 16 mm and HT stay sets 20 mm dia**.**

GENERAL REQUIREMENT

16 MM Dia Stay sets (Galvanized) – LT Stay Set

This stay sets (Line Guy set) will consist of the following components:-

Anchor Rod with one washer and Nut

Overall length of rod should be 1800 mm to be made out of 16 mm dia GI Rod, one end threaded up to 40 mm length with a pitch of 5 threads per cm and provided with one square GI washer of size 40X40x1.6mm and one GI hexagonal nut conforming to IS:1367:1967 & IS:1363:1967. Both washer and nut to suit threaded rod of 16 mm dia. The other end of the rod to be made into a round eye having an inner dia of 40mm with best quality welding.

Anchor Plate Size 200 x 200 x6 mm

To be made out of GI plate of 6 mm thickness. The anchor plate should have at its centre 18 mm dia hole.

Turn Buckle & Eye Bolt with 2 Nuts

To be made of 16 mm dia GI Rod having an overall length of 450mm, one end of the rod to be threaded up to 300 mm length with a pitch of 5 threads per cm and provided with two GI Hexagonal nuts of suitable size conforming toIS:1363:1967 & IS:1367:1967. The other end of rod shall be rounded into a circular eye of 40mm inner dia with proper and good quality welding.

Bow with Welded ngle

To be made out of 16mm dia GI rod. The finished bow shall have an over all length of 995 mm and eight of 450 mm, the apex or top of the bow shall be bent at an angle of 10 R. The other end shall be welded with proper and good quality welding to a GI angle 180 mm long having a dimension of 50x50x6mm. The angle shall have 3 holes of 18 mm dia each.

Thimble

To be made on 1.5 mm thick GI sheet into a size of 75x22x40mm and shape as per standard shall be supplied. Average Weight of Finished 16mm Stay Sets shall be at least 7.702 KG (Minimum) (Excluding Nuts Thimbles and Washer) 8.445 Kg. (Maximum)

20 mm Dia Stays Sets for 33 Kv,11 KV Lines (Galvanized) HT Stay Set The Stay Set (Line Guy Set) will consist of the following components: **Anchor Rod with one Washer and Nut**

Overall length of Rod should be 1800mm to be made out of 20 mm dia GI rod one end threaded up to 40 mm length with a pitch of threads per cm. And provided with one square G.I Washer of Size
50x50x1.6mm and one GI Hexagonal nut conforming to IS: 1363:1967 & IS:1367:1967. Both washer and nut to suit the threaded rod of 20mm. The other end of the rod to be made into a round eye having an inner dia of 40mm with best quality of welding. Dimensional and other details are indicated and submitted by bidders for owner‟s approval before start of anufacturing.

Anchor Plate Size 300 x 300 x 8 mm

To be made out of G.S. Plate of 8 mm thickness. The anchor plate to have at its centre 22mm dia hole.

Turn Buckle, Eye Bolt with 2 Nuts.

To be made of 20 mm dia G.I Rod having an overall length of 450 mm. One end of the rod to be threaded up to 300 mm length with a pitch of 4 threads per cm. The 20 mm dia bolt so made shall be provided with two G.I Hexagonal nuts of suitable size conforming to IS: 1363:1967 & IS: 1367:1967.The other end of the rod shall be rounded into a circular eye of 40mm inner dia with proper and good quality of welding. Welding details are to be indicated by the bidder separately for approval.

Bow with Welded hannel:

To be made out of 16mm dia G.I Rod. The finished bow shall have and overall length of 995 mm ad height of 450 mm. The apex or top of the bow shall be bent at an angle of 10R. he other end shall be welded with proper and good quality welding to a G.I Channel 200 mm long having a dimension of 100x50x4.7 mm. The Channel shall have 2 holes of 18 mm dia and 22 dia hole at its centre as per drawing No.3 enclosed herewith.

Thimble 2 os.

To be made of 1.5 mm thick G.Isheet into a size of 75x22x40mm and shape as per standard.

Galvanizin

The complete assembly shall be hot dip galvanized.

Welding

The minimum strength of welding provided on various components of 16mm and 20 mm dia stay sets shall be 3100 kg & 4900 kg respectively. Minimum 6mm filet weld or its equivalent weld area should be deposited in all positions of the job i.e. at any point of the weld length. The welding shall be conforming to relevant IS: 823/1964 or its latest amendment.

Threading

The threads on the Anchor Rods, Eye Bolts and Nuts shall be as per specification IS;4218:1967 (ISO Metric Screw Threads). The Nuts shall be conforming to the requirements of IS:1367:1967 and have dimension as per IS 1363:1967. The mechanical property requirement of fasteners shall confirm to the properly clause 4.6 each for anchor rods and Eye bolt and property clause 4 for nuts as per IS:1367:1967.Average weight of finished 20 mm Stays Set: 14.523 Kg.(Min) (Excluding Nuts Thimble & Washer):15.569 Kg.(Max.)

TESTS

The contractor shall be required to conduct testing of materials at Govt./Recognized testing laboratory during pre-dispatch inspection for Tensile Load of 3100 Kg/4900Kg. applied for one minute on the welding and maintained for one minute for 16 mm and 20mm dia stay sets respectively.

IDENTIFICATION MARK

All stay sets should carry the identification mark of the Purchaser (NESCO) applicable.

This should be engraved on the body of stay rods to ensure proper identification of the materials. The nuts should be of a size compatible with threaded portion of rods and there should be not play or slippage of nuts.

Welding wherever required should be perfect and should not give way after erection.

TOLERANCES

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

GURANTEED TECHNICAL PARTICULARS (To be submitted along with Offer)

Sl No.	**Item Description**	**Specified Parameters**			
		Section Tolerances	**Fabrication Tolerances**	**Material**	
1	Anchor Plate	6mm thick +2.5%- 5% 8mm thick +2.5%-5%	200x200mm+1% 300x300mm+1%	GI Plate 6 mm thick GI Plate 8 mm thick	**LT Stay Set** **HT Stay Set**
	Anchor Rod	16mm dia +5%-3% 20mm dia +3%- 2%	Length 1800mm+0.5% Rounded Eye 40 mm inside dia + 3% Threading 40mm+11%-5% Length 1800mm+0.5% Round Eye 40mm inside dia +3%. Threading 40mm+11%-5%	GI Round 16mm dia GI Round 16mm dia GI Round 20mm dai GI Round 20mm dia	**LT Stay Set** **HT Stay Set**
3	Turn Buckle Bow	16mm dia +5%-3%	Length 995mm+1% 16mm dia Length180mm+1% 50x50x6mm	GI Round 16mm dia. GI Angle G I Channel 100x50x4.7m m	**LT Stay Set** **HT Stay Set**
			Channel length 200mm + 1%		

4	Eye Bolt Rod	16mm dia +5%-3% 20mm dia +3% - 2%	Length 450mm + 1% Threading 300mm+1% Round Eye 40mm inside dia +3% Length450mm +1% Threading 300mm+1% Round Eye 40mm inside dia +3%	GI Round 16 mm dia GI Round 20mm dia.	**LT Stay Set** **HT Stay Set**
5	Galvanisation thickness	All galvanization shall be carried out in accordance with IS: 2629 . The weight of Zinc deposited shall be in accordance with IS: 2629 and shall not less than 0.61 kg/m² with a minimum thickness of 86 microns for items of thickness more than 5 mm, 0.46kg/m²(64 microns) for items of thickness between 2 mm & 5 mm& 0.33kg/m²(47 microns) for items less than 2 mm thickness.			
a	Anchor Plate				
b	Anchor Rod				
c	TurnBuckle Bow				
d	Eye Bolt Rod				
6	Thimble	2 nos. to be made of 1.5 mm thick G.S Sheet into a size 75x22x40 mm & shape as per			
7		One G.S Hexagonal Nut confirming to IS:1363 & 1367 with one square washer of size			
8		Two G.S Hexagonal Nuts of suitable size along with Eye Bolt Rod.			

7/10 GI Stay Wire :

7/12 GI Stay Wire :

TECHNICAL SPECIFICATIONS 7/10 SWG and 7/12 SWG STAY WIRE)

1. Application Standards

Except when they conflict with the specific requirements of this specification, the G.I Stay Stranded Wires shall comply with the specific requirements of IS: 2141-1979. IS: 4826-1979 & IS: 6594-1974 or the latest versions thereof.

2. Application and Sizes

a) The G.I. stranded wires covered in this Specification are intended for use on the overhead power line poles, distribution transformer structures etc.

b) The G.I stranded wires shall be of 7/10 SWG(7/3.15 mm for 11KV lines) and 7/12 SWG (7/2.5mm for LT lines) standard sizes.

3. Materials

The wires shall be drawn from steel made by the open hearth basic oxygen or electric furnace process and of such quality that when drawn to the size of wire specified and coated with zinc, the finished strand and the individual wires shall be of uniform quality and have the properties and characteristics as specified in this specification. The wires shall not contain sulphur and phosphorus exceeding 0.060% each.

3.1 **Tensile Grade**

The wires shall be of tensile grade 4, having minimum tensile strength of 700 N/mm² conforming to 1S:2141.

3.2 **General Requirements**

a)The outer wire of strands shall have a right-hand lay.

b)The lay length of wire strands shall be 12 to 19 times the strand diameter.

3.3 **Minimum Breaking Load & Galvanising**

The minimum breaking load of the wires before and after stranding shall be as follows

No. of Wires & Const.	Wire ia (mm)	Min. breaking load of the Single wire before stranding	Min. breaking
7 (6/1)	2	3.44	21.40
7 (6/1)	3	5.46	34.00
7 (6/1)	4	8.80	54.90
Minimum weight of zinc coating before stranding	490 gm/mm2	490 gm/mm2	490 gm/mm2
Minimum weight of zinc coating before			

4. Construction

a) The galvanized stay wire shall be of 7-wire construction. The wires shall be so stranded together that when an evenly distributed pull is applied at the ends of completed strand, each wire shall take an equal share of the pull.

b) Joints are permitted in the individual wires during stranding but such joints shall not be less than 15 metres apart in the finished strands.

c) The wire shall be circular and free from scale, irregularities, imperfection, flaws, splits and other defects.

5. Tolerances

A tolerance of (±) 2.5% on the diameter of wires before stranding shall be permitted.

6. Sampling Criteria

The sampling criteria shall be in accordance with IS :2141.

7. Tests on Wires before Manufacture

i) The wires shall be subjected to the following tests in accordance with IS :2141.a) Ductility Test

b) Tolerance on Wire Diameter

ii) **Tests on Completed Strand**

The completed strand shall be tested for the following tests in accordance with IS:2141.

a) Tensile and Elongation Test: The percentage elongation of the stranded wire shall not be less than 6%.

b) Chemical analysis

c) Galvanizing Test

The Zinc Coating shall conform to "Heavy Coating" as laid down in 1S:4826

8. Marking

Each coil shall carry a metallic tag, securely attached to the inner part of the coil bearing the following information:

a) Manufacturers name or trade mark
b) Lot number and coil number
c) Size
d) Construction
e) Tensile esignation
f) Lay
g) Coating h) Length
i) Mass
j) ISI certification mark, if any

9. Packing

The wires shall be supplied in 75-100 Kg. coils. The packing should be done in accordance with the provisions of IS:6594.

GURANTEED TECHNICAL PARTICULARS STAY WIRE (7/10 SWG)

Sl. No.	Description	Specified	Bidder's offer
1.	Manufacturer's name & address	To be specified by the Bidder	
2	Nominal diameter of wire in mm	3.15	
3	Tolerance in diameter in mm	± 2.5%	
4	Minimum breaking load in Kg	3697.50	
5	Tensile strength Kgf/mm²	71.40	
6	Overall diameter of stranded wire in mm	9.45	
7	Sectional Area (in mm².)	70.16	
8	Coating Test		
a	Type of zinc coating whether heavy or light	Heavy	
b	Weight of coating in g/m²	476	
9 a	Length of wire in each coil in mtr.	193	
b	Tolerance	± 5%	
10	No. of dips the coating is able to withstand as 18 ± 20ºC	3 dip in min.	
11	Adhesion Test (Wrap Test at 1 turn per second coiling while stress not exceeding % nominal tensile strength)		
a	Min. complete turn of wrap	To be specified by bidder	
b	Dia of mandrel on which wrapped	- do -	
12	Bend Test		
a	Angle	- do -	
b	Dia round a format to be bent	- do -	
13	Freedom from defect	- do -	
14	Chemical composition the MS Wire		
a	Sulphur 0.060%	- do -	
b	Phosphorous 0.065%	- do -	
15 a	Weight of each coil in Kg	70 to 100	
b	Tolerance	± 5%	
16 a	Weight of wire in Kg/Km	465	
b	Tolerance	± 5%	
17	Standard according to which the solid wire is	ISS: 2141/1992	

GURANTEED TECHNICAL PARTICULARS STAY WIRE (7/12 SWG)

Sl. No.	Description	Specified	Bidder's offer
1.	Manufacturer's name & address	To be specified by the Bidder	
2	Nominal diameter of wire in mm	2.50	
3	Tolerance in diameter in mm	± 2.5%	
4	Minimum breaking load in Kg	2331.07	
5	Tensile strength Kgf/mm²	71.40	
6	Overall diameter of stranded wire in mm	7.50	
7	Sectional Area (in mm².)	44.19	
8	Coating Test		
a	Type of zinc coating whether heavy or light	Heavy	
b	Weight of coating in g/m²	476	
9 a	Length of wire in each coil in mtr.	298	
b	Tolerance	± 5%	
10	No. of dips the coating is able to withstand as 18 ± 20ºC	3 dip in min.	
11	Adhesion Test (Wrap Test at 1 turn per second coiling while stress not exceeding		
a	Min. complete turn of wrap	To be specified by bidder	
b	Dia of mandrel on which wrapped	- do -	
12	Bend Test		
a	Angle	- do -	
b	Dia round a format to be bent	- do -	
13	Freedom from defect	- do -	
14	Chemical composition the MS Wire		
a	Sulphur 0.060%	- do -	
b	Phosphorous 0.065%	- do -	
15 a	Weight of each coil in Kg	70 to 100	
b	Tolerance	± 5%	
16 a	Weight of wire in Kg/Km	310	
b	Tolerance	± 5%	
17	Standard according to which the solid wire is	ISS: 2141/1992	

GI Clamp for HT Stay set :

HT stay clamp suitable for PSC poles made out of 50x8 mm MS Flat, confirming to latest IS Specification.

GI Clamp for LT Stay set :

LT stay clamp suitable for PSC poles made out of 50x6 mm MS Flat, confirming to latest IS Specification.

40mm dia GI Earthing Device:

Technical Specifications

1. **Scope :-**

This specification provides for design, manufacturing, testing before dispatch, supply & delivery of Earthing
Device (Heavy Duty) (for use in Sub-
station earthing).

2. **APPLICABLE STANDARDS** :-

The Earthing Device must be made out of 40 mm nominal Bore & 3.2 mm (Medium Gauge- No minus Tolerance allowed) wall thickness Hot Dip G.I. Pipe (as per IS ;- 1239,m Part-1, 1990 & REC construction Standard –J-2) , ISI marked of reputed Make & 2.5 mtrs length tapered finished smooth at one end for a length of 75 mm
& Clamp at the other end.
Staggered drills hole of 12 mm Dia of interval of 150mm shall be made
before galvanization.
The GI Earthing Clamp/ Strip (C- Clamp Type) is to be of 50mm width, 6mm thickness & flange length of
65 mm in each side. This should be suitable for termination of 4 nos of GI Flat earth electrodes. The Clamp/ Strip & Earthing pipe after fabrication will be hot dip galvanized confirming to IS: 2629/85 with latest
amendments. The clamp shall have two holes in both sides suitable for 5/8 x 2‖ Bolt & provided with two GI
bolts& Nuts in each side of 5/8 x 2‖ long half threaded with spring washer as per IS: 3043/1982.The galvanization tests are to be conducted as per IS: 2633/72 & IS: 6745/72 & its latest imendments.

Guaranteed Technical Particulars of Earthing Device

(To be submitted along with Offer)

	Part	**Bidder's Offer**
1.	Location of Factory or Place of Manufacture	
2.	Maker's Name, Address & Country	
3.	Size of	
a	Pipe	
b	Earthing Strips	
4.	Length	
5.	Thickness of Pipe	
6.	Galvanization Process	
7.	Galvanization thickness	
a	For Earthing device	
b	For Connecting Flat	
8.	Galavanization tests to be conducted as per ISS	
9.	Any other Particulars (like details of Clamp/ G.I.	
10.	Details of Drawings submitted	

Piercing Connector
Suspension Clamp
Dead End Clamp
Pole Clamp with Eye Hook

TECHINICAL SPECIFICATIONS FOR AB CABLE ACCESSORIES

Technical specification for insulation piercing connectors , Dead End Clamp (Anchor), Suspension Clamp , Neutral Connector & Eye hook for Arial Bunch Cables for working voltage upto and including 1100 Volts.

INSULATION PIERCING CONNRCTOR(IPC)

1.0 Scope

This specification covers the design, manufacture, assembly, testing and supply of Insulation Piercing Connectors
(IPC) making connections to Bare Messenger L.T XLPE insulated Aerial Bunched Cables rated up to1100 volts to L.T XLPE insulated Aerial Bunched Cables / Service cable (Twin core double insulated flat PVC Aluminium wire of different sizes)

2.0 Standard

The design, performance and test requirements shall confirm to this specification and the following standards. However in case of any conflict, the requirements of this specification shall prevail.

1) REC Specification 83/2010 (Insulation Piercing Connectors)
2) NFC 33-020 (Insulation Piercing Connectors)
3) IS 7098 part 1 XLPE insulated Cables
4) IS 398 Part IV : aluminum alloy conductors

The devices shall also be compatible with the cables of sizes & dimensions as defined in the cable Specifications for the cables with which they are intended to be used.

3.0 Cable Data

AB Cable

The standard sizes and characteristics of the phase and street lighting conductors, bare messenger wires shall be as specified in IS: 14255-1995 and REC Specification 32/1984 of following sizes

a) 3x95 (Insulated Phase)+1x70(Bare Messenger)+1x16(Insulated street lighting) sq.mm b) 3x50 (Insulated Phase)+1x35(Bare Messenger)+1x16(Insulated street lighting) sq.mm c) 3x50 (Insulated Phase)+1x35(Bare Messenger)
d) 2x50 (Insulated Phase)+1x35(Bare Messenger) sq.mm e) SERVICE CABLE

Twin core double insulated single strand flat PVC Aluminium wire of size 2.5/4/6/10 sq mm.

4.0 Types Of Insulation Piercing Connectors(IPC)

Insulation Piercing Connectors (IPC) is used for making Tee/Tap-off/Service connectors to an ABC Line. Insulation Piercing Connectors are designed to make a connection between the uncut main conductor and a branch cable conductor without having to strip either cable to expose the conductor. Instead, the tightening action of the IPC will first pierce the Insulation, and then make good electrical contact between the main end and branch conductor while simultaneously insulating and sealing the connection.

The standard size ranges for various applications are given below:

Requirement	Main Cable Size range	Branch Cable Size range
Insulation Piercing Connectors for Tap off phase & Street Lighting core	16-95 sq mm (AB Cable)	16-95 sq mm (AB Cable)
Insulation Piercing Connectors for service connections	16-95 sq mm (AB Cable)	2.5 -10 sq mm (PVC Al service Cable)

4.1 Marking and Embossing

The Connector shall be indelibly marked with the following information: Name orLogo of manufacturerName Purchaser, Model NumberSizes of –Max and Min‖ Main and Branch cables for which it is suitable. The permanence of the marking shall be permanent.

5. CONSTRUCTIONAL FEATURES OF INSULATION PIERCINGCONNECTORS

The following features of Insulation piercing bare connectors are to be met for the qualification criteria

1. The connector bodies shall be made entirely of mechanical and weather resistant plastic insulation material made of weather & UV resistant reinforced polymer and no metallic part outside the housing is acceptable except for the tightening bolt or nuts.
2. Any metallic part that is exposed must not be capable of carrying a potential during or after connector installation.
3. Screws or nuts assigned for fitting with IPC must be fitted with torque limiting shear heads to prevent over tightening or under tightening While the min & max torque values are to be specified by Manufacturer, these should not exceed 20 N mtr for IPC for main conductor < 95 sq mm and 30 N mtr for main conductor >95 but < 150 sq mm.
4. The IPC must perform piercing of Tap insulated conductor connection on Main cable simultaneously using single bolt for tightening as multiple bolts do not ensure even tightening. Design of connector needs to avoid the stripping of insulated tap conductor and make the connection by piercing the insulation.
5. The shear bolt/nut shall be suitable for tightening with a hexagonal spanner of 13 mm.
6. The contract blade of the connector is made of tinned copper/aluminum alloy.

7. The IPC shall be water proof and the water proof and the water tightness shall be ensured by appropriate elastomer materials and not by grease gel or paste alone. Grease can be applied to protect the contact blade alone and shall not be visible of the outer surface of the connector. Connector should not be dipped in grease.

8. Each IPBC should be provided with a cap to seal the cut end of the insulated Branch cable. It should be of a design that once the connector id fitted, it shall not be possible to remove the cap without dismantling the connector.

9. Design of IPBC should be such as to not cause damage to insulation of adjacent conductors due to vibration and relative movement during service.

10. All the metallic parts of the connector should be corrosion resistant and there should not be any appreciable change in contact resistance & temperature after overloads & load cycling and should be confirm to the long duration tests specified in this standard.

6. TESTING REQUIREMENTS OF INSULATION PIERCING CONNECTORS

The following tests are intended to intended to establish performance characteristics of insulation piercing connectors and categorized as follows:

Sr No.	Test	Type Test	Acceptance Test	Routine Test
1	visual		X	X
2	Dimensional		X	X
3	Mechanical Electrical Continuity and Shear head & mechanical behavior Effect of tightening the mechanical strength of main core Checking mechanical strength of tap core	X X X	X X X	X X X
4	Dielectric & Water tightness test	X	X	X
5	Climate Ageing Test	X		
6	Corrosion Test	X		
7	Electrical ageing test	X		

7.0 General Test Condition

Connectors to be tested shall be identified using the following elements

- Minimum marking details requested in this specification.
- The minimum and maximum operating torque of shear off head.
- Nominal torques of the re-usable tightening screws.
- Min-Max conductor range suitable for Main and Tap.

8.0 SAMPLING PLAN FOR ACCEPTANCE TESTS

Sampling Plan for acceptance tests on IPCs are as per ISO 2895-1 as mentioned below.

a) For Visual and Dimensional

Sampling Level: General Inspection Level 1

SL NO	LOT SIZE	SAMPLE SIZE
1	51 to 90	5
2	91 to 150	8
3	151 to 280	13
4	281 to 500	20
5	501 to 1200	32
6	1201 to 3200	50
7	3201 to 10000	80
8	10001 to 35000	12
9	35001 to 150000	20
1	150001 to 500000	31
1	500001 & over	50

b) For Mechanical and Voltage Tests

Sampling Level: Special Inspection Level S-2

SL NO	LOT	SAMPLE SIZE
1	51 to 90	3
2	91 to 150	3
3	151 to	5
4	281 to	5
5	501 to 1200	5
6	1201 to 3200	8
7	3201 to 10000	8
8	10001 to 35000	13
9	35001 to 150000	13
10	150001 to 500000	13
11	500001 & over	13

8.3 Type Test

For IPCs, the Type Test Report should be submitted from an Independent NABL Accredited Laboratory like CPRI ,ERDA e.t.c / International Laboratory Accreditation Corporation, Mutual Recgnitions arrangement (ILAC,MRA) signatory Laboratory like COFRAC.The installation of the connectors shall be done in the laboratory following instructions provided by the manufacturer.The Test report shall include the Model Number, Applicable size Range, and GA Drawing showing the principal parts and dimensions of the connector.The following shall constitute Type Tests for Insulation Piercing Connectors.

a)Electrical Ageing Test

b) Dielectric and Water Tightness Test

c) Mechanical Tightening Test & Shear – head behaviour

d) Effect of tightening on main core

e) Effect of tightening on branch core

f) Climatic test in accordance with NFC20-540

g) Corrosion Test in accordance with NFC 33-003

8.4. Acceptance Tests

The Acceptance Tests are to be conducted as per clause no.'6' above & REC Spec. 83/ 2010 and as per relevant IS Specifications.

9.0 Drawings & Samples:

GA drawings, GTP and other particulars along with samples are to be submitted along with offer.

10.0 SUSPENSION CLAMPS

Scope

This specification covers the design, manufacture, assembly, testing and supply of Accessories for suspending. Aerial Bunched Cables rated 1100 volts and insulated with cross-linked polyethylene and aluminum alloy bare messenger.

	Description	Application
a)	Suspension Clamp (as per REC Construction standard E-34) suitable for bare messenger AB cable (35-70 sq	For supporting a length of ABC at an intermediate pole in a length, with small angle of deviation.

10.1 Cable Data

The standard sizes and characteristics of the phase and street lighting conductors, bare messenger wires shall be as specified in IS: 14255-1995 and REC Specification 32/1984 of following sizes

a) 3x95 (Insulated Phase)+1x70(Bare Messenger)+1x16(Insulated street lighting) sq.mm b) 3x50 (Insulated Phase)+1x35(Bare Messenger)+1x16(Insulated street lighting) sq.mm c) 3x50 (Insulated Phase)+1x35(Bare Messenger)

d) 2x50 (Insulated Phase)+1x35(Bare Messenger) sq.mm

TEST REQUIREMENTS

1. Slip strength shall not be less than 25% of the tensile strength of the messenger wires of $25mm^2$ and $35mm^2$ sizes having tensile strengths of 7.4 KN and 10.3 KN respectively (tests to be made separately for the two sizes).

2. Mechanical test – Tensile strength at right angle to the direction of messenger wire shall not be less than 15KN.

TESTS

The suspension clamp shall be subjected to the following tests in accordance with the latest version of

IS:2486 (Part-I). Sampling plan as per clause no 8.0 above.

	Type Tests	Acceptance Tests	Routine Tests
	Slip strength test	1. Verification of	
2.	Mechanical test	2. Galvanising test	1. Visual examination
3.	Verification of	3. Mechanical test	
4.	Galvanising test		
5.	Visual examination test		

NOTES :

I. Permissible tolerance shall be ± 5% on the indicated dimensions.

II. The supplier of the clamps shall provide necessary facilities at his works for the acceptance tests.

10.3 Marking / Embossing

Anchoring Clamp, Suspension clamp should bear

- Manufacturers trade mark and logo
- Purchaser, NESCO
- Product Code or Reference
- Traceability Code/Batch Number

10.4 Drawings & Samples:

GA drawing and other particulars along with samples are to be submitted along with offe

ANCHOR (DEADENDCLAMP)

11.0 Scope

This specification covers the design, manufacture, assembly, testing and supply of Accessories for anchoring Aerial Bunched Cables rated 1100 volts and insulated with cross-linked polyethylene and aluminum alloy bare messenger.

	Description	Application
a)	Dead end Clamp (as per REC Construction standard E-35) suitable for bare messenger AB cable (35-70 sq	For fitting onto a pole for anchoring the end of a length of ABC, or for a major change in direction.

11.1 Cable Data

The standard sizes and characteristics of the phase and street lighting conductors, bare messenger wires shall be as specified in IS: 14255-1995 and REC Specification 32/1984 of following sizes

a) 3x95 (Insulated Phase)+1x70(Bare Messenger)+1x16(Insulated street lighting) sq.mm b) 3x50 (Insulated Phase)+1x35(Bare Messenger)+1x16(Insulated street lighting) sq.mm c) 3x50 (Insulated Phase)+1x35(Bare Messenger)

d) 2x50 (Insulated Phase)+1x35(Bare Messenger) sq.mm

12.0 EYEHOOKS

a) Eye hooks shall be of Hot dip GI as per REC construction standard E-35 (Type – A)
b) It should be made of forged hot dip galvanized steel as per IS-1570
c) The clamp corrosion resistance should conform to standards IS 2629 & IS 2633. d) Minimum breaking Load should be 20 KN.

12.1 Type Test

1.0 EARTHING:

Earth mat design to be carried out referring to the I**EEE-Std 81** before implementation of the same. Design shall be based on the soil resistivity. The measurement of the soil resistivity is to be taken before the representative of Owner by using a latest 4-port Digital Earth Tester duly calibrated having validity period. The design of Earth mat to be furnished by the Contractor for approval of the Owner.

The material offered shall be procured from short listed vendor at **E-14** and shall have been successfully Type Tested during last five years on the date of bid opening. The Type Test reports shall be submitted along with the bid.

1.1 GUIDE LINE:

The Earth mat conductor shall be of 75x10 mm GI flats and it shall be laid in both the directions in the Switchyard and the gap between each conductor shall not be more than 2(two) Mtr. However, this gap may be further reduced depending on the design.

Earth risers should be of 50x6 mm GI flats. All equipment & metal parts of the Sub-station should be connected with main earth grid by using 50x6 GI flats at two different places. The main earth grid should be laid not less than 600 mm below the finished ground level. The lap welding should not less than 150 mm. The welding of joints should be done after removal of Zinc by using Blow lamps. Welding should be done in all four sides and should be double layer continuous. Before taking up the second layer welding the deposited flux should be removed. During welding the two flats should be tightened properly by using 'C 'clamps. Immediately after welding two layers of anti-corrosive paints should be painted over the welded portion along with two coats of Black bituminous paints. Before back filling of earth trenches the welded portion should be covered by wrapping with bituminous tape properly and also jointing portion should be covered with PCC (1:2:4) mix. The backfilling of earth pits and trenches should be done with powered loam soil mixed with Bentonite powder (10:1) mix.

All equipment, steel structures etc. should be connected with main earth mat at two points and with separate risers from the main earth mat. All equipment,structures, spikes (if any) should be connected individually with individual Pipe electrodes and again should be connected with main earth grid at two separate places. The Neutral of Power Transformer should be connected with two separate Pipe electrodes and again connected with main earth electrodes at two separate places. The separation distance between each Pipe electrodes should not be less than 3 mts. The back filling of Pipe electrodes should be done in layer of Charcoal, loam soil mixed with Bentonite powder. The value of earth resistance should be less than 0.5 ohm with above arrangement. Where there is possibility of not achieving the earth resistance value, special type of earthing device (chemically treated) can also be used to achieve the desired value.

There should be a closely spaced earth grid of size 1.5 mts x 1.5mts by using

75 mm x 10mm GI flat, with 0.3 mts spacing both ways below the mechanism boxes of each Isolators & AB switches. In Sub-station the diameter of Pipe electrode should not be less than 50 mm dia, heavy gauge GI Pipe (perforated). **The Flange (50x6) mm GI flat should be welded in all sides with Pipe electrode**. In each face of Flange there should be two nos. of 17.5 mm hole to accommodate 16 mm GI Bolt & nut with spring washer.

The fencing of the Switchyard should not directly be connected with main earth mat grid. There should be a separate earth mat by running 75x10 mm GI flat at 2 mts away from outside the fence and should be connected rigidly with the fence at an interval of 5 mts. In addition, another GI Flat of 50x6 mm should run continuously over the fencing and proper welding is also to be made. There should be one 50x6 mm earth flat run over the cable rack and should be connected with main earth mat grid at an interval of 5 mts . The jointing portion of earth flats over the ground should be painted with two coats of Anti-corrosive paints and two coats of good quality of Aluminium paints (Berger/Asian paints).

Provision of watering to earth pits shall have to be provided by using conduit pipe arrangement. The pipes are be connected to the water source provided in the S/s. Each handles of Isolators / AB switches etc should be connected with earth mat grid by using flexible Tinned Copper earth bonds (25mm x 5mm through net). In each earth switches 2(two) nos. flexible earth bonds should be provided. Each earth pits having pipe electrodes

should be provided 250 mm Brick wall chambers duly plastered on all the side with RCC cover Slab. The size of the chamber shall be **450x450x600**mm.

2.0 G.I. Flat (75x 10 mm) & G.I.Flat (50 x 6 mm)

The specification covers supply and testing of Galvanized Steel flat for Earthing arrangements.

2.1. APPLICABLE STANDARDS:

Materials shall conform to the latest applicable Indian standards / International standards.

Sl. No.	Standard No.	Title
1	IS:2062 Grade 'A' Quality	Specification for M.S. Channel and M.S. Flat
2	IS:2062	Chemical and Physical Composition of material
3	IS:1852	Rolling and Cutting Tolerances for Hot Rolled Steel products

2.2 . INSPECTION AND TEST CERTIFICATE

The Owner's representatives shall be entitled at all reasonable time during manufacture to inspect, examine and test at the bidder's premises, the materials and workmanship of the steel section to be supplied. As soon as the steel section are ready for testing , the bidder's shall intimate the Owner well in advance, so that action may be taken for getting the material inspected. The material shall not be dispatched unless waiver of inspection is obtained or inspected by the Owner's authorized representative. The routine & acceptance tests shall be in accordance with the latest version of the relevant Indian Standard.

All conductors buried in earth or in concrete or above the ground level shall be galvanized steel. Galvanized steel shall be subject to four one minute dips in copper sulphate solution as per IS:2633/1922).

The materials to be supplied will be subject to inspection and approval by the Owner's representatives before dispatch unless otherwise waived. Inspection before dispatch shall not, however, relieve the Contractor of his responsibility to supply the steel section strictly in accordance with the ISS.

The representative of Owner shall pick up samples at random from the GI Flats offered for carrying out Routine tests as per specified IS. The representative shall make visual inspection on each & every GI flats. **The**

Owner reserves the right to reject the material if the same is found defective at destination.

2.3. METHOD OF GALVANISING:

Sl. No.	Tests	For GI Flat
1	Dip test	6 dips of 1 min each
2	Mass of Zinc coating	610 gram/sq.m minimum

Pre dispatch inspection shall be performed to witness following tests:

i) Freedom from defects,
ii) Verification of dimensions iii)
Galvanization tests
iv) Mechanical tests
v) Chemical composition tests

These tests are to be performed and certified at Govt. recognized laboratory. MS flat shall conform to IS 2062 & its latest amendments for steel & Galvanization as per IS 4759 & its Latest amendments.

The flat shall be coated with Zn 98 Zinc grade.

The minimum Zinc coating shall be 610 gm/sqm for thickness more than 5 mm and 460 gm/sqm for item thickness less than 5 mm.

3.0 Earth Electrode (50mm Dia. GI having gauge perforated pipe as per ISS)

3.1. Scope:-This specification provides for Supply of Earthing Device (**Heavy Duty**) (50x3000 mm), as per enclosed Drawing.

3.2. APPLICABLE STANDARDS:-

The Earthing Device must be made out of 50 mm (Heavy Gauge- No minus Tolerance is allowed on Wall thickness) Hot Dip G.I. Pipe (as per IS: - 1239,m Part-1, 1990 of reputed Make – (i.e. **SAIL/TATA/ RINL)** & 3.3 mtrs length tapered finished smooth at one end for a length of 75 mm & Clamp at the other end.

Staggered drills hole of 12mm Dia. at an interval of 150mm shall be made before galvanization.

The GI Earthing Clamp/ Strip (C- Clamp Type) is to be of 50mm width, 6mm thickness & flange length of 65 mm in each side. This should be suitable for termination of 4 nos. of GI Flat earth electrodes. The Clamp/ Strip & Earthing pipe after fabrication will be hot dip galvanized confirming to IS: 2629/85 with latest amendments. The clamp shall have two holes in both sides suitable for 16 mm GI Bolts & Nuts. There shall be provision of funnel for pouring water through pipes. The height of the funnel shall be such that the watering will be better. Provision of reduced of GI pipe to be converted to the main GI earth pipe & on the top of the funnel is to be provided.

EARHTING COIL TECHNICAL SPECIFICATION

1.0. Qualification Criteria of Manufacturer:-

The material offered shall be procured from a vendor who must have at least three years experience in manufacturing of the sam. The materials shall have been successfully type tested during last five years on the date of bid opening. The Type Test reports shall be submitted along with the bid.

1.1. SCOPE

The specification covers design, manufacture, testing for use in earthing of the HT poles.

2.0. GENERAL REQUIREMENTS

Earthing coils shall be fabricated from soft GI Wire Hot Dip Galvanized. The Hot Dip galvanized wire shall have clean surface and shall be free from paint enamel or any other poor conducting material. The coil shall be made as per REC constructions standard.The Hot Dip galvanizing shall conform to IS: 2629/1966, 2633/1972 and 4826/1969 with latest amendments.

3.0. TESTS

I Galvanizing Tests

Minimum Mass of Zinc On GI Wire used 280 cm/m²After Coiling-266 gm/m².The certificate from recognized laboratory shall be submitted towards mas of zinc.

II Dip Test

Dip test shall stand 3 dips of 1 minute and one dip of ½ minute before coiling and 4 dips of 1 minute after coiling as per IS: 4826/1979

III Adhesion Test

As per ISS 4826 – 1979.

4.0. DIMENSIONAL REQUIREMENT

Nominal dia of GI Wire -4 mm (Tolerance ± 2.5%)
Minimum no. of turns – 115 Nos.
External dia of Coil (Min) – 50 mm
Length of Coil (Min) – 460 mm
Free length of GI Wire at one end coil (Min.) – 2500 mm
Minimum length of wire to be grounded during installation -1000 mm.
The turns should be closely bound. Weight of one finished Earthing Coils (min.) – 1.850 Kg

5.0 EARHTING COILGUARANTEED TECHNICAL PARTICULARS

(To be submitted along with Offer)

Sl. No.	GENERAL TECHNICAL PARTICULARS	Bidder's Offer
1	Nominal diameter of wire	
2	No. of turns	
3	External dia of Coil	
4	Length of Coil	
5	Mass of Zinc	
6	Total weight of Coil	
7	Whether drawing enclosed (yes)	

6.0. EXTENSION POLE

Pole with pole extension arrangement up to two **to three** meters (**in case** of 33 KV new **Mini base** GI tower structure) shall be used at low ground level locations for maintaining ground clearance and for road crossings for HT Lines.

7.0 PROVISION OF GUYS/STRUT POLES TO SUPPORTS

7.0.1 The arrangement for guys shall be made wherever necessary**.** Strut poles/flying guys wherever required shall be installed on various pole locations as per REC construction standards. In order to avoid guys/ Strut self supported GI poles/ structures may be used.

7.0.2 In this work anchor type guy sets are to be used. These guys shall be provided at following locations where guys are damaged or not provided.

(i) Angle locations
(ii) Dead end locations
(iii) T-off points
(iv) Steep gradient locations.
(v) Double Pole, & four pole

The stay rod should be placed in a position so that the angle of rod with the vertical face of the pit is 30^0 to 45^0 as the case may be maximum movement for tightening or loosening.

7.0.3 If the guy wire proves to be hazardous, it should be protected with suitable asbestos pipe filled with concrete of about 2 m length above the ground level, painted with white and black strips so that, it may be visible at night.

7.0.4 The guy insulator should have a minimum vertical clearance of 3.5 mtr from the ground.

TECHNICAL SPECIFICATION FOR G.I. EARTH WIRE

1.0 SUSPENSION CLAMPS: FOR GROUND WIRE

Clamps of suitable size are required for holding the galvanized steel stranded ground wire at suspension points. The suspension clamps shall be suspended from the lower hanger or 'D' belt of 16mm diameter and should therefore be supplied with a suitable attached that would allow the clamps to swing freely both in the transverse and longitudinal direction. The clamps shall be so designed that the effect of vibration both on the ground wire and the fittings itself is minimum.

The clamps shall be manufactured and finished so as to avoid sharp radia of curvature, ridges which might lead to localized pressure and damage the ground wire in service.

The clamps shall be made of heat treat malleable iron one Eye hook made of forced steel. The entire assembly shall be hot dip galvanized.

The clamping surface shall be smooth and formed to support the ground wire on long easy curves to take care or required steel vertical and horizontal angles.

The clamps shall permit the groundwire to slip before the failure of the latter occurs. The leg of U-bolt holding the keeper piece of the clamps shall be kept sufficient long and shall be provided with threads, nuts and locking nuts for fixing the flexible earthing hond between the suspension clamps and tower structures.

2.0 TENSION CLAMPS (DEAD END ASSEMBLY) FOR GROUND WIRE.

Compression type dead end assembly of G.S.S. ground wire shall be required for use on the tension towers. The dead end assembly shall be supplied with complete jumper terminals, nuts and bolts suitable link pieces between the steel clevis and tower strain plates so as to provide sufficient flexibility not less than that of G.S.S. ground wire and the tensile strength not less than 90% that of the G.S.S. ground wire.The assemblies shall comprise of compression type dead end clamps and one anchor shackle made of forged steel. The entire assembly shall be hot dip galvanized.One of bolt holding joint per terminal of dead end assemblies shall be kept sufficiently long and threaded and shall be provided with nuts, washers and locking nuts for fixing the flexible earthing bond between the dead-end clamp and tower structures.

3.0 Basic Technical Requirement

The following Technical requirement is furnished below:

A	***7/3.15mm Galvanised Stranded Steel Wire For Suspension Clamps***	
i	Materials	Malleable Cast Iron / Galvansied Steel
ii	Size	As per Drawing
iii	Suitable for groundwire	Yes (7/3.15)
iv	Weight in kg	
v	Slip strength	12-17 KN
vi	Minimum failing load	70 KN
vii	Galvanising	
	a.Ferrous parts	Hot Dip Galvanised
	b.Spring washers	Electro Galvanised
	c.Quality of Zinc used	99.5%
	d.Number of dips which the clamp can withstand	4/1 minute dips
viii	Standard to which conforming	IS 2486 and IS 2633

B	***Compression type dead end assemblies For 7/3.15mm Galvanised Stranded Steel Wire***	
i	Materials	Forged steel
ii	Size	As per drawing
iii	Suitable for ground wire	Yes (7/3.15)
iv	Weight in kg	3.694
v	Slipping strength	95% of UTS of Conductor
vi	Minimum failing load	70 KN
vii	Galvanising	
	a.Ferrous parts	Hot Dip Galvanised
	b.Spring washers	Electro Galvanized
	c. Quality of zinc used	99.5%
	d. Number of dips which the clamp can withstand	4/ 1 minute dips
vii	Standard to which conforming	IS 2486 and IS 2633
C	**Flexible copper bond**	
i	Stranding	37/7/0.417mm
ii	Cross sectional area (Sq.mm)	75.6
iii	Minimum copper equivalent area	34Sq.mm
iv	Length of copper cable (mm)	500mm
v	Material lugs	Tinned Copper
vi	Bolt Size	
	(a) Diameter (mm)	16
	(b) Length (mm)	40
vii	Resistance (Ohm)	0.0004 (as per IS:2121)
viii	Total weight of flexible copper bond (kg)	0.45 (approx)

SCHEDULE OF BIDS FOR TECHNICAL

1. Name of tenderer with Office and factory address, Tel.No./Telex No./Fax No. :
2. Specification No. :
3. Address of Local Office and Tel.No./Telex/Fax No. :
4. Tenderer's Referance No. :
5. Last date and time of submission of Tender :
6. Date and time for opening of Tender :
7. Testing Facilities available :
8. Category of organization :
9. Whether qualifying certificates submitted :
10. Particulars of Earnest Money submitted :
11. Whether NESCO delivery clause accepted :
12. Whether agreed to :
    a) Inspection Clause :
    b) Packing Clause :
    c) Retesting Clause :
13. Whether Sample is enclosed :
14. Whether the material/equipment offered conformed to the relevant ISS specification and drawing . :
15. Whether executed orders previously for the items tendered now. Please give full details of supplies made. :
16. Whether the materials bears ISI mark :
17. Offer valid up to :
18. Delivery Schedule :
    a) Commence with minimum quantity :
    b) Rate of delivery per month/quarter and completion time. :
19. If any deviation, please mention in deviation sheet enclosed. :
20. Technical literature/catalogue of the materials offered enclosed. :
21. Bidders work experience including user's certificate furnished or not. :
22. Type test certificate from any National Testing Laboratory ,Govt. of India :
23. ISO-9001 Certificate submitted :
24. Whether Guaranteed Technical Data Sheet Particulars submitted.

Signature of Bidder
With Name and Seal of Firm

(This form is to be duly filled up and duly signed by the Bidder & submitted along with the tender.)

ABSTRACT OF GENERAL TERMS AND CONDITIONS

1.	Earnest Money Furnished	:
2.	Contractor / Firm's work experience including user's certificate furnished or not.	:
3.	Deviation to the specification, if any (list enclosed or not).	:
4.	Test Certificate from any National. Testing Laboratory. Govt. of India	:
5.	ISO-9001 Certificate submitted	:
6.	Guaranteed Technical Particulars	:
7.	Delivery / Execution Date of commencement / Execution	:
8.	Guarantee: Whether agreeable to NESCO Terms.	:
9.	Whether agreeable to furnish security deposit in shape of Bank Guarantee in case his tender is successful.	:
10.	Terms of payment: Whether agreeable to NESCO standard terms of payment or not.	:
11.	Sub-Contractor / Authorized representative	:
12.	Turnover Certificate furnished from Chartered Accountant.	:
13.	Valid ITCC & STCC submitted	:

Signature of the Bidder
Name & With Seal of Firm

[This form is to be duly filled up and duly signed by the Bidder & submitted along with the tender.]

SCHEDULE FOR PRICE BID (1) BASIS = TURNKEY

Dear Sir,

We hereby furnish the detailed price of supply, erection & inspection of the equipment & materials covered for 1Km scope of Rural electrification Work in Mayurbhanj **District** of Orissa under Biju Gram Jyoti Yojana Scheme of Govt. of Odisha. **(All Price in Rs.)**

SCHEDULE FOR PRICE BID (1) BASIS = TURNKEY							
Sl No	**Name of the Work**	**Unit**	**Qnty.**	**Scheduled Price in Rs**		**Bidder Quoted Price in Rs**	
				In figures	**In words**	**In figures**	**In words**
A.	Erection, drawal & conversion single pole S/S to double pole S/S(Excluding DTR) **with 2nos 9mtr 150X150 RS Joist Pole** with replacement of new pin insulator & disc insulator, installing stay set (4 nos of stay per S/S) with stay wire & HT stay set complete. There should be 5nos earthing & All the poles (0.333Cum i.e PCC 1:2:4) and stays (0.1485Cum i.e PCC 1:2:4) are to be concreted.. The line should be duly inspected by authorized officers of Electrical Inspectorate, Orissa so as to make the line suitable for charging.	**No**	**1.00**	205696.00	**Rupees Two lakhs five thousand six hundred ninety six only**		
B.	Erection, drawl & conversion of **2Phase 2wire to 3phase 3wire 11KV HT Line with 55sqmm AAA Conductor with** F clamp, Pole top bracket, with installation of pin insulator & disc insulator where ever required and by binding the conductor with the alluminium binding wire where ever required and making jumpering with the same AAA conductor through P.G clamp, installing stay set (3 nos. of stay per K.m on the average)with stay wire & HT stay set complete. There should be one cut point per Km on the average. The line should be duly inspected by authorized officers of Electrical Inspectorate, Orissa so as to make the line suitable for charging.	**Km**	**1.00**	**94837.00**	**Rupees Ninety four thousand eight hundred thirty seven only.**		

SCHEDULE FOR PRICE BID (2) BASIS = TURNKEY							
Sl No	**Description of work**	**Unit**	**Qnty.**	**Scheduled Price in Rs In figures**	**In words**	**Bidder Quoted Price in Rs In figure**	**In words**
C	Erection, drawal & commissioning of **11KV 3Phase HT Line (1Km) with 55 sqmm AAA Conductor with 9 mtr long 100X116 mm RS Joist Pole with 60 mtr. span (17spans per Km),** having one DP per KM installed over V cross arm, F clamp, Pole top bracket, back clamp for 'V' cross arm with installation of pin insulator & disc insulator where ever required and by binding the conductor with the alluminium binding wire where ever required and making jumpering with the same AAA conductor through P.G clamp where ever required, installing stay set where ever required (6 nos. of stay per K.m on the average) with stay wire & HT stay set complete. There should be four cut point per Km on the average. The line should be duly inspected by authorized officers of Electrical Inspectorate, Orissa so as to make the line suitable for charging. All the poles (0.333Cum i.e PCC 1:2:4) and stays (0.1485Cum i.e PCC 1:2:4) are to be concreted. **N.B. –** All the required materials for the above work has to be provided by the bidder as per on going REC specification & the workmanship should also be of REC standard. The iron materials should be painted with two coats of red oxide paint. Proof of purchase of material is required.Stay to be provided wherever the angular deviation of line exceeds 15 degree. The padding & cooping work of all HT supports must be done as per REC standard. There should be inscribed in each pole "BIJU GRAM JYOTI" and the year of electrification in white paint in the background of deep green paint.	**Km**	**1.00**	**937985.00**	**Rupees Nine lakhs thirty seven thousand nine hundred eighty five only**		

SCHEDULE FOR PRICE BID (8) BASIS = TURNKEY

Sl No	Description of work	Unit	Qnty.	Scheduled Price in Rs In Figures	Scheduled Price in Rs In words	Bidder quoted Price in Rs In figures	Bidder quoted Price in Rs In words
D	Erection, drawal & commissioning of **of 3-Phase XLPE insulated ABC LT OH Lines (Span = 40m), with 8 mtr 125X70 mm RS Joist Pole(**25Nos of pole per Km) along with earthing arrangement, suspension clamp,dead end clamp,pole clamp with eyehook, percing & neutral connector etc. LT stay set complete in all respect & Supply & stringing of XLPE Insulated, 3-Phase ABC (a**)(3X50+1x16+1X35)sq.mm** as per specification along with Supply & erection of LT stay set Complete set(Eight numbers per Km on the average). All the poles (0.333Cum i.e PCC 1:2:4) and stays (0.1485Cum i.e PCC 1:2:4) are to be concreted. **N.B. –** All the required materials for the above work has to be provided by the bidder as per on going REC specification & the workmanship should also be of REC standard. The iron materials should be painted with two coats of red oxide paint. Proof of purchase of material is required. Stay to be provided wherever the angular deviation of line exceeds 15 degree. The padding & cooping work of all LT supports must be done as per REC standard. There should be inscribed in each pole "BIJU GRAM JYOTI" and the year of electrification in white paint in the background of deep green paint.	**Km**	**1.00**	**613868.00**	**Rupees six lakh thirteen thousand eight hundred sixty eight only.**		

SCHEDULE FOR PRICE BID (9) BASIS = TURNKEY

Sl No	Description of work	Unit	Qnty.	Scheduled Price in Rs		Bidder quoted Price in Rs	
				In figures	In words	In Figures	In words
E	Erection, drawal & Conversion from 1Ph LT line to **3-Phase XLPE insulated ABC LT OH Lines, with 12 nos of 8 mtr 125X70 mm RS Joist Pole** along with earthing arrangement, suspension clamp,dead end clamp,pole clamp with eye hook,percing & neutral connector etc. and 4 nos LT stay set complete in all respect & Supply & stringing of XLPE Insulated, 3-Phase ABC (a**)(3X50+1x16+1X35)sq.mm** as per specification along with Supply & erection of LT stay set Complete set(Eight numbers per Km on the average). All the poles (0.333Cum i.e PCC 1:2:4) and stays (0.1485Cum i.e PCC 1:2:4) are to be concreted. **N.B. –** All the required materials for the above work has to be provided by the bidder as per on going REC specification & the workmanship should also be of REC standard. The iron materials should be painted with two coats of red oxide paint. Proof of purchase of material is required.. Stay to be provided wherever the angular deviation of line exceeds 15 degree. The padding & cooping work of all LT supports must be done as per REC standard. There should be inscribed in each pole "BIJU GRAM JYOTI" and the year of electrification in white paint in the background of deep green paint.	**Km**	**1.00**	**419456.00**	**Rupees four lakhs nineteen thousand four hundred fifty six only**		

SCHEDULE FOR PRICE BID (2) BASIS = TURNKEY							
Sl No	**Description of work**	**Unit**	**Qnty.**	**Scheduled Price in Rs In figures**	**In words**	**Bidder Quoted Price in Rs In figure**	**In words**
F	Erection, commissioning & upgradation of **11KV 3Phase HT Line (1Km) with 100 sqmm AAA Conductor with 10nos of interposing 11mtr long 150X150 mm RS Joist Pole,** having one DP per KM installed over V cross arm, F clamp, Pole top bracket, back clamp for 'V' cross arm with installation of pin insulator & disc insulator where ever required and by binding the conductor with the alluminium binding wire where ever required and making jumpering with the same AAA conductor through P.G clamp where ever required, installing stay set where ever required (6 nos. of stay per K.m on the average) with stay wire & HT stay set complete. There should be three cut point per Km on the average. The line should be duly inspected by authorized officers of Electrical Inspectorate, Orissa so as to make the line suitable for charging. All the poles (0.333Cum i.e PCC 1:2:4) and stays (0.1485Cum i.e PCC 1:2:4) are to be concreted. **N.B. –** All the required materials for the above work has to be provided by the bidder as per on going REC specification & the workmanship should also be of REC standard. The iron materials should be painted with two coats of red oxide paint. Proof of purchase of material is required.Stay to be provided wherever the angular deviation of line exceeds 15 degree. The padding & cooping work of all HT supports must be done as per REC standard. There should be inscribed in each pole "BIJU GRAM JYOTI" and the year of electrification in white paint in the background of deep green paint.	**Km**	**1.00**	874220.00	Rupees Eight lakhs seventy four thousand two hundred twenty only		

SCHEDULE FOR PRICE BID (2) BASIS = TURNKEY							
Sl No	**Description of work**	**Unit**	**Qnty.**	**Scheduled Price in Rs In figures** **In words**		**Bidder Quoted Price in Rs** **In figure**	**In words**
G	Erection, commissioning & upgradation of **33KV Line (1Km) with 232 sqmm AAA Conductor with 10nos of interposing 11mtr long 150X150 mm RS Joist Pole,** having one DP per KM installed over V cross arm, F clamp, Pole top bracket, back clamp for 'V' cross arm with installation of pin insulator & disc insulator where ever required and by binding the conductor with the alluminium binding wire where ever required and making jumpering with the same AAA conductor through P.G clamp where ever required, installing stay set where ever required (6 nos. of stay per K.m on the average) with stay wire & HT stay set complete. There should be three cut point per Km on the average. The line should be duly inspected by authorized officers of Electrical Inspectorate, Orissa so as to make the line suitable for charging. All the poles (0.333Cum i.e PCC 1:2:4) and stays (0.1485Cum i.e PCC 1:2:4) are to be concreted. **N.B. –** All the required materials for the above work has to be provided by the bidder as per on going REC specification & the workmanship should also be of REC standard. The iron materials should be painted with two coats of red oxide paint. Proof of purchase of material is required.Stay to be provided wherever the angular deviation of line exceeds 15 degree. The padding & cooping work of all HT supports must be done as per REC standard. There should be inscribed in each pole "BIJU GRAM JYOTI" and the year of electrification in white paint in the background of deep green paint.	**Km**	**1.00**	1575666.00	Rupees Fifteen lakhs seventy five thousand six hundred sixty six only		

SCHEDULE FOR PRICE BID (2) BASIS = TURNKEY							
Sl No	**Description of work**	**Unit**	**Qnty.**	**Scheduled Price in Rs In figures**	**In words**	**Bidder Quoted Price in Rs In figure**	**In words**
H	Erection, drawal & commissioning of **33KV Line (1Km) with 232 sqmm AAA Conductor with 21nos of 11 mtr long 150X150 mm RS Joist Pole with 60 mtr. span,** having two DP per KM installed over V cross arm, F clamp, Pole top bracket, back clamp for 'V' cross arm with installation of pin insulator & disc insulator where ever required and by binding the conductor with the alluminium binding wire where ever required and making jumpering with the same AAA conductor through P.G clamp where ever required, installing stay set (10 nos. of stay per K.m on the average) with stay wire & HT stay set complete. There should be four cut point per Km on the average. The line should be duly inspected by authorized officers of Electrical Inspectorate, Orissa so as to make the line suitable for charging. All the poles (0.333Cum i.e PCC 1:2:4) and stays (0.1485Cum i.e PCC 1:2:4) are to be concreted. **N.B. –** All the required materials for the above work has to be provided by the bidder as per on going REC specification & the workmanship should also be of REC standard. The iron materials should be painted with two coats of red oxide paint. Proof of purchase of material is required.Stay to be provided wherever the angular deviation of line exceeds 15 degree. The padding & cooping work of all HT supports must be done as per REC standard. There should be inscribed in each pole "BIJU GRAM JYOTI" and the year of electrification in white paint in the background of deep green paint.	**Km**	**1.00**	2124701.00	Rupees twenty one lakhs twenty four thousand seven hundred only.		

PROFORMA OF BANK GUARANTEE FOR EARNEST MONEY DEPOSIT

Bank Guarantee No…….
Date…….

1. In accordance with invitation to Bid No…….. Dated…… of Collector & District Magistrate Mayurbhanj (herein after referred to as Collector) for the purpose of …….. M/s……. Address…….. …… wish / wishes to participate in the said tender and as the Bank Guarantee for the sum of Rs……. (Rupees…….. only) valid for a period of …….. days (in words) is required to be submitted by the tenderer. We the …….. Bank (herein after referred to as the bank) at the request of M/s…….. hereby unequivocally and unconditionally guarantee and undertake to pay during the above said period or written request by the Collector, an amount not exceeding Rs……. (Rupees……. only) to Collector without any reservation. The guarantee will remain valid up to 4.00PM of date…….. (date) and if any further extension is required the same will be extended on receiving instruction from M/s……. on whose behalf this guarantee has been issued.
2. We, the …….. Bank do hereby undertake to pay the amounts, due and payable under the guarantee without any demur, merely on a demand from the Collector stating that the amount claimed is due by war of loss or damage caused to or suffered by Collector by reason of any breach by the said contractor(s) of any of the terms or conditions contained in the said agreement or by the reason of any breach by the said contractors failure to perform the said Bid. Any such demand made on the Bank shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs. ……. (in words).
3. We undertake to pay to the Collector any money so demanded not withstanding any dispute or dispute raised by the contractor(s) / Supplier(s) in any suit or proceeding instituted / pending before any Court or Tribunal relating thereto our liability under this agreement being absolute and univocal. The payment made under this bond shall be a valid discharge of our liability for payment there under and the contractor(s) / supplier(s) shall have no claim against us for making such payment.
4. We, the ……. Bank our local Branch at baripada(detail address & Code No. of local branch to be specified) further agree that the guarantee herein contain shall remain in full force and effect during eh period 240 days (two hundred and forty days) and it shall continue to do so enforceable till all the dues of the Collector under by the virtue of the said Bid have been fully paid and its claims satisfied or discharged or till Collector certifies that the terms and conditions of the said Bid have been fully and properly carried out by the said contractor(s) and accordingly discharge this guarantee. Unless a demand or claim under this guarantee is made on us in writing on or before the …… we shall be discharged from all liabilities under this guarantee thereafter.

We, the ……. Bank our local Branch at Baripada further agree that Collector shall have the fullest liberty without our consent and without affecting any manner our obligations hereunder to very and of terms and conditions of the said Bid or to extend time of performance by the said contractor(s) from time to time to postpone for any time or from time to time any of the powers exercisable by Collector against the said contractor(s) and to forebear or enforce any of terms and conditions relating to the said Bid and we shall not be relived from our liability by reason of any such variation postponement or extension being granted by the contractor(s) or for any forbearance act of omission on part of Collector to the said contractor(s)

1. or by any such matter or thing whatsoever which under the law relating to sureties should but for this provisions have effect of so relieving us.
2. The guarantee will not discharged due to change in the name, style and constitution of the Bank and contractor(s).

3. We, the …… Bank our local Branch at Baripada lastly undertake not to revoke this guarantee during its currency except with the previous consent of Collector in writing.

Dated……Day of ……..200…….
Witness :-
1……..
2……

For

……
(indicating name of the Bank with seal)

PROFORMA OF BANK GUARANTEE FOR PERFORMANCE GUARANTEE

(To be stamped in accordance with Stamp Act.)

Bank Guarantee No…….
Date…….

This Guarantee Bond is executed this …… Day …… 200 by us the …… Bank at …… P.O…… P.S…… Dist…….. State……

Whereas the Collector & District Magistrate, Mayurbhanj (hereinafter called "Collector") has placed Order No……. Dt…… (herein after called "the Agreement") with M/s…….. (herein after called "Contractor") for Electrification of villages / hamlets under Biju Gram Jyoti Scheme on Turnkey basis and whereas Collector has agreed to exempt from depositing of performance guarantee amount on furnishing by the Contractor to the Collector a Bank Guarantee of the value of 10% (Ten percent) of the Contract price valid for 18 months from the date of completion of work of the said Agreement.

1. Now, therefore, in consideration of the Collector having agreed to exempt from deposit of performance guarantee amount in terms of the said Agreement as aforesaid, we the ……Bank, Address……..…… (code No. ……..) (herein after referred to as "the Bank") do hereby undertake to pay to the Collector an amount not exceeding Rs……..……. (Rupees…….…… ……) only against any loss or damage caused to or suffered by the Collector by reason of any breach by the said Contractor(s) of any of the terms or conditions contained in the said Agreement.

2. We, the ……. Bank do hereby undertake to pay the amounts due and payable under the guarantee without any demur, merely on a demand from the Collector stating that the amount calmed is due by way of loss or damage caused to or suffered by Collector by reason of any breach by the said Contractor (s) of any of the terms or conditions contained in the said Agreement or by the reason of any breach by the said Contractor's failure to perform the said Agreement. Any such demand made on the Bank shall be conclusive as regards the amount due and payable by the Bank under this Guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs……..… (Rupees…….. … …… ……..) only.
3. We, the ……. Bank also undertake to pay to the Collector any money so demanded not withstanding any dispute or dispute raised by the Contractor (s) in any suit or proceeding instituted / pending before any court or Tribunal relating thereto our liability under this Agreement being absolute and unrecoverable.

   The payment so made by us under this bond shall be valid discharge of our liability for payment there under and the Contractor(s) shall have no claim against us for making such payment.

4. We, the …….. Bank further agree that the guarantee herein contain shall remain in full force and affect during the period that would be taken for the performance of this said Agreement and it shall continue to remain in force endorsable till all the dues of the Collector under by virtue of the said Agreement have been fully paid and its claim satisfied or discharged or till Collector certifies that the terms and conditions of the said Agreement have been fully and properly carried out by the said Contractor(s) and accordingly discharge this guarantee and will not be revoked by us during the validity of the guarantee period.

Unless a demand or claim under this guarantee is made on us or with ……. (Local Bank Name, Address and code No.)……, Mayurbhanj in writing on or before ……. (date) we shall be discharged from all liability under this guarantee thereafter.

5. We, the ……..Bank further agree that the Collector shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said Agreement or to extend time of performance by the said Contractor(s) and we shall not be relieved from our liability by reason of any such variation or extension being granted to the said contractor or for any forbearance act or omission on part of the Collector or any indulgence by the Collector to the said Contractor(s) or by any such matter or thing whatsoever which under the law relating to sureties would but for this provisions have effect of so relieving us.

6. The Guarantee will not be discharged due to change in the name, style and constitution of the Bank and or Contractor(s).

7. We, the …… Bank lastly undertake not to revoke this Guarantee during its currency except with the previous consent of the Collector in writing.

Dated……. The ……. Days of Two thousand ……

Not withstanding anything contained herein above.

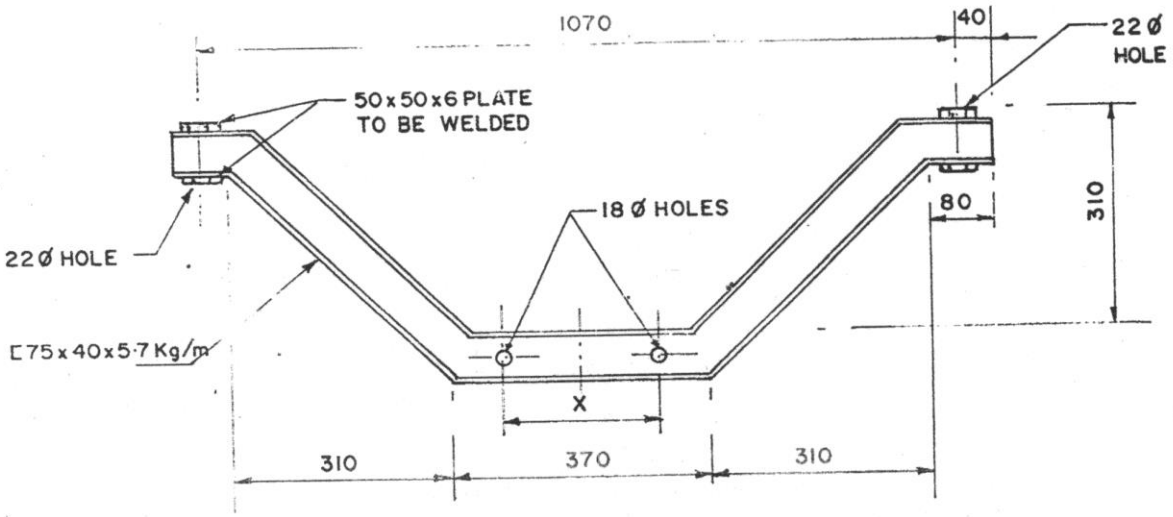
i) Our liability under this Bank Guarantee shall not exceed Rs. …… (Rupees……) only.
ii) The Bank Guarantee shall be valid up to ……only.
iii) We or our Bank at ……..(Name & Address of the Local Bank, Dhenkanal) are liable to pay the guaranteed amount depending on the filling of claim and any part thereof under this Bank Guarantee only if you serve upon us or our local Bank at ……, a written claim or demand and received by us or by Local Branch at …… on or before, Dt…… otherwise bank shall be discharged of all liabilities under this guarantee thereafter.

For…….
(indicate the name of the Bank)

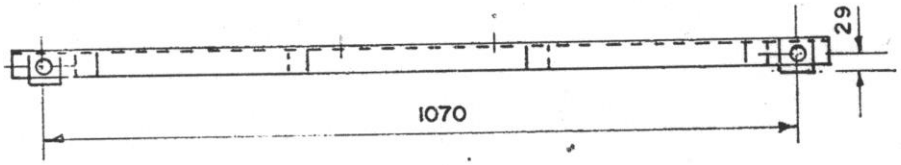
N.B.:-

1) Name of the Contractor:
2) No. & date of the purchaser order / agreement:
3) Name of the Bank:
4) Amount of the Bank Guarantee:
5) Name, Address and Code No. of the Local Branch:
6) Validity period or date upto which the agreement is valid:
7) Signature of the Constituent Authority of the Bank with seal:
8) Name & address of the Witnesses with signature:
9) The Bank Guarantee shall be accepted only after getting confirmation from the respective Bank

REC
CONSTRUCTION STANDARD
A-6



ELEVATION



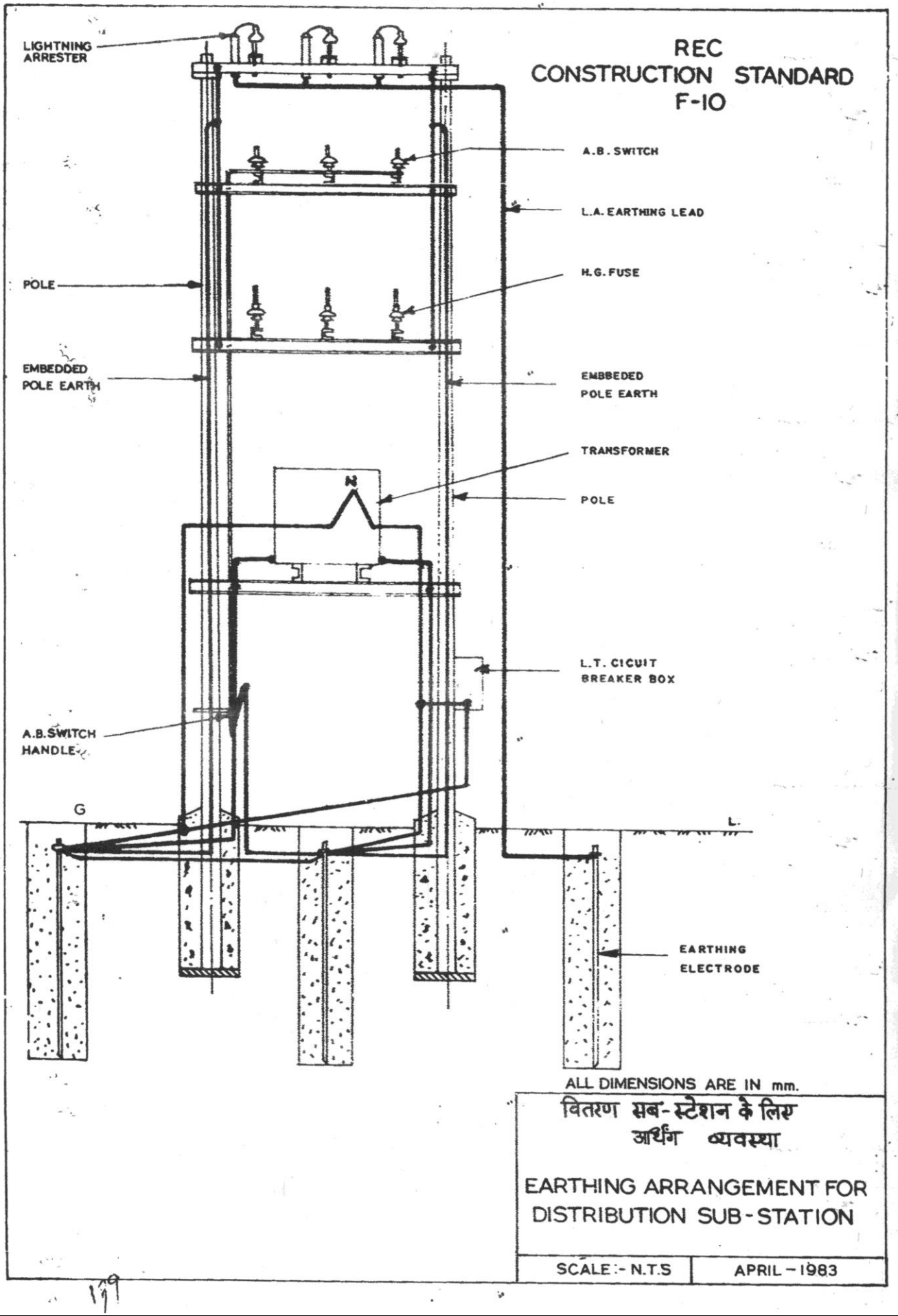
PLAN

X :- -TO SUIT THE POLE
NOTE :-AS AN ALTERNATIVE, M.S. ANGLE CROSS-ARM (A-13) MAY BE USED IF CHANNEL SECTION AS PER THIS STANDARD IS NOT AVAILABLE

ALL DIMENSIONS ARE IN mm.

११ के०वी० लाईन
V-केंची भुजा
11 KV LINES
V - CROSS ARM

SCALE :- N.T.S	SEPT. - 1972



REC
CONSTRUCTION STANDARD
F-10

ALL DIMENSIONS ARE IN mm.

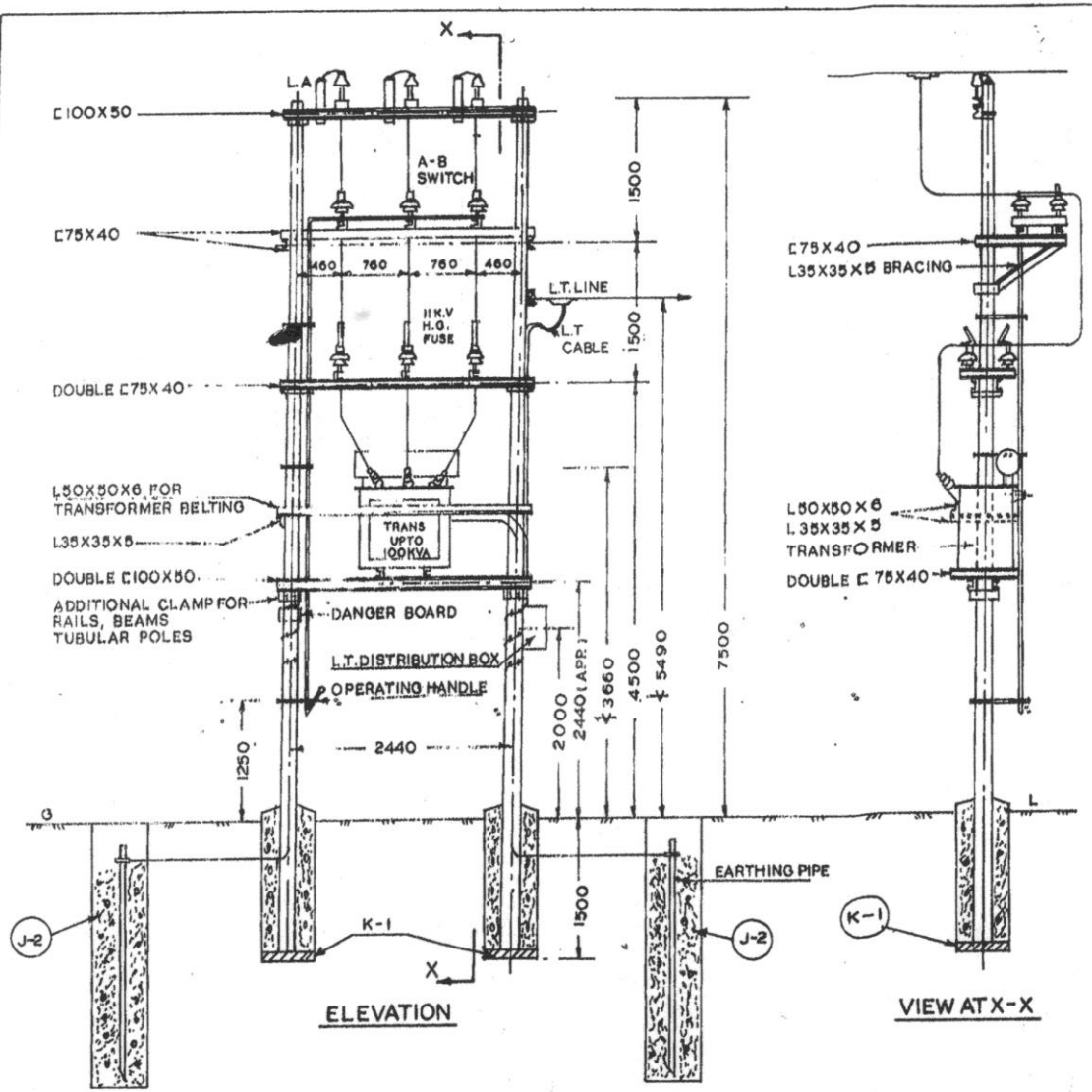
वितरण सब-स्टेशन के लिए
अर्थिंग व्यवस्था

EARTHING ARRANGEMENT FOR
DISTRIBUTION SUB-STATION

SCALE :- N.T.S	APRIL – 1983

179

REC
CONSTRUCTION STANDARD
F-4



BILL OF MATERIAL

SUPPORT - 9m	2
CHANNEL 100X50 - 2800 (APP.)	3
CHANNEL 75X40 - 2800 (APP.)	4
CHANNEL 75X40 - X-ARM FOR A-B SWITCH - 1000 (APP.)	2
ANGLE 50X50X6 - 2800 (APP.)	4
ANGLE 35X35X5 - BRACING FOR SUPPORTING A-B SWITCH - 1000 (APP.)	2
ANGLE 35X35X5 - FOR TRANSFORMER BELTING	2
DISTRIBUTION TRANSFORMER	1
AIR BREAK SWITCH (HORIZONTAL TYPE	1 SET
H.G. FUSE UNIT - 3 PHASE	1 SET
11KV LIGHTNING ARRESTERS	3
DISTRIBUTION BOX	1
PIPE/ROD EARTHING (REFER J-2)	AS REQD.
BASE PLATE (REFER K-1)	2
DANGER BOARD	1
CLAMPS, NUTS, BOLTS, BARBED WIRE ETC.	AS REQD.
L.T CABLE	AS REQD.

NOTE:- REFER F-5 FOR LOCATION OF EARTH PITS

११ के० वी०/४३३-२५० वी०
वितरण उप-केन्द्र
(चालू लाइन के स्थानान्धीरण के लिए)
आरपार लाइन

11KV/433 - 250V
DISTRIBUTION SUB-STATION
(FOR ON LINE LOCATIONS-ACROSS LINE)

SCALE :- N.T.S | 1972/JAN - 1993

140

188

154

GENERAL CONDITIONS OF CONTRACT / TENDER

1. The tender will be examined for the document called for. The bid of the tenderer if not complete in all respect can be rejected .However there can be consideration in case of documents which are not very important for the point of view of work i.e which will not give indication of poor workmanship if deemed appropriate by the consideration of District Electricity committee constituted for the purpose of electrification under the chairmanship of Collector & District Magistrate, Mayurbhanj.

2. In case of HT lines or LT lines on the average there should be one D.P. per K.M of line. Besides to take care of bends more than 80 degree or for other exigencies if there is necessity there will be one cut point Per K.M. on the average over and above the D.P. point. If for some reason the average cut point become more than 1 cut point per K.M. for which the tenders had to bear additional financial burden, the matter will be referred to District electricity committee constituted for the purpose of electrification. Depending upon the justification after going, into details the committee under the chairmanship of the Collector and District Magistrate Mayurbhanj may pass the higher bill. The additional cost should be maximum within 5% of the cost of line, which the tenderer has constructed as per his rate submitted in the tender. The average will be decided taking block as a unit.

3. The rates quoted by the contractor should be inclusive of the materials cost plus transportation cost plus the labour cost and the cost of conveyance for inspection. At the time of handing over the line or sub station they should be ready for charging and operation.

4. The work of the contractor will be inspected from time to time (stage inspection) by the authorized representative of the Collector cum District Magistrate Mayurbhanj and that the Superintending Engineer Electrical Circle Baripada and incase it is seen that the materials used is substandard or workmanship is substandard the contractor will be asked to change the material or re do the work within the stipulated time. If the contractor fails to do so his bill will not be passed and the work may be awarded to another contractor for whole or balance part of the work.

5. In case of any difference in opinion in work or work related matter the district Electricity committee (Created for village Electrification purpose) will settle the issue which will be binding contractor/bidder.

6.The contractor has to give an undertaking to the effect that he will abide by all the terms & conditions stipulated in the general conditions of contract /tender and at no point of time he will disagree with the terms & conditions mentioned in the contract/tender. In case of such an incident the contract may be cancelled and may be re -awarded to another bidder.

7.Prior to bidding all the tenderer should clarify their doubts pertaining to tender, if any, from the SE, Electrical circle Baripada.

Sd/-
Collector & District Magistrate
Mayurbhanj