DISTRICT OFFICE BALASORE
COLLECTOR & DISTRICT MAGISTRATE BALASORE
PHONE 06782 – 262001, FAX – 06782- 262208
E-Mail : dmbls@ori.nic.in

TENDER NOTICE NO: 290 DATED: 06.03.2012

BIJU SAHARANCHAL VIDYUTIKARAN YOJANA

Revised sealed tenders are invited from Registered/ licensed electrical contractors having valid H.T. license issued by ELBO for erection of 11KV O.H. Lines, Up gradation of capacity of the existing distribution system, Erection of 16KVA, 11/0.23 and 25 KVA, 11/0.4 KV Sub-Stations, erection of L.T. Lines with AB cables, Electrification of BPL Households under Kutir Jyoti Scheme, and other work related to Electrification under **Biju Saharanchal Vidyutikaran Yojana** with supply of materials on Turn Key basis in Balasore Municipality for the year 2010-11 & 2011-12.

Balasore Municipality,

The details are as follows.

Sl. No.	Name of Municipality	EMD (in Rs.)	Cost of Tender documents in Rs.	Period of completion
1.	Balasore Municipality	1% of total quoted price	6000/- Plus 4% VAT	3 (Three)Calendar Months

Terms and Conditions are as follows:-

1 -Tender papers consisting of technical Specification and other Terms and conditions etc. can be Downloaded from http://www.baleswar.nic.in from dt.07.03.2012 to dt.22.03.2012. Tender papers are to be submitted along with the cost of tender papers including 4% VAT in shape of bank draft in favour of Project Director DRDA, Balasore payable at any nationalized bank at Balasore failing which the tender paper is liable to be cancelled. The cost of tender paper is not refundable.

2 – Each Intending party/agency/company can bid for one or more Municipality, but separate Tender are required to be submitted for each Municipality.

3 – Sealed tenders should be sent to the office of the project Director, D.R.D.A., Balasore through Regd. Post/Speed Post / by hand. The envelope containing the Tender Papers should be super scribed with "Tender for BIJU SAHARANCHAL VIDYUTIKARAN YOJANA for the Year 2010-11& 2011-12".

4 – The sealed tender documents should reach the office of the Project Director, DRDA, Balasore on or before dated 22.03.2012 by 3.00 p.m. positively.

5 – Tenders will be opened on dated 23.03.2012 at 11.30 a.m. in the office of the Project Director,
DRDA, Balasore in presence of bidders or their authorized representative. 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.

6 – Tenders received after due date & time will not be entertained under any circumstances. The

authority will not be responsible for any postal delay.

7 – The sealed Tenders must be accompanied with attested copies of valid Electrical H.T. contractors license obtained from Electrical Licensing Board of Orissa (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. In absence of complete documents, the bid will be rejected. The tenderer would be under obligation to produce 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 Orissa at the time of submission of tender.

8 – EMD as specified should be submitted in shape of Demand Draft drawn in any way of the Nationalized Bank payable at Balasore in favour of Project Director, DRDA, Balasore along with tender document. In absence of proper EMD, the bid will be rejected. Bidders participated in earlier tender call Notice No.4385 dt.02.12.2010 & No.1261 dt.08.12.2011 are exempted for paying the EMD provided that the EMD amount are not taken by them. Bidders participated in earlier tender will deposit the balance EMD amount.

9 – The bidders must have a minimum turnover of Rs. 50 Lakhs (Rupees Fifty Lakhs Only) & above in the last financial year i.e. Year 2010-11. 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 submitted along with bid documents. 1 % EMD if the total tender value quoted by them exceeds Rs.50 lakhs for Municipality.

10 – The bidders are Required to have executed at least one work of Rs. 10.00 (Rupees TEN) Lakhs under single agreement in a year during any of the last two years. Attested copies of the work orders and satisfactory completion of such works in last one year should be submitted along with bid documents.

11 – The bidders are requested to quote the rates both in words and figure 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 rates in words will be taken as final.

12– The undersigned reserves the right to reject any or all the tenders without assigning any reason thereof.

13. All the Tenders received for Balasore Municipality against Tender Call Notice No.4385 dt.02.12.2010 & No.1261 dt.08.12.2011 are hereby cancelled.

Sd/-
Collector & District Magistrate
Balasore

Section-I

INFORMATION TO BIDDERS

00.00 The Collector & District Magistrate, Balasore invites sealed bids from eligible interested bidders on two part bidding system on ***Turnkey Basis*** for construction of new 11KV line, Re-conductoring of 11 KV line, Construcltion of Distribution Transformer Centrer of different capacity , upgradation of existing Distribution Sub-station construction of LT line & Reconductoring of L.T. line with AB conductor, Providing service connection to un electrified BPL household on the pattern of " Kutir Jyoti" in the Municipality area of **Balasore** District.

01.00 **INTRODUCTION**

01.01 The State Govt. of Orissa has launched "BIJU Saharanchala Vidyutikarana Yojana of the state Government" for electrification of villages / Wards/ Slums which are not scheduled to be covered under MLA LAD/ MP LAD fund/ BRGF etc.

01.02 Electrification of un-electrified villages / Wards/ Slums with a minimum population of 100 within their respective jurisdiction duly approved by the Municipal Corporation/Municipalities/NACs will be covered under this programme.

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

a) Up-gradation of existing Distribution Transformer of appropriate capacity.
b) Re-conductoring of 11KV conductor & use of AB cable LT lines.
c) Provision of LT less Transformer.
d) Provision of DT metering for energy audit
e) Provision of XLPE AB cable for LT line
f) Electrical service connection to un electrified BPL households on the pattern of "Kutir Jyoti".

01.04 Balasore District has one no Municipality.

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.

2.1 **Owner / Purchaser:**

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

2.2 **Contractor:**

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

2.3 **Engineer In Charge:**

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

2.4 **Consignee:**

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

2.5 **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.

2.6 **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.

2.7 **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.

2.8 **Approved:**

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

02.09 **Months:**

Months shall mean the calendar month.

02.10 **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.

02.11 **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**

03.01 Balasore District is located in the Northern part of Orissa. NH- 5 & NH- 60 pass through the district.

04.00 **SITE**

04.01 The site is spread in **Balasore** revenue district of **Orissa** state. The Balasore district has one municipality for which this tender is meant as detailed below:

5.0 **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 Superintending Engineer, Electrical Circle, NESCO, Balasore for sale to the interested eligible parties on receipt of application for the same alongwith Bank Demand Draft in favour of Project Director, DRDA, payable at Balasore for an amount of Rs.6,000/- plus 4% vat for Municipality area.

06.02 The bid specification documents will be available for sale on submission of a written application from Dt. 07.03..2012 during office working hours. Completed bids shall be received upto 15.00 Hrs on Dt. **22.03.2012.**. This part –I bid (technical bid) will be opened on on Dt. **23.03.2012 at 11.30 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. Balasore.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 Project Director, DRDa, Balasore payable at Balasore along with the bid document in order to make them eligible to participate in the tender.

06.05 Request for Bid Document through post / by hand will 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 / by hand to PD, DRDA, Balasore, Dist: Balasore, PIN: 756001. 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 Bank Draft for the specified value drawn in favour of "Project Director, DRDA, Balasore", payable at Balasore or in

shape of Bank Guarantee for said amount issued by any Nationalised Bank payable at Balasore in the prescribed format only & the Bank Demand draft in favour of Project Director, DRDa, Balasore payable at Balasore towards the cost of Tender paper, in case, bid documents are down loaded from website.

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

1. Valid H.T. license issued by ELBO.
2. Audited balance sheet in support of Turnover more than Rs.10 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.
6. Labour license.
7. ITCC, PAN card, TAN card.(Optional)
8. VAT clearance certificate
9. Experience supported by client's letter

07.05 **Envelope – C** – The price offer shall be furnished items as per Price Bid after proper field survey.

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

On the stipulated date / time the envelopes marked 'D' 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 corresponding envelope 'B' will be opened and the same will be read out as necessary.

The sealed **envelope 'C' 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 owner will have the right to seek any clarification that might be necessary. The bidders are expected to respond to such quarries within a reasonable time. However quarries of owner and bidders response shall not affect the eligibility criteria in any manner.

08.00 **PERFORMANCE BANK GUARANTEE:**

The Bidder will submit Performance Bank Guarantee alongwith acceptance from any Nationalised / Scheduled Bank, encashable at Balasore amounting 10% of total Contract value valid for 18 months from the date of completion of the work. No interest will be allowed for the Performance Bank Guarantee submitted by the Bidder.

09.00 **TERMS OF PAYMENT:**

(i) 80% of cost of materials, and services alongwith 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, Balasore 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 18 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**

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

13.02 **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.

13.03 The work after due completion under the supervision of SE Electrical (or E.E.BED Balasore,NESCO in their respective areas shall be inspected by competent authority of Electrical Inspectorate Govt. of Orissa. 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 45 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, Balasore 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, Balasore 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 with +/-20% of tender Quantities.

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 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.

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 **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.

20.0 **LEGAL JURISDICTION:**

Material pertaining to this order including it's 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 Balasore only.

21.00 **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.

22.00 **PRE-BID DISCUSSION:**

A pre bid meeting will be held on the stipulated date to clarify doubts (if any) of the intending bidders on the bid specification documents. The owner may also modify the stipulating in the bidding documents on its own. Bidders needing clarification shall forward their quarries to the owner well in advance of pre bid meeting date. Clarification / modification if any shall be issued by the purchaser / owner to all the bidders who have purchased the bidding document in the form of addendum which shall for all practical purposes be part of bidding document.

23.0 **ACCEPTANCE OF ORDER**

The **Collector & District Magistrate, Balasore** 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 DD / Bank Guarantee in favour of **"Project Director, DRDA, Balasore"** must be from any Nationalised / Scheduled Bank payable at **Balasore.**

- Cost of Bidding Scheduled Contract Document = Rs 6,000.00/- +4% VAT per Municipality
- Date of beginning of sale of Bidding documents = Dt. 07.03.2012 during office hours.
- Last date and time of receipt of Bids =Dt.22.03.2012 upto 15.00 hrs. in office of the Project Director DRDA, Balasore
- Date and time of opening of bid (Financial.) will be intimated to all responsive bidders after evaluation of technical proposal**.**
- Date of Pre Bid discussion (if any) = Dt.23.03.12 at 11.30 Hrs in office of the Project Director,DRDA,Balasore owner 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 180 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, Balasore
Tel: 06782 - 262001
FAX- 06782- 262208
E-mail – dmbls@ori.nic.in

SECTION – II

INSTRUCTION TO BIDDERS

INSTRUCTION TO BIDDERS

01.00 **SCOPE**

The Collector & District Magistrate, Balasore invites sealed bids from eligible interested bidders on two part bidding system on ***Turnkey Basis*** for construction of new 11KV line, Reconductoring of existing 11KV line, Erection of Distribution Sub-station of different capacity, upgradation of existing Distribution Sub-station, construction of LT line & Reconductoring of LT line with AB cable, Providing service connection to unelectrified BPL house holdS on the pattern " Kutir Jyoti" in the Municipality area of Balasore District.

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, Balasore, 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.

06.05 The Purchaser / Owner may waive any minor informality or non-conformity or irregularity in a bid which does not constitute a material deviation, provided such waiver does not prejudice or affect the relative ranking of any Bidder.

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 by up to 20% 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:**

10.01 **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.

18.2 **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 and his subcontractors 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.

18.3 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.

19.2 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/Sub-Contractor/Sub-agent in carrying out the job involved under this Work Order and against costs and expenses, if any, incurred by the Company in connection therewith and without prejudice to any of the Company's rights make recovery.

19.3 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.

19.4 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.

20.03 **PERMISSION TO DELIVER:**

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

20.5 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.

21.00 **TAKING OVER:**

21.01 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.

22.00 **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.

23.00 **NOTIFICATION OF AWARD:**

23.01 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.

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

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

24.00 **SIGNING OF CONTRACT:**

24.01 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.

24.02 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.

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

25.00 **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

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

25.2 The provisions of this Clause shall remain effective for a period of Two (2) years from the expiry or termination of this Work Order.

25.3 The Contractor shall not use the name of the Company in any manner either for credit arrangement or otherwise and it is agreed that the Company 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 licence issued by ELBO.
b) Bidder must have executed similar type of work previously.
c) Bidder must declare its sub-contractors name, if any, who will execute the work. The contractor must be having labour license for at least 20 labour.
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 & Vat 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.

04.00 The Bidder shall furnish Type Test Reports for materials required at site. The Bids received without type test reports may be treated as Non-responsive.

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.

7.0 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 Orissa has launched "BIJU Saharanchala Vidyutikaran Yojana of the state Government" for electrification of villages / Wards/Slums which are not scheduled to be covered under MLA LAD/ MP LAD funds/ BRGF etc.

01.02 Electrification of un-electrified Villages/Wards/Slums with a minimum population of 100 within respective jurisdiction duly approved by the Municipal Corporation / Municipalities will be covered under this programme.

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

1. Construction of new 11KV & LT Lines.
2. Provision of HVD system by LT less transformers
3. LT extension using XLPE AB cables.
4. Provision of DT metering for energy audit.
5. Up gradation & Reconductoring of 11KV & using of AB cable for LT lines.
6. Up gradation of the Existing Distribution sub-stations.
7. Power supply to unelectrified BPL households.

01.03 Balasore District has one Municipality.

02.00 **APPROACH TO SITE**

02.01 Balasore District is located in the Northern part of Orissa, NH- 5 & NH- 60 pass through the district.

3.0 **SITE**

03.01 The site is spread in **Balasore** revenue district of **Orissa** state. The Balasore district has one Municipality for which this tender is meant as detailed below:

S. No	Name of Municipality
1	Balasore

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.

1.1 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.

1.2 The package envisages following works at different locations in Balasore district in the state of Orissa

i) Survey, Pole Spotting for all HT & LT Lines and Finalization of DT Location.
ii. Construction of new 11KV & LT Lines.
iii. Provision of HVD system by LT less transformers
iv. LT extension using XLPE AB cables.
v. Provision of DT metering for energy audit.
vi. Up gradation & Reconductoring of 11KV & using AB cable for LT lines.
vii. Up gradation of the Existing Distribution sub-stations.
viii. Power supply to unelectrified BPL households on the pattern of "Kutir Jyoti".

02.00 **DETAILED SCOPE**

2.1 **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:

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

i. Villages/Wards/Slums boundaries and their respective census codes

ii. Existing and proposed 11KV lines and Distribution transformer Stations.

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

i) Village/Ward/Slum geographical features and landmarks with clear depiction and label

ii) All the village/ward/slum that exist in the Municipality or NACs area.

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.

03.00 **Village /Wards/Slums Electrification**

03.01 The list of villages / Wards/Slums where with a minimum population of 100 Nos. and which are to be electrified under the scheme alongwith their census code, approximate electrical scope of work will be indicated in the work order. However the bidders shall verify the actual scope at site during field survey before execution of work.

Annexure

LIST OF VILLAGES / HABITAITON TO BE ELECTRIFIED UNDER THE SCHEME WITH APPROXIMATE SCOPE

TO BE ATTACHED

04.00 New 11KV line for village/habitation electrification:

Construction of 11KV spur line from the existing or to be constructed lines for electrification of villages/habitations with a span length of 50 meters with 9 mtr.long 300 Kg P.S.C. pole.

These lines shall emanate from existing lines and shall have provision of AB Switches of 400Amp. rating at T-off points only where the spur line length exceeds 2 Km.

4.1 Reconductoring of 11KV lines

Reconductoring of 11KV lines with 55mm^2 & 100mm2 AA Conductor with all allied materials will be taken up where the conductor has been stolen in the existing route.

Reconductoring of 11KV line with 55mm^2 AAA Conductor will also be taken up where the existing line has GI wire or under size conductor. The dismantled conductor to be returned to Executive Engineer of concerned electrical division of NESCO.

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

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

While reconductoring disconnection / connection of the existing DT shall be in the scope of the bidder

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

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

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.

While reconductoring disconnection / connection of the existing DT shall be in the scope of the bidder

However, bidders is to assess the actual scope of re-conductoring of the 33 KV lines while carrying out the route survey.

05.00 **Construction of Distribution Transformer Centers**

Construction of Distribution Transformer Centers (DTC) using the type of transformers & configurations as given in the table below.

Sl No.	Type of DT	Voltage ratio (KV)	Rating(KVA)	Arrangement	No. of earthing
				9Mtr. 300Kg. single pole structure with 2pole AB switch & DO fuse	4 Nos.
				9Mtr. PSC Double pole structure with AB switch & HG fuse	5 Nos.

05.01 The scope includes supply, installation, testing and commissioning the following

i) 3 Phase 25KVA Distribution Transformers & 1-Phase 16KVA DT shall be fitted with LA 11KV line.

ii) All structures, cables, earthing and all other items, not specifically mentioned but necessary for safe operation of the distribution transformer is included in scope. The cable from DT to DB and from DB to Overhead lines shall be run properly, duly clamped with poles for protection of cable.

iii) LT Distribution Box with MCCB & Energy Meter on LT side of DT. The Distribution box shall have proper locking arrangement.

05.02 The contractor shall survey the area, fix the location of DT keeping in view that DT is as close as practically possible to the load centre of the area to be fed.

05.03 Contractor shall obtain the approval for final DT location from engineer in the field.

05.04 The no. of LT feeders/ service connections to be connected to a particular DT shall be decided during detailed engineering.

05.05 For three phase DTs, Gang operated AB switches shall be mounted between 11 KV line dropper & HG fuse.

05.06 In case of up-gradation of sub-station capacity one additional DT of appropriate capacity will be installed on pole / plinth depending on the existing DT. If the existing DT is a pole mounted one the additional DT will be on a plinth or vice versa.

5.7 Similarly in case of upgradation of Sub-station capacity, if the existing DT is of 25/63KVA it is to be upgraded to next higher capacity i.e 63/100KVA 11/0.4KV. And in such case LT PVC cable is to be upgraded to the required size.

06.00 **Construction of LT Lines**

The LT lines shall be of following configurations

	Type of line	Conductor		Average span in mtr.
	3Phase 4Wire	AB cable of size 3X35mm^2+1X25mm^2 + 1x16) of XLPE INSULATION		40
	1Phase ABC	Aerial Bunched Cable (ABC) of size 1X35+1X25 +1x16 XLPE INSULATION		40

06.01 LT Lines using AB Cable shall be constructed on 9 mtr 300KG PSC 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 finalised during detailed engineering.

07.00 **Service Connections**

07.01 The scope includes providing service connections to the consumers Below Poverty Line (BPL consumers) including 2 points wiring and coil earthing to the installation. The service cable shall travel from service pole to the premises of the consumer with the provision of

i) PVC insulated double core with outer sheath 2.5 sq. mm single strand Alluminium cable
ii) UDC (Universal Distribution Connector) ABC cable with piercing type connector and distribution box at DT
iii) Supporting GI wire 10 SWG
iv) GI pipe 20 mm, bend etc.
v) Electro Static Energy meter at the consumer premises as per the specification enclosed.
vi) Providing 2Nos. CFL Bulb (18W+11W – 1 No. each) lamp in the consumer premise

07.02 **L.T. consumer connection from service pole**

The contractor shall provide the service connections to the identified households. The service connection shall be complete with energy meters with TP Box in consumer's premises. Service Connection shall be provided with 'PVC' insulated 650/1100 V grade, twin core Aluminum solid Conductors of size 2.5 sq.mm (3/22 cu equivalent) these wires shall be supported by a bearer GI wire (3.15 mm) as per REC Spec. No. 45/1986. Cable shall be tied to bearer wire with an insulated (Porcelain or bakelite) ring of adequate size and strength. The bidder shall provide his own arrangements for anchoring the bearer wire at the premises of customers in case of BPL households.

07.03 **Pole Top Distribution Box**

Locations, where the numbers of consumers are in excess of 2 (say 3 to 5), a pole top LT distribution box shall be provided. If the number of consumers exceeds 5, then the connection has to be provided from adjacent pole having separate distribution box.

7.4 **Piercing Connector**

Wherever, the consumers for a particular pole are 1 or 2, piercing type connectors, having provision for main conductor and service conductor of appropriate size for ABC & UDC for bare conductor, shall be used. For LT main lines with bare conductors, service connection shall be provided using 'UDC' or wedge type connectors of suitable dimension/size as per REC specification.
Cost of all items/material required to complete the service connections shall be included in the quoted price. The installation of all the material is in the scope of contractor.

As far as possible the service connection shall be given from the DT/pole of the LT line, which is nearest to the consumer's premise.
The service cable shall enter to the meter of the consumer premises through GI pipe of 20mm dia up to the meter board. GI pipe will be fixed to the wall with suitable clamps. The supporting GI wire will be suitably tied to the GI pipe. Coil earthing is to be done with GI lead wire to main switch.

07.05 **House Wiring**

For all the identified BPL households, the contractor shall carry out complete works of house wiring with installation of energy meters.

ISI marked Double Pole 16Amp main switch shall be used.

ISI marked PVC conduit with single core 2.5 sq mm. aluminum wire shall be used for house wiring.

Two point wiring for lighting points shall include two piano type ISI marked 5A switch, Bakelite/plastic holder, 2Nos. CFL Lamp (18W & 11W).

The wooden box shall be fixed in the consumer premises at a suitable height and shall house

i) 16Amp. DP Main Switch
ii) Earthing terminal
iii) One 5 Amp. Switch
iv) One 18W CLF bulb with holder

Another wooden distribution board shall be fixed in the consumer premises at a suitable height and shall house

i) 5 Amp switch
ii) 11 Watt CFL lamp with holder

The internal wiring shall be done using PVC conduits.

The Electrostatic meter with TP Box will be fixed separately.

08.00 GENERAL REQUIREMENTS & INSTRUCTIONS

08.01 Sub-stations or Transformers upgraded / installed or PSC poles installed and BPL households electrified under this scheme will be inscribed with the name of the scheme i.e “Biju Saharanchal Vidyutikaran Yojana” and year of electrification in white paint in the back ground of deep green paint.

08.01 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.

08.02 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.

08.03 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.

08.04 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

08.05 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.

08.06 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.

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

08.08 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.

08.09 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.

08.10 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.

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

8.12 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.

ROUTE SURVEY

Successful bidder shall carry out detailed survey and prepare the detailed route of 33KV, 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 33 KV, 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.

GENERAL CONSTRUCTIONAL PRACTICES (11KV)

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

a) SP (Single Pole support) 0o - 10o deviation.
b) DP (Double Pole support) 0o - 60o deviation
c) FP (Four Pole support) 60o - 90o 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	50 50
2	LT 3Ph 4W	PSC (8/200)	ABC	3X35+1X25+1x16	40
3	LT 1Ph 2W	PSC (8/200)	ABC	1X35+1X25+1x16	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 suppression 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.

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.

POLES

Erection of Pole, PSC footing and compaction of soil

Pits are to excavated to a size of 0.6 meter x 1.2 meter with its longer axis in the direction of the line. In case bidder employs Earth augers, the Pit size can be considered 0.6 meter dia with 1.5 meter depth.

For hard rock locations, 1 meter deep hole of diameter 20% in excess of the longest dimension of the bottom most portion of pole shall be excavated. The pole shall be grouted in the pit with 1:2:4 nominal concrete mix at the time of pole erection.

The planting depth of pole over the base precast concrete slab shall be 1500 mm in the ground except in wet soil and black cotton soil where depth shall be increased by 0.2 mtr. to 0.3 mtr. with reduced wind span.

Following arrangement shall be adopted for proper erection of PSC type poles and properly Compacting of the soil around the base / foot of the poles, under this package.

1. All the PSC poles shall be provided with a RCC block base having dimensions and constitutions as per REC Construction Standard K-1.

2. The poles shall then be lifted to the pit with the help of wooden supports. The pole shall then be kept in the vertical position with the help of 25 mm (min.) manila ropes, which will act as the temporary anchor. The verticality of the pole shall be checked by spirit level in both longitudinal & transverse directions. The temporary anchor shall be removed only when poles set properly in the foundation after compacting the soil.
3. Entire void space above the block is to be filled with uniform pieces of bricks and rigidly compacted by ramming in layers maintaining verticality of the PSC pole.
4. Concreting of foundation upto a height of 1.8 mtrs. from the bottom of the pit with a circular cross-section of radius 0.25 mtrs. (volume of 0.3 cu.mtr. per pole) in the ratio of 1:2:4 shall be done at the following locations:
   i) For all 33KV poles
   ii) At all the tapping points and dead end poles.
   iii) At all the points where DT is to be installed.
   iv) At all the points as per REC construction dwg. No. A-10 (for the diversion angle of 10-60 degree)
   v) Within a maximum distance of 1 km from the last Jhama filled pole structure.
   vi) Both side poles at all the crossing for road, nallaha railway crossings etc.
   vii) Where Rail poles, double pole and four pole structures.

5. In case the route of 33/11 kV lines encounters marshy low laying area, special type of foundations shall be used. In such a case, difference in excavation quantity, concreting & reinforcement between special foundation and normal foundation shall be paid extra as per Delhi Schedule of Rate (DSR) applicable on the date of bid opening. No other payment incidental to special foundation locations shall be made to the contractor.

Earthing of Poles

In 33/11 kV & LT line, each pole shall be earthed with coil type earthing as per REC Construction Standard J-1.

All DP & Four pole structures & the poles on both sides of railway, Telecommunication, road, drain & river crossing shall be earthed by pipe earthing as per enclosed REC Construction Standard J-2.

Extension Pole

PSC pole with pole extension arrangement up to *two meters* shall be used at low ground level locations for maintaining ground clearance and for road crossings for HT & LT lines. Extension of poles shall be by use of *100x50x6mm galvanise channel* up to three meters. A overlap of one meter shall be maintained with the pole.

Wherever such extended poles will be used the span on both sides of the extension pole shall be suitably reduced to take care of loading on the pole.

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.

Crossings-All 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.

11 KV line : 50 meter

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, support Poles, Cross Arms and Bolts & Nuts. 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 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, Balasore 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, Balasore shall have the power to reject any work or material, which, in his judgment, is not in full accordance therewith.

2.0 **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 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 Orissa 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.

04.00 **PSC POLES**

PSC Poles shall be of solid rectangular type with an overall length 9.0 M suitable for use in 11KV overhead power lines and double pole & four pole structures associated with the lines and for 11/0.4 KV substations.

05.00 **APPLICABLE STANDARDS**

Except when they conflict with specific requirements in this Specification, the PSC poles shall comply with the relevant provisions made in the following Indian Standards or the latest versions thereof.

a) IS: 1678, Specification for pre stressed concrete poles for overhead power, traction and telecommunication lines
b) IS: 2905, Method of test for concrete poles for overhead power and telecommunications lines.
c) IS: 7321, Code of Practice for selection, handling and erection of concrete poles for overhead power and telecommunication lines

06.00 **TERMINOLOGY**

For the purpose of this specification, following definitions shall apply:-

06.01 **AVERAGE PERMANENT LOAD**

That fraction of the working load which may be considered of long duration over a period of one year

06.02 **LOAD FACTOR**

The ratio of ultimate transverse load to the transverse load at first crack.

06.03 **TRANSVERSE**

The direction of the line bisecting the angle contained by the conductor at the pole. In the case of a straight run, this will be normal to the run of the line.

06.04 **Transverse Load at First Crack**

For design, the transverse load at first crack shall be taken as not less than the value of the working load.

6.5 **WORKING LOAD**

The maximum load in the transverse direction, that is ever likely to occur, including the wind pressure on the pole. This load is assumed to act at a point 600mm below the top with the butt end of the pole planted to the required depth as intended in the design

6.6 **Ultimate Failure**

The condition existing when the pole ceases to sustain a load increment owing to either crushing of concrete, or snapping of the prestressing tendon or permanent stretching of the steel in any part of the pole.

06.07 **Ultimate Transverse Load**

The load at which failure occurs, when it is applied at a point 600mm below the top and perpendicular to the axis of the pole along the transverse direction with the butt end of the pole planted to the required depth as intended in the design.

07.00 **Application**

07.01 **9.0 M Poles (300 Kg)**

These poles shall be used at tangent locations for 11kv and L.T. lines in wind pressure zones of 100kg/M^2 & for double pole structures of distribution transformer centers as per REC Construction Standards F-2 to F-4 and for special locations in 11 KV and L.T Lines, such as road crossing etc.

08.00 **Material**

08.01 **Cement**

The cement used in the manufacture of pre stressed concrete poles shall be ordinary or rapid hardening Portland cement conforming to IS: 269-1976(Specification for ordinary and low heat Portland cement) or IS: 8041 E-1978(Specification for rapid hardening Portland cement).

08.02 **Aggregates**

Aggregates used for the manufacture of pre-stressed concrete poles shall confirm to IS:383 (Specification for coarse and fine aggregates from natural sources for concrete). The nominal maximum size of aggregates shall in no case exceed 12mm

08.03 **Water**

Water should be free from chlorides, sulphates, other salts and organic matter. Potable water will be generally suitable.

08.04 **Admixture**

Admixture should not contain Calcium Chloride or other Chlorides and salts which are likely to promote corrosion of pre-stressing steel. The admixture shall conform to IS 9103.

08.05 **Pre-Stressing Steel**

The pre-stressing steel wires including those used as un tensioned wires should conform to IS: 1785 (Part-I) (Specification for plain hard-drawn steel wire for pre stressed concrete, Part-I cold drawn stress relieved wire), IS 1785 (Part-II) (Specification for plain hard-drawn steel wire) or IS:6003 (Specification for indented wire for pre stressed concrete).The type designs given in the annexure are for plain wires of 4 mm diameter with a guaranteed ultimate strength of 175 kg/mm^2 and for plain wires of 5mm diameter

with a guaranteed ultimate strength of 160 kg/mm^2.

All pre stressing steel shall be free from splits, harmful scratches, surface flaws, rough, aged and imperfect edges and other defects likely to impair its use in pre stressed concrete.

08.06 **Concrete Mix**

The concrete mix shall be designed to the requirements laid down for controlled concrete (also called design mix concrete) in IS: 1343-1980(code of practice for prestressed concrete) and IS: 456-1978 (Code of practice for plain and reinforced concrete), subject to the following special conditions;

a) Minimum works cube strength at 28 days should be at least 420 Kg/cm^2.

b) The concrete strength at transfer should be at least 210 kg/cm^2.

c) The mix should contain at least 380kg. Of cement per cubic meter of concrete.

d) The mix should contain as low a water content as is consistent with adequate workability. If it becomes necessary to add water to increase the workability, the cement content also should be raised in such a way that the original value of water cement ratio is maintained.

09.00 **Design Requirements**

The poles shall be designed for the following requirements:

a) The poles shall be planted directly in the ground with a planting depth as per IS: 1678. Wherever, planting depth is required to be increased beyond the specified limits or alternative arrangements are required to be made, on account of ground conditions e.g. water logging etc., the same shall be in the scope of the bidder at no extra cost to owner. The bidder shall furnish necessary design calculations/details of alternative arrangements in this regard.

b) The working load on the poles should correspond to those that are likely to come on the pole during their service life.

c) The factor of safety for all poles 9.0 Mts. shall not be less than 2.0 and for 8.0 M poles, the factor of safety shall not be less than 2.5.

d) The average permanent load shall be 40% of the working load.

e) The F.O.S against first load shall be 1.0.

f) At average permanent load, permissible tensile stress in concrete shall be 30Kg/cm^2.

g) At the design value of first crack load, the modulus of rupture shall not exceed 53.0 kg/cm^2 for M –40.

h) The ultimate moment capacity in the longitudinal direction should be at least on fourth of that in the transverse direction.

g) At the design value of first crack load, the modulus of rupture shall not exceed 53.0 kg/cm^2 for M –40.

h) The ultimate moment capacity in the longitudinal direction should be at least on fourth of that in the transverse direction.

i) The maximum compressive stress in concrete at the time of transfer of pre-stress should not exceed 0.8 times the cube strength.

j) The concrete strength at transfer shall not be less than half, the 28 days strength ensured in the design, i.e. 40O x 0.5 = 200kg/cm^2.

09.01 **Dimensions and Reinforcement**

The cross-sectional dimensions and the details of pre-stressing wires should conform to the particulars given in the annexure.

The Provision of holes for fixing cross-arm and other fixtures should conform to the REC specification No. 15/1979.

09.02 Manufacture

All pre-stressing wires and reinforcements shall be accurately fixed and maintained in position during manufacture. The untensioned reinforcement, as indicated in the drawings, should be held in position by the use for stirrups which should go round all the wires.

All wires shall be accurately stretched with uniform prestress in each wire. Each wire or a group of wires shall be anchored positively during casing. Care should be taken to see that the anchorages do not yield before the concrete attains the necessary strength.

09.03 **Cover**

The cover of concrete measured from outside of pre-stressing tendon shall be normally 20mm.

09.04 **Welding and Lapping of Steel**

The high tensile steel wire shall be continuous over the entire length of the tendon. Welding shall not be allowed in any case. However, jointing or coupling may be permitted provided the strength of the joint or coupling is not less than the strength of each individual wire.

09.05 **Compacting**

Concrete shall be compacted by spinning, vibrating, shocking or other suitable mechanical means. Hand compaction shall not be permitted;

Curing

The concrete shall be covered with layer of sacking, canvass, hessian or similar absorbent material and kept constantly we up to the time when the strength of concrete is at least equal to the minimum strength of concrete at transfer of pre stress. Thereafter, the pole may be removed from the mould and watered at intervals to prevent surface cracking of the unit, the interval should depend on the atmospheric humidity and temperature.

The pre stressing wires shall be de-tensioned only after the concrete has attained the specified strength at transfer (i.e. 200 or 210 kg/cm^2, as applicable). The cubes cast for the purpose of determining the strength at transfer should be cured, as far as possible, under conditions similar to those under which the poles are cured. The transfer stage shall be determined based on the daily tests carried out on concrete cubes till the specified strength indicated above is reached. Thereafter the test on concrete shall be carried out as detailed in IS: 1343 (Code of practice for pre stressed concrete). The manufacturer shall supply, when required by the owner or his representative, result of compressive test conducted in accordance with IS: 456 (Code of practice for plain an reinforced concrete) on concrete cubes made from the concrete used for the poles. If the owner so desired, the manufacturer shall supply cubes for test purposes and such cubes shall be tested in accordance with IS:456 (Code of practice for plain and reinforced concrete).

The de tensioning shall be done by slowly releasing the wires, without imparting shock sudden load to the poles. The rate of de tensioning may be controlled by any suitable mean either mechanical (screw type) or hydraulic

The poles shall not be de tensioned or released by cutting the pre stressing wires using flames or bar croppers while the wires are still under tension.

09.07 **Lifting Eye-Hooks or Holes**

Separate eye-hooks or holes shall be provided for handling the transport, one each at a distance of 0.15 times the overall length, from either end of the pole. Eye-hooks, if provided, should be properly anchored and should be on the face that has the shorter dimension of the cross-section. Holes, if provided for lifting purposes, should be perpendicular to the broad face of the pole.

09.08 **Holes for Cross Arms etc**

Sufficient number of holes shall be provided in the poles for attachment of cross arms and other equipments.

10.00 **Stacking & Transportation**

Stacking should be done in such a manner that the broad side of the pole is vertical. Each tier in the stack should be supported on timber sleeper located as 0.15 time the overall length, measured from the end. The timber supported in the stack should be aligned in a vertical line.

Poles should be transported with their board faces placed vertically and in such manner that shocks are avoided. Supports should be so arranged that they are located approximately at a distance equal to 0.15 times the overall length from the ends. The erection of the pole should be carried out in such a way that the erection loads are applied so as to cause moment with respect to the major axis, i.e. the rope used for hoisting the pole should be parallel to the broader face of the pole.

11.00 **Earthing**

11.01 Earthing shall be provided by having length of 8 SWG GI wire embedded in concrete during manufacture and the ends of the wires left projecting from the pole to a length of 100mm at 250mm from top and 150mm below ground level.

11.02 Earth wire shall not be allowed to come in contract with the pre stressing wires.

12.00 Tests

12.01 **Transverse Strength Test**

Poles made from ordinary Portland cement shall be tested only on the completion of 28 days and poles made from rapid hardening cement only on the completion of 14 days, after the day of manufacture.

The poles may be tested in either horizontal or vertical position. If tested in horizontal position, provisions shall be made to compensate for the overhanging weight of the pole, for this purpose, the overhanging portion of the pole may be supported on a movable trolley or similar device.

The pole shall be rigidly supported at the butt end for a distance equal to the agreed depth of planting

Load shall be applied at a point 600mm from the top of the pole and shall be steadily and gradually increased to the design value of the transverse load at first crack. The deflection at this load shall be measured.

A pre stressed concrete pole shall be deemed not to have passed the test if cracks wider than 0.1 mm appear at a stage prior to the application of the design transverse load at first crack and the observed ultimate transverse load is less than the design ultimate transverse load.

The load shall then be reduced to zero and increased gradually to a load equal to the first crack load plus 10% of the minimum ultimate transverse load, and held up for 2 minutes. This procedure shall be repeated until the load reaches the value of 80 per cent of the minimum ultimate transverse load and thereafter increased by 5 percent of the minimum ultimate transverse load until failure occurs. Each time the load is applied, it shall be held for 2 minutes. The load applied to pre stressed concrete pole at the point of failure shall be measured to nearest five Kilograms.

The pole shall be deemed not to have passed the test if the observed ultimate transverse load is less than the design ultimate transverse load.

12.02 **Measurement of Cover**

After completion of the transverse strength test, the sample pole shall be taken and checked for cover. The cover of the pole shall be measured at 3 points, one within 1.8 meter from the butt end of the pole, the second within 0.6 meters from the top and the third at an intermediate point and the mean value compared with the specified value.

The mean value of the measured cover should not differ by more than(±) 1 mm from the specified cover. The individual values should not differ by more than (±) 3mm from the specified value.

If these requirements are not met, the workmanship with reference to aligning of the end plates and pre stressing wires and assembly of moulds should be improved and inspection at pre-production stage tightened suitably.

12.03 **Sampling and Inspection**

Scale of sampling

Lot: In any batch, all poles of the same class and dimensions shall be grouped together to constitute a lot.
Sub-lot: If the number of poles in a lot exceed 500, the lot shall be divided into a suitable number of sub lots such that the number of poles in any sub-lot shall not exceed 500. The acceptance or otherwise of a sub-lot shall be determined on the basis of the performance of samples selected from it.

The number of poles to be selected from a lot or a sub-lot shall depend upon its size and shall be in accordance with col.1 and 2 of the following table:

SAMPLE SIZE AND CRITERION FOR CONFORMITY

Size of lot or sub-lot	Dimensional Requirement		No. of poles for transverse strength test
	Sample Size	Permissible No. of defective samples.	
Upto 100	10	1	*
101 to 200	15	1	3
201 to 300	20	2	4
301 to 500	30	3	5

*The number of poles to be tested shall be subject to the agreement between the owner and supplier

12.04 These poles shall be selected at random. In order to ensure randomness, all the poles in the lot or the sub-lot may be arranged in a serial order and starting from any random pole, every r^{th} pole may be included in the sample, r being the integral part of N/n where N is the size of the lot or the sub-lot and n is the sample size.

12.05 Number of Tests

All the poles shall be tested for overall length, cross-selection and uprightness. The tolerance shall be (±) 15 mm on overall length (±) , 3 mm on cross sectional dimensions and 0.5 per cent on uprightness.

The number of poles to be tested for transverse strength test shall be accordance with Col. 4 of the above table. These poles may be selected from those already tested in 10.2.1

12.06 Criteria for Conformity

A lot or sub-lot shall be considered as conforming to this specification.

The number of poles which does not satisfy the requirements of overall length, cross-section and uprightness shall not exceed the corresponding number, If the number of such poles exceeds the corresponding number, all poles in the lot or sub-lot shall be tested for these requirements and those not satisfying the requirements shall be rejected.

All the poles tested for transverse strength test shall satisfy the requirements of the test. If one or more poles fail, twice the number of poles originally tested shall be selected from those already selected and subjected to the test., If there is no failure among these poles, the lot or the sub-lot shall be considered to have satisfied the requirements of this test.

13.00 Marking

The pole shall be clearly and indelibly marked with the following particulars either during or after manufacture but before testing at a position so as to be easily read after erection in position.

a) Month and year of manufacture
b) Transverse strength of pole in Kg.
c) Marker's serial No. and mark.

TECHNICAL SPECIFICATION FOR STEEL MATERIALS

100X50 MM MS CHANNEL
50X50X6 MM MS ANGLE

01.00 **Scope:**

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

100X50 MM MS CHANNEL
75X40 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 11 KV INSULATORS

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 Insulators for use in the networks of NESCO, Orissa.

The equipment offered shall have been successfully type testes and the design shall have been satisfactory operation for a period not less than five 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 for type tests shall be given in the appropriate price schedule of the bidding document and will be considered for evaluation.

The insulators 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.

Any departure from the provisions of this specification shall be disclosed in the Non Compliance Schedule at the time of bidding.

02.00 **STANDARDS**

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

IEC/ISO/BS	IS	Subject
IEC 120		Dimensions of ball and socket coupling of string insulator units.
IEC 372 (1984)		Locking devices for ball and socket couplings of string insulator units : Dimensions and tests.
IEC 720		Characteristics of the line post insulators
IEC 383		Insulators for overhead lines with a nominal voltage above 1000V.
	IS- 731	Porcelain insulators for overhead power lines
	IS –2486 (Part I, II, III)	Specification for insulator fittings for overhead power lines with a nominal voltage greater than 1000V.
IEC 273		Characteristics of indoor and outdoor insulators.
	IS – 2544	Porcelain post insulators
IEC 168		Tests on post insulators
IEC 575		Thermal-mechanical performance test and mechanical performance test on string insulator units.
IEC 575		Thermal-mechanical performance test and mechanical

		performance test on string insulator units
	IS-1445	Porcelain insulators for LV overhead power lines
	IS- 5300	Stay insulators
ISO 8501-1		Shot blasting
	IS –6005	Phosphating of iron and steel
	IS-2633	Tests on galvanized steel
ISO 1460	IS – 2629	Hot dip galvanizing
IEC 1109		Composite Insulators
IEC 305		Characteristics of string insulators of the cap and pin type.
IEC 471		Dimensions of clevis and tongue coupling of string insulator units.
ISO 1460 BS 729	IS 2629	Specification for hot dip galvanized coatings on iron and steel 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.

TECHNICAL

The types of insulators described in this specification are intended to maintain the general look of the existing network and to take advantage of the familiarity of the employer's staff with these type of units. However, the Bidder, is free to make alternative proposals.

It shall be the Bidders responsibility to ensure that the insulators conform to or exceed both the mechanical electrical properties specified in this specification and all related international and Indian Standards.

The strength of the proposed insulators shall be capable of supporting the loads generated as per the Bidder's line design, by wind acting on the conductors and insulators, by conductor tensions for maximum windspan and worst design conditions and for all insulator duties and permitted line deviations.

03.00 **PIN INSULATORS**

Nominal Voltage	**33 KV**	**11 KV**
Visible discharge voltage	27 KV rms.	9 KV rms.
Wet power frequency one minute withstand voltage	75 KV rms.	35 KV rms.
Power frequency puncture voltage	180 KV rms.	105 KV rms.
Impulse withstand voltage peak	170 KV peak	75 KV peak
Creepage distance	840 mm	320 mm
Protected creepage distance	420 mm	--
Minimum failing load up to conductor size 100 mm^2	10 KN	

04.00 **Performance Characteristics**

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.

They shall conform to IEC 720 or IS 731 and shall meet the following performance criteria

05.00 **Materials**

The insulators used by the Employer at present are of the brown glazed porcelain type.

Porcelain in the line pin insulators shall be sound, free from cavities and other defect, thoroughly verified with uniform brown glaze and have a high quality smooth finish. The glaze shall cover all the external parts of the insulator. The cement used shall not give rise to chemical reaction with metal fittings.

05.01 Design and Construction

The relevant vertical dimension shall be such that when combined with pin insulator spindle describe in technical specification for line fittings, the design requirements are the specified voltage level for conductor clearance from the cross arm shall be met.

The design shall be such that stresses due to expansion and contraction in any part of the insulator shall not lead to deterioration. Precautions shall be taken to avoid chemical reaction between cement and metal fittings by the choice of suitable materials or by the manufacturing method. Single piece insulator construction is preferred.

The insulating material shall not engage directly with hard metal. Pin insulators shall be provided with a thimble of suitable material. Cement used in the insulator shall not cause fracture by expansion or loosening by contraction and proper care shall be taken to locate the individual parts correctly during cementing. The insulators shall have a center conductor groove.

05.02 **Dimensions**

The Bidder shall guarantee that the dimensions and tolerances of the insulator offered are in accordance with the technical drawing submitted with the bid documents.

05.03 **Markings**

All insulators shall be clearly marked with the name or trademark of the manufacturer, the minimum failing load in KN and the month and year of manufacture. They shall also be marked with the name of the Employer. These marking shall be legible and indelible. The markings may be printed or impressed, provided such impressions do not impair the performance of the insulator. Markings shall be applied before firing.

05.04 **Tests**

Type, acceptance and routine tests shall be carried out and results given alongwith certification as appropriate in the Technical Schedule and Test Certificates Schedule of this specification. The insulators shall comply with the following tests as per IS-731

05.05 Type tests

The following type tests are required :

- Visible discharge test;
- Impulse voltage withstand test;
- Wet power frequency voltage withstand test
- Mechanical failing load test

24 hour mechanical strength test;

05.06 **Acceptance Tests**

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

- Verification of dimensions
- Electro-mechanical failing load test;
- Puncture test;
- Porosity test;
- Test for galvanization of ferrous parts

05.07 **Routine Tests**

The following routine tests shall be conducted on each set and results are to be furnished for consideration:

- Visual examination
- Tensile load test;
- Power frequency voltage test

06.00 **DISC INSULATOR**

06.01 **Performance Characteristics**

Nominal Voltage	33 KV	11 KV
Minimum number of discs is string	3	1
Visible discharge voltage	27KV rms.	9 KV rms.
Wet power frequency one minute withstand voltage	75KV rms.	35 KV rms.
Power frequency puncture voltage	1.3 times the actual dry flashover voltage of the unit	
Impulse withstand voltage peak	170 KV	75 KV
Minimum creepage distance	840 mm	320 mm
Minimum protected creepage distance	420 mm	--
Minimum mechanical failing load for conductor sizes of 232 MM^2 AAAC	120 KN	120 KN
80 & 100 mm2	90	90

55 mm2	70	70

06.02 **Materials**

The disc insulators used by the Employer at present are of the brown glazed porcelain type.

Insulators shall be of the cap and pin type and the insulating material shall be brown glazed aluminous porcelain. The porcelain used in the manufacture of shells and shall be sound, free from defects, thoroughly vitrified and smoothly glazed. The finished porcelain shall be glazed in brown colour. The glaze shall cover all exposed parts of the insulator and shall have a good luster, smooth surface and good performance under the extreme weather conditions of a tropical climate. It shall not be cracked or chipped by ageing under the specified service conditions. The glaze shall have the same coefficient of expansion as of the porcelain body throughout the working temperature range. Cement used in the construction of the insulators shall not cause fracture by expansion or loosening by contraction and proper care shall be taken to locate the individual parts correctly during cementing.

06.03 **Design and Construction**

The design shall be such that stresses due to expansion and contraction in any part of the insulator shall not lead to deterioration. Precautions shall be taken to avoid chemical reaction between cement and metal fittings, either by choice of suitable materials, or by the manufacturing method.

The design of the insulators shall be such that the shell shall not engage directly with hard metal. When units are coupled together there shall be no contact between the shell of one unit and metal of the next adjacent unit.

Pin and Cap shall be designed to transmit the mechanical stresses 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, of such design that it will not yield or distort under load conditions.

The pin ball shall move freely in the cap socket but without danger of accidental uncoupling during erection or in position. The design of the disc should be such that stresses due to expansion or contraction in any part of the insulator shall not lead to deterioration.

The locking devices shall be so formed that when set there shall be no risk of the locking device being displaced accidentally under any conditions. Nothing but extreme deformation of the locking device shall allow separation of the insulator units or fittings. The hole for the security clip shall be countersunk and the force required to pull the clip into its unlocked position shall not be less than 50 N (5 Kg) or more than 250 N (25 Kg.) Locking devices when in position shall be independent of rotation, and the efficiency of the locking shall be independent of the degree of opening applied to the locking device after insertion. The locking device shall be of austenitic stainless steel or phosphor bronze and of the same design for all the complete insulator sets.

Pin shall be made of drop forged steel and caps shall be made of malleable cast iron, spheroid graphite iron or drop forged steel. Pins and caps shall be duly hot dip galvanized and shall not be made by jointing, welding, shrink fitting or any other process from more than one piece of material. The finished product shall be free from cracks and air-holes, and shall be of such quality so as to comply with the requirements of this Specification.

Insulator units after assembly shall be concentric and co-axial within limits as permitted by the relevant Standards.

06.04 **Corrosion Protection and Finish**

Ferrous parts, unless of stainless steel, shall be hot dip galvanized in accordance with BS – 729 or IS :2629. However, the minimum weight of zinc deposited generally shall be 610g/sq.m. which is equivalent to a minimum average thickness of coating of 85 micron (µm).

06.05 **Dimensions**

The dimensions of ball and socket insulators shall 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.

The bidder shall guarantee that the dimensions and tolerances of the insulator offered are in accordance with the drawing which shall accompany the bid documents.

All components shall comply with the relevant standards.

06.06 **Markings**

All insulators shall be clearly marked with the name or trademark of the manufacturer and the year of manufacture. In addition each unit shall be marked with the specified mechanical or electromechanical failing load. 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. Markings shall be applied before firing.

One 10 mm. thick ring of suitable quality of paint shall be marked on the cap of each insulator of particular strength for easy identification of the type of insulator. The paint shall not have any deteriorating effect on the insulator performance. Different colour codes shall be used as identification mark for different insulators.

06.07 **Associated Hardware**

The hardware for insulator strings with disc insulators together with ball and socket fittings shall be of standard design, so that units are interchangeable with each other and suitable for use with disc insulator of any make conforming to relevant Indian or International Standard.

06.08 **Security clips**

Security clips for use with ball and socket coupling shall be W-shaped type which provides positive locking of the coupling as per IS:2486 – (Part-III) / IEC : 372. The legs of the security clips shall be spread after assembly in the works to prevent complete withdrawal from the socket. The locking device shall be resilient, corrosion resistant and of suitable mechanical strength. There shall be no risk of the locking device being displaced accidentally or being rotated when in position. Under no circumstances shall be locking devices allow separation of fittings.

Split pins shall be used with bolts and nuts. The Bidder must note that 2.5% extra fasteners are to be supplied without any extra cost to the Employer to deal with losses during erection.

06.09 **Tests**

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

06.10 **Type tests**

The following type tests are required :

- Visible discharge test;
- Impulse voltage withstand test;
- Wet power frequency voltage withstand test
- Electro-mechanical failing load test for string insulator units (porcelain type)
- 24hours mechanical strength test;

06.11 **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
- 24 hour mechanical strength test;
- Electro-mechanical failing load test for string insulator units (porcelain type)
- Puncture test;
- Porosity test (porcelain only);
- Test for galvanization of ferrous parts

06.12 **Routine tests**

The following routine tests shall be conducted on each set and results are to be furnished for consideration :

- Visual examination;
- Tensile load test;
- Power frequency voltage test;

07.00 **POST INSULATOR FOR PRIMARY SUBSTATIONS**

07.01 **Post Insulator (clamp top type)**

Bidders may offer substation designs using post insulators of the clamp top type. The insulators shall be suitable for use in NESCO primary substations with conditions as shown in the sections on Service Conditions and System Conditions.

They shall conform to IEC 273 or IS 2544 and shall meet the following performance criteria:

Normal Voltage	33KV	11KV
Visible discharge voltage	27 KV rms.	9 KV rms.
Wet and dry power frequency one minute withstands voltage.	75 KV rms.	35 KV rms.
Power frequency puncture withstand voltage	1.3 times the actual dry flashover voltage.	1.3 times the actual dry flashover voltage.
Impulse withstand voltage peak	170 KV peak	75 KV peak
Minimum creep age distance	840 mm	380 mm

Minimum protected creep age distance	420 mm	-
Minimum failing load (bending)	12.5 KN	12.5 KN
Minimum failing load (torsion)	2000 Nm*	1200 Nm*

* While these are the minimum failing loads acceptable to the employer, it shall be the bidder's responsibility to ensure that the mechanical strength of the offered insulators shall be capable of insulators, by conductor tensions for maximum wind span and worst design conditions and for all insulator duties and permitted line deviations.

The Bidder shall quote the make, type of insulation material, metal fittings along with cantilever, torsion, tension and compression strengths.

The porcelain shall be sound, free form defects thoroughly vitrified and smoothly glazed to give a brown colored finish. The glaze shall cover all exposed parts of the insulator and shall have a good luster, smooth surface and good performance under the extreme weather conditions of a tropical climate. It shall not be cracked or chipped by ageing under the specified service conditions. The glaze shall have the same coefficient of expansion as of the porcelain body throughout the working temperature range. The cement used shall not give rise to chemical reaction with metal fittings.

07.02 **Tests**

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

07.03 **Type Tests**

The following type tests are required :

- 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;

07.04 **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

07.05 **Routine Tests**

The following routine tests shall be conducted on each set and results are to be furnished for consideration :

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

08.00 **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.

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

08.02 Materials

The insulators shall be brown glazed porcelain.

08.03 **Design**

The bidder shall guarantee than the dimensions and tolerance of the insulators offered are in accordance with the drawing which shall accompany the bid documents**.**

The insulators shall be used with 7/8 SWG (7/4.00 mm) steel stay wire, having an overall diameter of 12.2 mm and tensile strength of 70 kgf/sq. mm. The insulators shall be suitable for use having a minimum stay wire hole diameter of 22 mm and be such that a straight stay wire can be passed through it.

08.04 **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.

08.05 **Tests**

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

08.06 **Type Tests**

The following type tests are required:

- Dry power frequency voltage withstand test;
- Wet power frequency voltage withstand test;
- Mechanical strength test;

08.07 **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.

08.08 Routine Tests

The following routine tests shall be conducted on each insulator:

- Visual examination
- Mechanical load test.

TECHNICAL SPECIFICATION FOR 11 KV LINE FITTINGS

01.00 **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 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.

GENERAL

03.00 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 hard wares 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 cross arms 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 cross arm.

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.

04.07 **Dual Yoke Plates**

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.

Ball Clevises

04.08

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 Aluminum 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 aluminum 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
Recon 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 aluminum portion in all connectors shall be 99.5% pure aluminum, conforming with IS – 5082: 1981: Wrought aluminum 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 **Aluminum 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 Aluminum 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.

08.05 **Delivery**

The aluminium binding wire shall be delivered in 30 m coils, with a permitted tolerance of +5%. Random 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 **Aluminum Binding Stirrups**

08.07 **Physical Characteristics**

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

12.03 **Measurements and Tests for Stay Wire**

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	Aluminum Alloy Stranded Conductors
	IS 9997	Aluminum 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		Aluminum 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 aluminum, 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 diameter 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 aluminum 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.

05.03 Mechanical and Electrical Characteristics of Aluminum Alloy Stranded Conductors

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

- Sizes used by NESCO

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 aluminum 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.

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

where,

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

R_T = resistance measured T^0C

α = 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.

11.4 **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 programmed 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.

8.0 **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;

Standard Technical Specification for 1-Ph meters

A) Single Phase meter (5-30 Amps) & (10-80Amps) for Kutir- Jyoti Consumer & DT meter respectively .

1. SPECIFICATION OF SINGLE PHASE STATIC ENERGY METERS

Sr. No.	Function /Feature	Technical Requirements
1.1	Voltage	240 volt (P-N), +20% to -40% Vref, however the meter should withstand the maximum system voltage i.e. 440 volts continuously.
1.2	Display	a) LCD (Six digits) b) Height: 10 mm X 6 mm min. c) Pin Type d) Viewing angle min. 160 degrees
1.3	Power factor range	Zero lag –unity- zero lead
1.4	Display parameters	a) Display parameters : LCD test, KWH, MD in KW, Date & Time (Cumulative KWH will be indicated continuously by default & other parameters through push-button) b) Display order shall be as per Annexure-1
1.5	Power Consumption	Less than 1 Watt & 4VA in Voltage circuit and 2 VA for Current circuit
1.6	Starting current	0.2 % of Ib
1.7	Frequency	50 Hz with + / - 5% variation
1.8	Test Output Device	Flashing LED visible from the front
1.9	Billing data	a) Meter serial number, Date and time, KWH, MD in KW, History of KWH, & MD for last 6 months. b) All the above parameters (namely KWH, MD in KW) are meter readings. c) All these data shall be accessible for reading, recording and spot billing by downloading through **IR porT** on universal MRI or Laptop computers at site.
1.10	MD Registration (KW)	a) Meter shall store MD in every 15 min. period along with date & time. At the end of every 15 min, new MD shall be previous MD and store whichever is higher and the same shall be displayed.
1.11	Auto Reset of MD	Auto reset date for MD shall be indicated at the time of finalizing GTP and provision shall be made to change MD reset date through MRI even after installation of meter on site. Default resetting date is 00:00 hrs, 1st of every month.
1.12	TOD metering	Not applicable.
1.13	Security feature	Programmable facility to restrict the access to the information recorded at different security level such as read communication, communication write etc
1.14	Memory	Non volatile memory independent of battery backup, memory should be retained up to 10 year in case of power failure
1.15	Software & communication compatibility	a) IR port to transfer the data locally through CMRI or lap top. b) The Supplier shall supply Software required for CMRI. The supplier shall also provide training for the use of software. The software should be compatible to Microsoft Windows systems (Windows 98 system).

Sr. No.	Function /Feature	Technical Requirements
		c) The Supplier shall provide meter reading protocols. Vendor to jointly work with BSES IT team to develop PDS/CMRI software for meter downloading and further uploading on computer. **The vendor has to give an undertaking in this regards.**
1.16	Climatic conditions	a) Refer IS: 13779 for climatic conditions. b) The meter should function satisfactorily in India with high end temperature as 60ºC and humidity up to 96%.

2.CONSTRUCTIONAL SPECIFICATIONS

Sr. No.	Parameters	Technical Requirements
2.1	Body of Meter	a) Top transparent and base opaque material polycarbonate UV stabilized. b) Front cover & base should be ultrasonically welded. Top cover should be designed so as the internal components should not be visible.
2.2	Terminal Block	Made of polycarbonate Grade 500R or equivalent bakelite, brass or copper current terminals with flat-head brass screws.
2.3	Terminal cover	Transparent terminal cover with provision of sealing through sealing screw.
2.4	Diagram of connections	Diagram of external connections to be shown on terminal cover
2.5	Marking on name plates	Meter should have clearly visible, indelible and distinctly name plate marked in accordance with IS & DISCOM specifications. Prior approval of name plate design to be taken before product supply.
2.6	Meter Sealing	Supplier shall affix one Buyer seal on side of Meter body as advised and record should be forwarded to Buyer. Sealing shall be as per IS 13779 amendment and CEA guidelines.
2.7	Guarantee / Warranty	5 Years.
2.8	Insulation	A meter shall withstand an insulation test of 4 KV and impulse test at 8 KV
2.9	Resistance of heat and fire	The terminal block and Meter case shall have safety against the spread of fire. They shall not be ignited by thermal overload of live parts in contact with them as per the relevant IS 13779.

TAMPER & ANTI-FRAUD DETECTION/EVIDENCE FEATURES

3.1 Tamper Conditions:

The meter shall not get affected by any remote control device & shall continue recording energy under any one or combinations of the following conditions:

Sr. No.	Tamper condition	Meter behavior
3.1.1	I/C & O/G Interchanged	Meter should record forward energy
3.1.2	Phase & Neutral Interchanged	Meter should record forward energy

3.1.3	I/C Neutral Disconnected, O/G Neutral & Load Connected To Earth.	Meter should record forward energy
3.1.4	I/C Neutral Disconnected, O/G Neutral Connected To Earth Through Resistor & Load Connected To Earth.	Meter should record forward energy
3.1.5	I/C Neutral connected, O/G Neutral Connected To Earth Through Resistor & Load Connected To Earth.	Meter should record forward energy
3.1.6	I/C (Phase & Neutral) Interchanged, Load Connected To Earth.	Meter should record forward energy
3.1.7	I/C & O/G (Phase or Neutral) Disconnected, Load Connected To Earth.	Meter should record forward energy

During neutral missing mode starting test will be done at 2A and accuracy shall be within 5% at Ib and above.

3.2 Influence Parameters

The meter shall work satisfactorily with guaranteed accuracy limit under the presence of the following influence quantities as per IEC: 1036 and CBIP Technical Report No: 88 with latest amendment:

a) External magnetic field *
b) Electromagnetic field induction,
c) Radio frequency interference,
d) Vibration etc,
e) Waveform 10% of 3rd harmonics,
f) Voltage variation,
g) Electro magnetic H.F. Field,
h) D.C. immunity test,

External magnetic field * test will be done as IS for AC abnormal field and at 0.5Tesla for DC magnetic field.

4.0 COMPONENT SPECIFICATIONS

Ser No	Component Function	Requirement	Makes and Origin
4.1	Current Transformers/ Shunt	The Meters should be with the current transformers/ Shunt as measuring elements. The current transformer should withstand for the clauses under 5.2.h	The current transformer/ Shunt should withstand for the clauses under 5.2.h
4.2	Measurement or computing chips	The Measurement or computing chips used in the Meter should be with the Surface mount type along with the ASICs.	USA: Analog Devices, Cyrus Logic, Atmel, Phillips,TDK,TI South Africa: SAMES Japan: NEC
4.3	Memory chips	The memory chips should not be affected by the external parameters like sparking, high voltage spikes or electrostatic discharges.	USA: Atmel, National Semiconductors, Texas Instruments, Phillips, ST, Japan: Hitachi or Oki
4.4	Display modules	a) The display modules should be well protected from the external UV radiations. b) The display visibility should be	Hong Kong: Genda Singapore: Bonafied Technologies Korea: Advantek China: Success,China

Ser No	Component Function	Requirement	Makes and Origin
		sufficient to read the Meter mounted at height of 0.5 meter as well as at the height of 2 meters (refer 3.2.d for Viewing angle). c) The construction of the modules should be such that the displayed quantity should not disturbed with the life of display (PIN Type). d) It should be trans-reflective HTN or STN type industrial grade with extended temperature range.	dispaly Japan: Hitachi, Sony
4.5	Communicatio n modules	Communication modules	USA: National Semiconductors, HP, Optonica Holland / Korea: Phillips Japan: Hitachi Taiwan: Ligitek
4.6	IR Port	The mechanical construction of the port should be such to facilitate the data transfer easily.	USA: National Semiconductors ,HP Holland / Korea: Phillips Japan: Hitachi, Taiwan: Ligitek
4.7	Power Supply	The power supply should be with the capabilities as per the relevant standards. The power supply unit of the meter should not be affected in case the maximum voltage of the system appears to the terminals due to faults or due to wrong connections.	It should take care of clause 3.1 and 3.5 **NO capacitive supply**
4.8	Electronic components	The active & passive components should be of the surface mount type & are to be handled & soldered by the state of art assembly processes.	USA: National Semiconductors, Atmel, Phillips, Texas Instruments, Japan: Hitachi, Oki, AVX or Ricoh Korea: Samsung Taiwan; Yageo; samxon
4.9	Mechanical parts	a) The internal electrical components should be of electrolytic copper & should be protected from corrosion, rust etc. b) The other mechanical components should be protected from rust, corrosion etc. by suitable plating/painting methods.	
4.10	Battery	Lithium with guaranteed life of 10 years	Varta, Tedirun, Sanyo or Panasonic, maxwell
4.11	RTC & Micro controller	The accuracy of RTC shall be as per relevant IEC / IS standards	USA: Philips, Dallas Atmel, Motorola, Microchip Japan: NEC or Oki
4.12	P.C.B.	Glass Epoxy, fire resistance grade FR4, with minimum thickness 1.6 mm	(BBT test is must)

Note: The components used by manufacturer shall have “Minimum Life” more than the product “Guarantee life” as mentioned in cl 4.7 This hold true even for name plate printing, mechanical component plating, glue of stickers etc. Incase vendor want to use other make components; same shall be approved by BSES before use. In general the component life shall be twice the “Guarantee life”.

5.0 GENERAL REQUIREMENTS

5.1On the meter name-plate:

a) meter serial number should be of 7/8 digits

b) Size of the digit of the meter serial number should be minimum 5mm X 3mm.

c) bar code should be printed next to / below / above the meter serial number

d) BIS registration mark (ISI mark)

5.2 Meter Sr. Nos. to be printed in black on the name plate, instead of embossing.

5.3 Buyer’s Serial Number sticker should be fixed on window glass from inside or on Meter front cover of minimum digit size 5 mm X 3 mm.

5.4 Supplier shall supply software suitable for energy measurement & energy spot billing through CMRI.

5.5 The supplier should seal the meter cover. The Buyer shall approve the method of sealing.

5.6 The internal potential links should be in closed position or link less Meters will be preferred and there shall not be any external link.

5.7 Terminal cover should be fixed on Meter before dispatch.

5.8 Box number, Meter serial number, type, rating should be mentioned on cases / cartons.

5.9 Meters shall be suitably packed with environmental friendly material in order to avoid damage or disturbance during transit or handling and to prevent in grace of moisture and dust.

6.0 ANNEXURE 1: DISPLAY SEQUENCE FOR THE PARAMETERS

6.1 Default Display:

1. Cumulative KWH (cumulative KWH to be displayed continuously without decimal)

6.2 On-demand Display:

After using pushbutton the following parameters should be displayed.

1. LCD test
2. Date
3. Real Time
4. Current MD in KW
5. Last month billing Date
6. Last month billing KWH reading
7. Last month billing Maximum Demand in KW
8. Last month billing Maximum Demand in KW occurrence Date
9. Last month billing Maximum Demand in KW occurrence Time
10. Serial No of meter.

Note: The meter display should return to Default Display mode (mentioned above) if the 'push button' is not operated for more than 6 seconds.

History : Last six month cumulative active energy (KWH) .

Last six months maximum demand in KW with occurrence date and time

B) Three Phase (20-100 Amps).

1.0 TECHNICAL SPECIFICATION

Sr. No.	Parameters	Technical Requirements
1.1	Voltage	240 volt (P-N), 415 volt (P-P) +20% to -40% Vref.
1.2	Display	a) LCD (Seven digits) b) Height: 10 mm X 5 mm min. c) Pin Type d) Viewing angle min. 120 degrees
1.3	Display parameters	a) Display parameters: LCD test, date & time, cumulative KWH, cumulative KVAH & RKVAH, MD in KW & KVA, PF, V, I (cumulative KWH continuous and other parameter with pushbutton. All the energies are without decimal.) b) Display order shall be as per Annexure-1
1.4	Power factor range	Zero lag –unity- zero lead
1.5	Power Consumption	Less than 1 Watt & 4VA per phase in voltage circuit, 2 VA in current circuit
1.6	Starting current	0.2 % of I_b
1.7	Current range	Higher current range i.e. Imax is acceptable.
1.8	Test Output Device	Flashing LED visible from the front
1.9	Billing data	a) Meter serial number, Date and time, KWH, KVAH, RKVAH, MD in KW and KVA, No. of tamper counts, tamper occurrence with date & time, tamper restoration date & time with snap shots. History of KWH, KVAH, RKVAH & MD for last 6 months along with TOD readings. b) All the above parameters (namely KWH, KVAH, RKVAH, MD in KW and KVA) are meter readings. c) All these data shall be accessible for reading, recording and spot billing by downloading through optical port on MRI or Laptop computers at site.
1.10	MD Registration	a) Meter shall store MD in every 30 min. period along with date & time. b) It should be possible to reset MD automatically at the defined date (or period)
1.11	Auto Reset of MD	Auto reset date for MD shall be indicated at the time of finalizing GTP and provision shall be made to change MD reset date through MRI even after installation of meter on site.
1.12	TOD metering	Meter shall be capable of doing TOD metering for KWH, KVARH, KVAH and MD in KW and KVA with 6 time zones (programmable on site through CMRI)
1.13	Load survey	30 min integration period, load profile of average voltage and current, KWand KVA for min. 36 days
1.14	Time required for data reading from meter and downloading on	Meter data consisting of all parameters and 36 days load survey for 4 parameters shall be read by CMRI and downloaded on desktop PC in minimum possible time and it shall be indicated at the time of finalizing GTP.

Sr. No.	Parameters	Technical Requirements
	desktop PC	
1.15	Diagnostic feature	Self diagnostic for time, calendar, RTC battery all display segments and NVM.
1.16	Security feature	Programmable facility to restrict the access to the information recorded at different security level such as read communication, communication write etc
1.17	Software & communication compatibility	a) Optical port with RS 232 compatible to transfer the data locally through CMRI & remote through PSTN / Optical fiber / GSM / CDMA / RF / any other technology to the main computer. b) The Supplier shall supply Software required for CMRI & for the connectivity to AMR modules. The supplier shall also provide training for the use of software. The software should be compatible to Microsoft Windows systems (Windows 98 system). The software should have polling feature with optional selection of parameters to be downloaded for AMR application. c) Necessary provision shall be made in the software for converting all the parameters available for new and old meters if supplied earlier. Copy of operation manual shall be supplied. d) The meter should have capability to store the tamper status in the memory in the form of status word. Any change in the status word (selectable basis) the meter should generate the interrupt to initiate the communication with the AMR module through RS232 port if module connected.
1.18	Memory	Non volatile memory independent of battery backup, memory should be retained up-to 10 year in case of power failure
1.19	Climatic conditions	a) The meter should function satisfactorily in India with temperature ranging from 0 - 60ºC and humidity upto 96%. b) Also refer IS: 13779 for climatic conditions.
1.20	Calibration	Meters shall be software calibrated at factory and modification in calibration shall not be possible at site by any means.

2.0 CONSTRUCTIONAL FEATURES

Sr. No.	Parameters	Technical Requirements
2.1	Body of Meter	a) Top transparent and base opaque material polycarbonate of LEXAN 143A/943AA or equivalent grade. b) Front cover & base should be ultrasonically welded and should be provided with the brass sealing screws. c) Top cover should be designed so as the internal components should not be visible.
2.2	Terminal Block	Made of polycarbonate of grade 500 R or equivalent grade and shall form Integral part of the meter base, brass or copper current terminals with flat-head brass screws.
2.3	Terminal cover	Transparent terminal cover with provision of sealing through sealing screw.
2.4	Diagram of connections	Diagram of external connections to be shown on terminal cover
2.5	Marking on name plates	Meter should have clearly visible, indelible and distinctly name plate marked in accordance with IS & Reliance Energy Ltd specifications.
2.6	Meter Sealing	Supplier shall affix one Buyer seal on side of Meter body as advised and record should be forwarded to Buyer.
2.7	Guarantee /	5 Years.

Sr. No.	Parameters	Technical Requirements
	Warranty	
2.8	Insulation	A meter shall withstand an insulation test of 4 KV and impulse test at 8 KV
2.9	Resistance of heat and fire	The terminal block and Meter case shall have safety against the spread of fire. They shall not be ignited by thermal overload of live parts in contact with them as per the relevant IS 13779.

3.0 TAMPER & ANTI-FRAUD DETECTION/EVIDENCE FEATURES

The meter shall log minimum 225 tamper events, compartment wise division of each event and their persistence time shall be indicated in GTP.

The Meter shall not be affected by any remote control device & shall continue recording energy under any one or combinations of the following conditions:

3.1. **Phase sequence reversal:** The meters shall work accurately irrespective of the phase sequence of the supply.

3.2. **Detection of missing potential:** In case someone intentionally takes out a potential lead, the date and time of such occurrence shall be recorded by the Meter. The restoration of normal supply shall also be similarly recorded. The threshold for the voltages should be programmable.

3.3. **Reversal of C.C. (Current Coil) Polarity:** Meter shall record the reversal of C.C. polarity with time and date, and also the time of restoration. Meter shall however

3.4. register the energy consumed correctly with any one, two or all three phase c.c. reversal.

3.5. **C.C. Shorting:** Meter shall record C.C. Terminal shorting with time and date and time of restoration. The threshold of the current should be programmable.

3.6. **Power On / Off:** Meter shall detect power OFF (minimum power off period 5 minutes) if any of phase voltages are not present. This event shall be recorded at the time of each power OFF. At the same time power ' ON ' event shall be recorded. This logging shall be available in Tamper details along with cumulative time of failure.

3.7. **Recording of Neutral disturbance: -** Meter shall log all events when AC/DC current or voltage is injected in neutral circuit without disturbing the recording of energy.

3.8. **Snap-on parameters:** Meter shall log all three phase voltage, current, power factor etc. at the time of tamper attempt for all such occurrence.

3.9. **External Magnetic tampers:** Meter should log on the events of attempt of tampering by external magnetic field as mentioned in the CBIP Technical report no. 88 with latest amendments.

The Meter shall record energy at maximum current (Imax) under the influence of abnormal external magnetic field irrespective of actual load, energy recorded in such case shall also be available in separate register. The Meter shall record as per actual load once the external abnormal magnetic field is removed. In such conditions the Meter shall log the event for presence of abnormal external magnetic field and its restoration.

3.10. **Influence Quantities:** The Meter shall work satisfactorily with guaranteed accuracy limit under the presence of the following influence quantities as per IS 13779, IEC-1036, and CBIP Technical Report No.88 with latest amendment.

The influence quantities are:

3.10.1. External Magnetic field – 0.2 tesla (with log on feature)

3.10.2. Electromagnetic field induction,
3.10.3. Radio frequency interference,
3.10.4. Unbalanced load,
3.10.5. Vibration etc,
3.10.6. Wave form 10% of 3rd harmonics,
3.10.7. Phase sequence,
3.10.8. Voltage unbalance,
3.10.9. Electro Magnetic H.F. Field, and
3.10.10. D.C. Immunity test.

4.0 COMPONENT SPECIFICATIONS

Ser No	Component Function	Requirement	Makes and Origin
4.1	Current Transformers	The Meters should be with the current transformers as measuring elements. The current transformer should withstand for the clauses under 5.9.j	The current transformer should withstand for the clauses under 5.9.j
4.2	Measurement or computing chips	The Measurement or computing chips used in the Meter should be with the Surface mount type along with the ASICs.	USA: Anolog Devices, Cyrus Logic, Atmel, Phillips, Texas Instruments. South Africa: SAMES Japan: NEC
4.3	Memory chips	The memory chips should not be affected by the external parameters like sparking, high voltage spikes or electrostatic discharges.	USA: Atmel, National Semiconductors, Texas Instruments, Phillips, ST,Microchip Japan: Hitachi or Oki
4.4	Display modules	a) The display modules should be well protected from the external UV radiations. b) The display visibility should be sufficient to read the Meter mounted at height of 0.5 meter as well as at the height of 2 meters (refer 3.2.d for Viewing angle). c) The construction of the modules should be such that the displayed quantity should not disturbed with the life of display (PIN Type). d) It should be trans-reflective HTN or STN type industrial grade with extended temperature range.	Hongkong: Genda Singapore: Bonafied Technologies Korea: Advantek China: Sucess Japan: Hitachi, Sony Holland / Korea: Phillips
4.5	Communication modules	Communication modules should be compatible for the two RS 232 ports (one for optical port for communication with Meter reading instruments & the other - for the hardwired RS 232 port to communicate with various modems for AMR)	USA: National Semiconductors, HP, Optonica,ST, Holland / Korea: Phillips Japan: Hitachi Taiwan: Ligitek Germany: Siemens
4.6	Optical port	Optical port should be used to transfer the meter data to meter reading instrument.	USA: National Semiconductors ,HP Holland / Korea: Phillips

Ser No	Component Function	Requirement	Makes and Origin
		The mechanical construction of the port should be such to facilitate the data transfer easily.	Japan: Hitachi, Taiwan: Ligitek
4.7	Power Supply	The power supply should be with the capabilities as per the relevant standards. The power supply unit of the meter should not be affected in case the maximum voltage of the system appears to the terminals due to faults or due to wrong connections.	SMPS Type (It should take care of clause 3.1 and 3.5)
4.8	Electronic components	The active & passive components should be of the surface mount type & are to be handled & soldered by the state of art assembly processes. The PTH components should be positioned such a way that the leads of components should not be under stress and not touching the internal wires.	USA: National Semiconductors, Atmel, Phillips, Texas Instruments,ST,Onsemi Japan: Hitachi, Oki, AVX or Ricoh Korea: Samsung
4.9	Mechanical parts	**a) The internal electrical components should be of electrolytic copper & should be protected from corrosion, rust etc.** b) The other mechanical components should be protected from rust, corrosion etc. by suitable plating/painting methods.	
4.10	Battery	Lithium with guaranteed life of 10 years	Varta, Tedirun, Sanyo or National
4.11	RTC & Micro controller	The accuracy of RTC shall be as per relevant IEC / IS standards	USA: Philips, Dallas Atmel, Motorola, Microchip Japan: NEC or Oki
4.12	P.C.B.	Glass Epoxy, fire resistance grade FR4, with minimum thickness 1.6 mm	

5.0 GENERAL REQUIREMENTS

5.1 On the meter name-plate:

5.2 meter serial number should be of 7/8 digits

5.3 size of the digit of the meter serial number should be minimum 5mm X 3mm.

5.4 bar code should be printed next to / below / above the meter serial number

5.5 BIS registration mark (ISI mark)

5.6 Supplier shall supply software suitable for energy measurement & energy spot billing through CMRI.

5.7 Buyer's Serial Number sticker should be fixed on window glass from inside or on Meter front cover of minimum digit size 6 mm X 3 mm.

5.8 The supplier should seal meters on both sides. The Buyer shall approve the method of sealing.

5.9 The internal potential links should be in closed position or link less Meters will be preferred and there shall not be any external link.

5.10 Terminal cover should be fixed on Meter before dispatch.

5.11 Meter Sr. Nos. to be printed in black on the name plate, instead of embossing.

5.12 Box number, Meter serial number, type, rating should be mentioned on cases / cartons.

5.13 Meters shall be suitably packed with environmental friendly material in order to avoid damage or disturbance during transit or handling and to prevent in grace of moisture and dust.

6.0 ANNEXURE 1: DISPLAY SEQUENCE FOR THE PARAMETERS

6.1 Default Display:

1. Cumulative KWH (cumulative KWH to be displayed continuously without decimal)

6.2 On-demand Display:

After using pushbutton the following parameters should be displayed.

1.LCD test
2 Date
3 Real Time
4 Cumulative RKVAH
5 Cumulative KVAH
6 Current MD in KW
7 Current MD in KVA
8 Instantaneous Power factor
9 Instantaneous voltage R phase
10 Instantaneous voltage Y phase
11 Instantaneous voltage B phase
12 Instantaneous current R phase
13 Instantaneous current Y phase
14 Instantaneous current B phase
15 Last month billing Date
16 Last month billing KWH reading
17 Last month billing RKVAH reading
18 Last month billing KVAH reading
19 Last month billing Maximum Demand in KW
20 Last month billing Maximum Demand in KW occurrence Date
21 Last month billing Maximum Demand in KW occurrence Time
22 Last month billing Maximum Demand in KVA
23 Last month billing Maximum Demand in KVA occurrence Date
24 Last month billing Maximum Demand in KVA occurrence Time

Note: The meter display should return to Default Display mode (mentioned above) if the 'push button' is not operated for more than 6 seconds.

TECHNICAL SPECIFICATION FOR ENGINEERING PLASTIC METER BOX

1. Scope

This specification covers manufacture, testing at works and supply of Three Phase LT Meter Boxes made of insulating material intended to contain meters to be installed on wall or similar flat surface structure.

2. Applicable Standard

The Meter Boxes shall comply with IS : 5133 (Part-II)

3. Service Conditions

Equipment to be supplied against this specification shall be suitable for satisfactory continuous operation under the following tropical conditions.

Maximum Ambient Temperature (Degree C)	60
Maximum temperature in shade (Degree C)	45
Minimum Temperature of Air in Shade (Degree C)	0° C
Relative Humidity (Percent)	10 to 100
Maximum annual rain fall (mm)	1450
Maximum Wind pressure (Kg/Sq. M.)	150
Maximum altitude above mean sea level (Metre)	1000
Isoceranic level (days per year)	50
Seismic level (Horizontal Acceleration) Moderately hot and humid tropical climate conducive to rust and fungus growth	0.3 g

4.0 Material and Construction

4.1 The Meter box shall be made of **Injection Moulded reinforced Fire Retardant Polypropylene/ Polycarbonate**, with wall thickness as specified by GTP capable of withstanding temperatures up to 125 °C (As per Ball pressure tests clause 9.14.2 IS – 8828/96).

4.2 (i) The over all dimensions (in mm) of the box shall ensure following inner air gap.

Both left ,right and top hinge side ……. 15mm.

Meter body top surface …….. 15mm

Meter body bottom (wire entry) ……..100 mm.

(All above above clearance are minimum dimension).

(ii) The thickness of the Box & window shall be 2.5 mm ± 0.15 mm.

(iii) The box shall have ample space to fit GSM / CDMA MODEM and their accessories including antenna etc.

4.3 The Cover of meter box is made of polycarbonate transparent. The meter shall have suitable cable terminated on top cover with D-Port . The other end of cable shall be suitable to be connected with wired port of meter.

4.4 Meter box shall have 2 Nos. of Knock out type holes of diameter at the bottom for entry of service connection wires fixed with one glands .

4.5 For Meter reading , Push button is provided .

4.6 The box cover shall be fixed on two hinges. A total no of 2 hinges in one meter box.

4.7 For holding and locking the cover, U-shaped latches with one hole for riveting on the base and the other for sealing the meter box shall be provided. This clamp will also hold the cover with base. The total number of Clamps for each box will be 2 Nos.

4.8 Meter base supports shall be raised by about 10 mm in the box for easy of wiring.

4.9 Soft rubber gasket for protection on all around cover will be provided.

4.10 The box will be provided with 4 fixing holes of 8mm dia , In addition sealing holes of 3 to 3.5 mm dia will be provided in U clamps.

4.11 The box should have earthling provision.

4.12 Box with CRCA frame for box and meter mounting will be preferred.

TECHNICAL SPECIFICATION FOR CRGO CORE DISTRIBUTION TRANSFORMERS

CAPACITY OF TRANSFORMERS

A. 10 Kva 11/0.23Kv Transformer.
B. 16 Kva 11/0.23Kv Transformer.
C. 25 Kva 11/0.4 Kv Transformer.
D. 63Kva 11/0.4Kv Transformer.
E. 100Kva 11/0.4 Kv Transformer.

1) Manufacturer must have CPRI certification.
2) All others technical specification must satisfy latest ISS .

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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

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 200 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.

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 Reference 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 BASIS = TURNKEY (BALASORE MUNCIPALITY)

SCHEDULE FOR PRICE BID (1C) BASIS = TURNKEY							
Sl No	**Name of the Work**	**Unit**	**Qnty.**	**Unit Rate in Rs**		**Total Price in Rs**	
				In figures	**In words**	**In figures**	**In words**
1	**Erection, drawal** & commissioning of **11KV 2Phase HT Line (1Km) with 55sqmm AAA Conductor with 9 mtr long 300 KG PSC Pole** with 50 mtr.span , 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 alluminum 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 (5 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. All the poles should be provided with paddling & cooping.	**KM**	**4.67**				
2	Erection, drawal & commissioning of **11KV 3Phase HT Line (1Km) with 55 sqmm AAA Conductor with 9mtr long 300 KG PSC Pole** with 50 mtr.span (19spans 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 alluminum 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 (5 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. All the poles should be provided with paddling & cooping.	**Km**	**1.5**				
GRAND TOTAL FOR CONSTRUCTION OF 11KV line							

SCHEDULE FOR PRICE BID BASIS = TURNKEY (BALASORE MUNCIPALITY)

Sl No	Description of work	Unit	Qnty.	Unit Rate in Rs In figures	Unit Rate in Rs In words	Total Price in Rs In Figures	Total Price in Rs In words
	Supply of **16 KVA, 11/0.23, 11 KV Single Ph distribution transforme**r (with CPRI certification or equivalent certification) and installation of the same with transformer mounting bracket over 300 KG 9 Mtr long PSC pole (with supply & erection of the pole) with padding, cooping as per specification and supply & installation of 11 KV 2 pole AB switch, HG fuse unit, 2 Nos. LA, one Distribution box with energy meter with provision of four Nos.earthing duly connected to transformer, AB switch, HG fuse & LA (All supplied by the bidder) along with supply & fixing of required channel, angle & stay set as per specification. Anti climbing device should be provided. The line should be duly inspected by authorized officers of Electrical Inspectorate, Orissa so as to make the line suitable for charging. **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. There should be provided stay at the sub station point if necessary. The padding & cooping work of all HT supports must be done as per REC standard. There should be inscribed in each pole/Sub-Station or Transformer Up-graded/ installed "BSVY" and the year of electrification in white paint in the background of deep green paint.	**Nos.**	**37**				
	GRAND TOTAL FOR INSTALLATION OF 16KVA11/0.23KV S/S						

SCHEDULE FOR PRICE BID BASIS- TURNKEY (BALASORE MUNICIPALITY)

Sl No	Description of work	Unit	Qnty.	Unit Rate in Rs In figures	In words	Total Price In figures	In words
	Construction of 25 KVA, 11/0.4, 11KV 3-Phase Distribution Sub-station complete with 1. 9mtrlong. **300 kg PSC Double Pole structure** along with Channel for supporting transformer, Channel and angle for supporting AB Switch, HG Fuse unit, Channel for supporting insulators, belting and belting support for transformer, danger plate, nuts, bolts & washers, preformed insulator binding, and required hardware, 5 nos. of earthing arrangement with electrodes,cable for connection of transformer to LTDB,GI pipe & lamps for routing of cable & all other sundry items & Supply and erection of 11Kv Stay set Complete & Supply & of 25 KVA, 11/0.433KV, 3-Phase Distribution Transformer with all accessories such as 11KV, 3-pole AB Switch, 11KV HG fuse set & LA, LT Distribution box with energy meter complete as per RE specification N.B – All the required materials in cluding fixtures are to be provided by the bidder and the work inspected by the authrosied official of ELBO Orissa so as to enable the s/s to be charged . The materials should be of good quality conforming to REC standard. The transformer provided should be CPRI certification or equivalent certification. Proof of purchase of materials is required .There should be inscribed in each pole and transformer up-graded /installed" BSVY" and the year of electrification in white paint in the background of deep green paint	Nos.	**11**				
	GRAND TOTAL FOR INSTALLATION OF 25 KVA11/0.4KV S/S						

SCHEDULE FOR PRICE BID BASIS = TURNKEY (BALASORE MUNICIPALITY.)

Sl No	Description of work	Unit	Qnty.	Unit Rate in Rs In Figures	In words	Total Price in Rs In figures	In words
1.	**Erection, drawal** & commissioning of **Single Phase ABC LT OH Line of 1Km (Span = 40m),with** 8 mtr long 200 KG PSC Pole with (25 spans per KM) along with pole concreting, earthing arrangement, eye hook, suspension / dead end clamp including belting of clamps, etc. complete as required for supporting LT XLPE insulated AB conductor, anti climbing device with fasteners, danger plate, nuts, bolts & washers and required hardware, as per specification & Supply & stringing of XLPE Insulated 1-phase ABC **(1X35+1x16+1x25) sq.mm** as per specification along with supply & erection of LT stay set Complete. All the poles should be provided with paddling & cooping. **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. If the number stays per K.M becomes less or more than 6 Nos taking the block as unit then the cost of that number of stay will be deducted from the bill or added in the bill. Here the cost of stay will be treated as the unit cost price of stay as per schedule rate. 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 "BSVY" and the year of electrification in white paint in the background of deep green paint.	Km	**7.0**				
	GRAND TOTAL FOR CONSTRUCTION OF 1-Ph ABC LT OH Lines						

SCHEDULE FOR PRICE BID BASIS = TURNKEY (BALASORE MUNICIPALITY.)

Sl No	Description of work	Unit	Qnty.	Unit Rate in Rs		Total Price in Rs	
				In Figures	In words	In figures	In words
1	Erection, drawal & commissioning of **of 3-Phase XLPE insulated ABC LT OH Lines (Span = 40m), with 8 mtr 200KG PSC Pole(**25Nos of pole per Km) along with earthing arrangement, cross arm insulator, fittings , hardware & accessories etc. complete as required for supporting conductor, anti climbing device, danger plate, nuts, bolts & washers and required hardware & LT stay set complete in all respect & Supply & stringing of XLPE Insulated, 3-Phase ABC (a**)(3X35+1x16+1X25)sq.mm** as per specification along with Supply & erection of LT stay set Complete set(Approximately six numbers per Km on the average). All the poles should be provided with paddling & cooping. **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. If the number stays per K.M becomes less or more than 6 Nos taking the block as unit then the cost of that number of stay will be deducted from the bill or added in the bill. Here the cost of stay will be treated as the unit cost price of stay as per schedule rate. 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 “BSVY” and the year of electrification in white paint in the background of deep green paint. .	Km	**3.30**				
	GRAND TOTAL FOR CONSTRUCTION OF 3 -Ph ABC LT OH Lines						

SCHEDULE FOR PRICE BID BASIS = TURNKEY (BALASORE MUNICIPALITY)

Sl No	Description of work	Unit	Qnty.	Unit Rate in Rs In Figures	Unit Rate in Rs In words	Total Price in Rs In Figures	Total Price in Rs In words
10	**Installation of Service Connections complete work for BPL consumer as specified below** 1. Supply & fixing of NESCO approved energy meter with TP box as per specification . 2. Supply of C.F.L bulb i) 18W –1No i) 11W- 1No ii) power supply to un electrified BPL House hold 3. Providing service connection 1.5sqmm Twin core PVC cable with piercing connector Meter Board , 16 amp DP main switch with earthing terminal, Coil earthing, Wooden distribution board with two nos. of flush type 5 A Switch, two nos. of holders, house wiring including all other sundry items such as /C bracket & bends with clamps, PVC Conduit, 10SWG GI Wire complete works as per specification. **N.B. –** All the required materials for the above work has to be provided by the bidder of ISS standard. The work should be complete in all respect duly inspected by authorized officials so as to be ready for providing power supply to BPL house holds.	No	**675**				
	GRAND TOTAL FORGIVING POWER SUPPLY TO BPL HOUSE HOLD						

SCHEDULE FOR PRICE BID BASIS = TURNKEY (BALASORE MUNICIPALITY)

Sl No	Description of work	Bls Municipality	Total Price in Rs In Figures	In words
1.	Supply & Erection of **HT stay set complete** along with stay wire (7/10 GI stay wire) & connecting the same to the HT pole complete in all respect.	6		
2.	Supply & Erection of **LT stay set complete** along with stay wire (7/12 GI stay wire) & connecting the same to the LT pole complete in all respect.	6		
3.	Supply & Erection of **2Nos of HT stay set complete** along with stay wire (7/10 GI stay wire) & connecting the same to the 2Nos of DP pole of 25KVA /63KVA/100KVA S/S complete in all respect.	2		
4.	Supply & Erection of **11mtr RS joist pole (115mmX115 mm)** & construction of DP by providing appropriate top channel (100X50x6 mm Ms channel)& required size **of N & B for road or river crossing for 11KV line.**	-		
5.	**Supply & Erection of 11mtr RS joist pole (115mmX115 mm) & construction of DP** by providing appropriate top channel (100X50x6 mm Ms channel)& required size of N & B for road or river crossing **for LT line**. **NB-** In case of river or road crossing if appropriate is not achieved by 9 mtr long psc pole, 11mtr long RS joist as in sl. 4 & 5 will be used.In that case the cost of 1 span with 2 pole will be deducted & cost 2 DPs as above will be added.			

SCHEDULE FOR PRICE BID BASIS = TURNKEY (BALASORE MUNICIPALITY)

Sl No	Description of work	Bls Municipality	Total Price in Rs In Figures	In words
1.	Supply ,Errection & fixing (suitably) of 8Mtr long Psc pole as strut on required points of LT & HT lines where stay cannot be fixed.	5		
2.	Supply ,Errection & fixing (suitably) of 9Mtr long Psc pole as strut on required points of LT & HT lines where stay cannot be fixed.	2		
3.	Supply & Errection of 9Mtr long Psc pole with V cross arm & F clamp duly fitted over it(All supplied by contractor)3 Nos of 11KV Pin insulator with GI pin.			
4.	Supply & Errection of 11Mtr long RS joist pole with V cross arm & F clamp duly fitted over it (All supplied by contractor) 3 Nos of 11KV Pin insulator with GI pin.			
5.	Supply & Errection of 9Mtr long Psc pole with V cross arm & F clamp duly fitted over it(All supplied by contractor)3 Nos of 11KV disc insulator for cut point.			
6.	Supply & Errection of 11Mtr long RS joist pole with V cross arm & F clamp duly fitted over it (All supplied by contractor) 3 Nos of 11KV disc insulator for cut point.			
7.	Supply of 6No & 8No GI wire including installation for guarding of the LT line or HT line with 50 mtr span	8		
8.	Supply & fixing of 2Nos of channel of 1.75mtr length (Size 75X40X6 mm Ms channel)&fixing of the same on the poles(2Nos)for installation of guarding wire.			

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 Balasore (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.
5. 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) 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.
6. The guarantee will not discharged due to change in the name, style and constitution of the Bank and contractor(s).

7. 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, Balasore (hereinafter called "Collector") has placed Order No……. Dt…… (herein after called "the Agreement") with M/s…….. (herein after called "Contractor") for Electrification of villages / Wards/Slums under Biju Saharanchala Vidyutikaran Yjojana 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.) ……, Balasore 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,) 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)

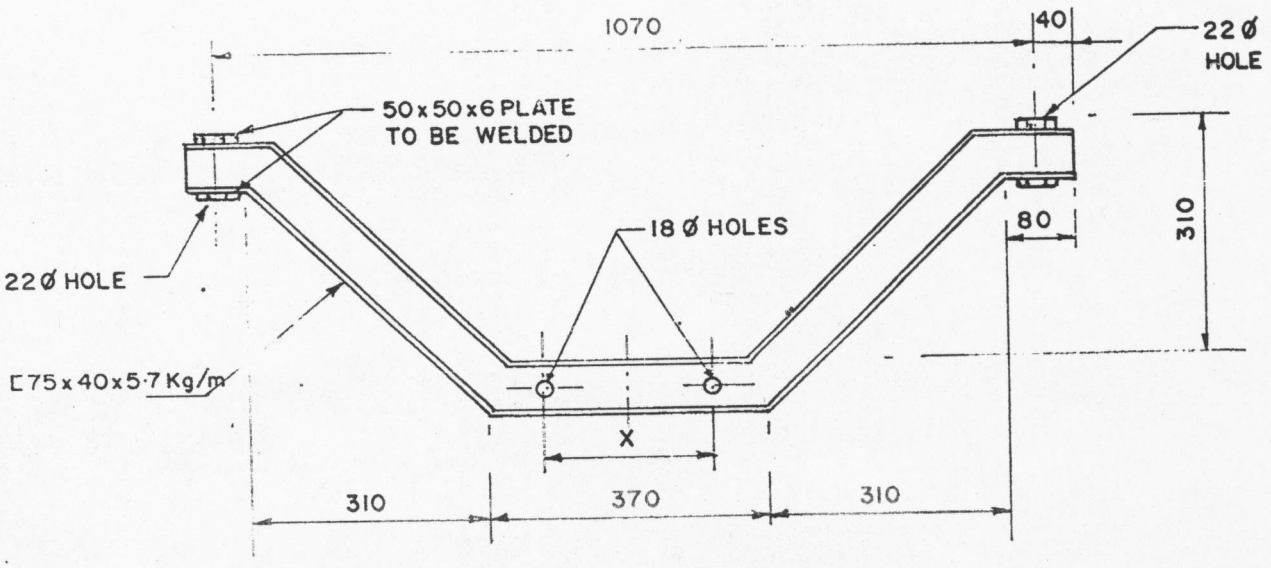
N.B.:-

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

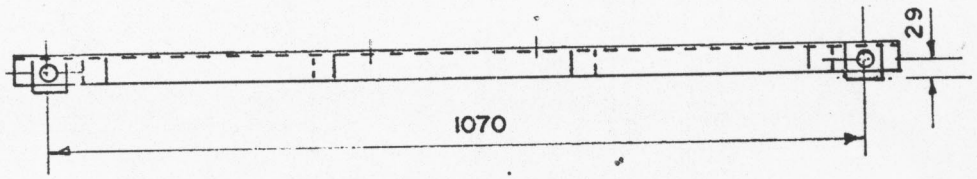
REC

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

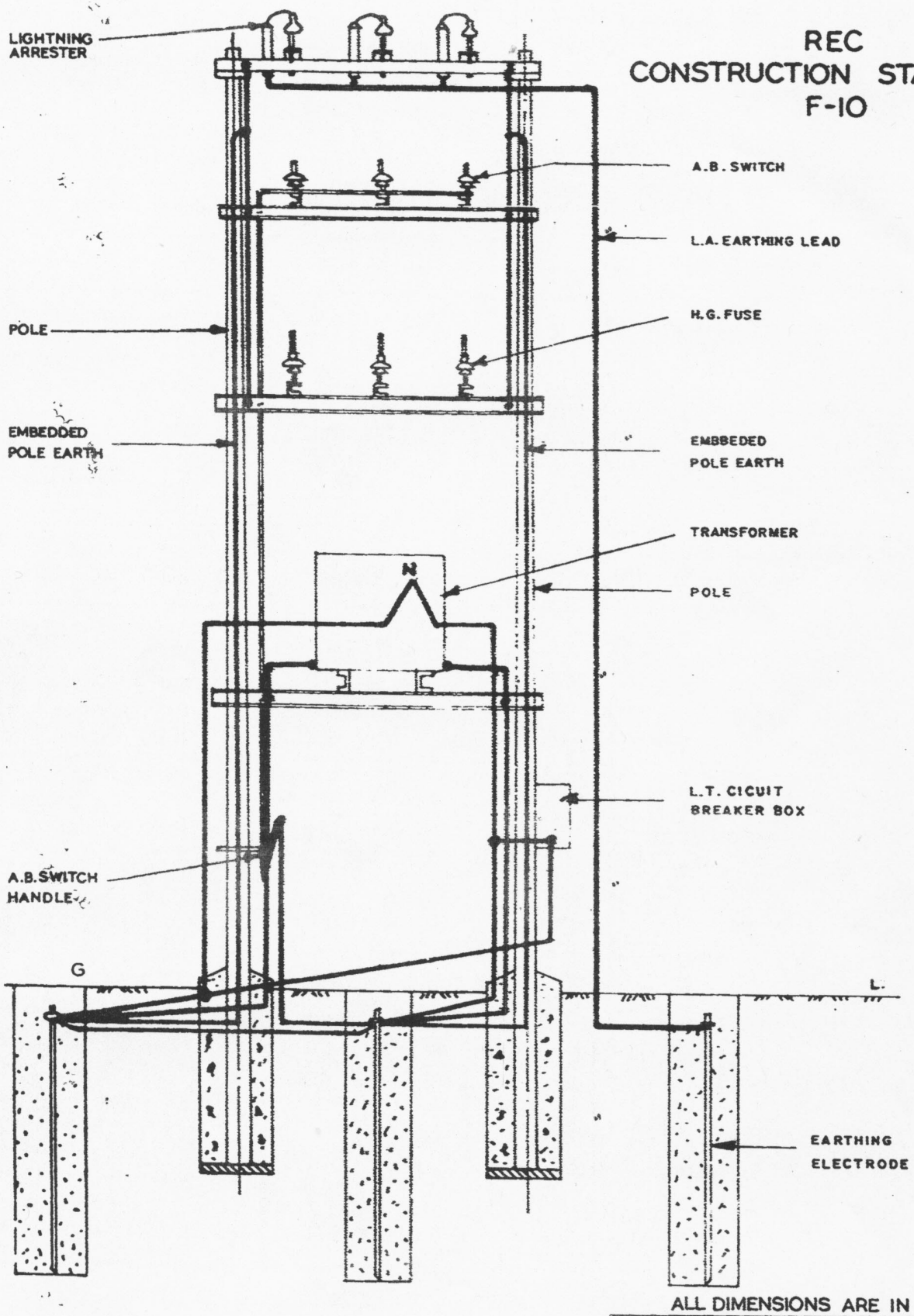
V-केंची भुजा

11 KV LINES

V - CROSS ARM

SCALE :- N.T.S	SEPT. - 1972

REC
CONSTRUCTION STANDARD
F-10



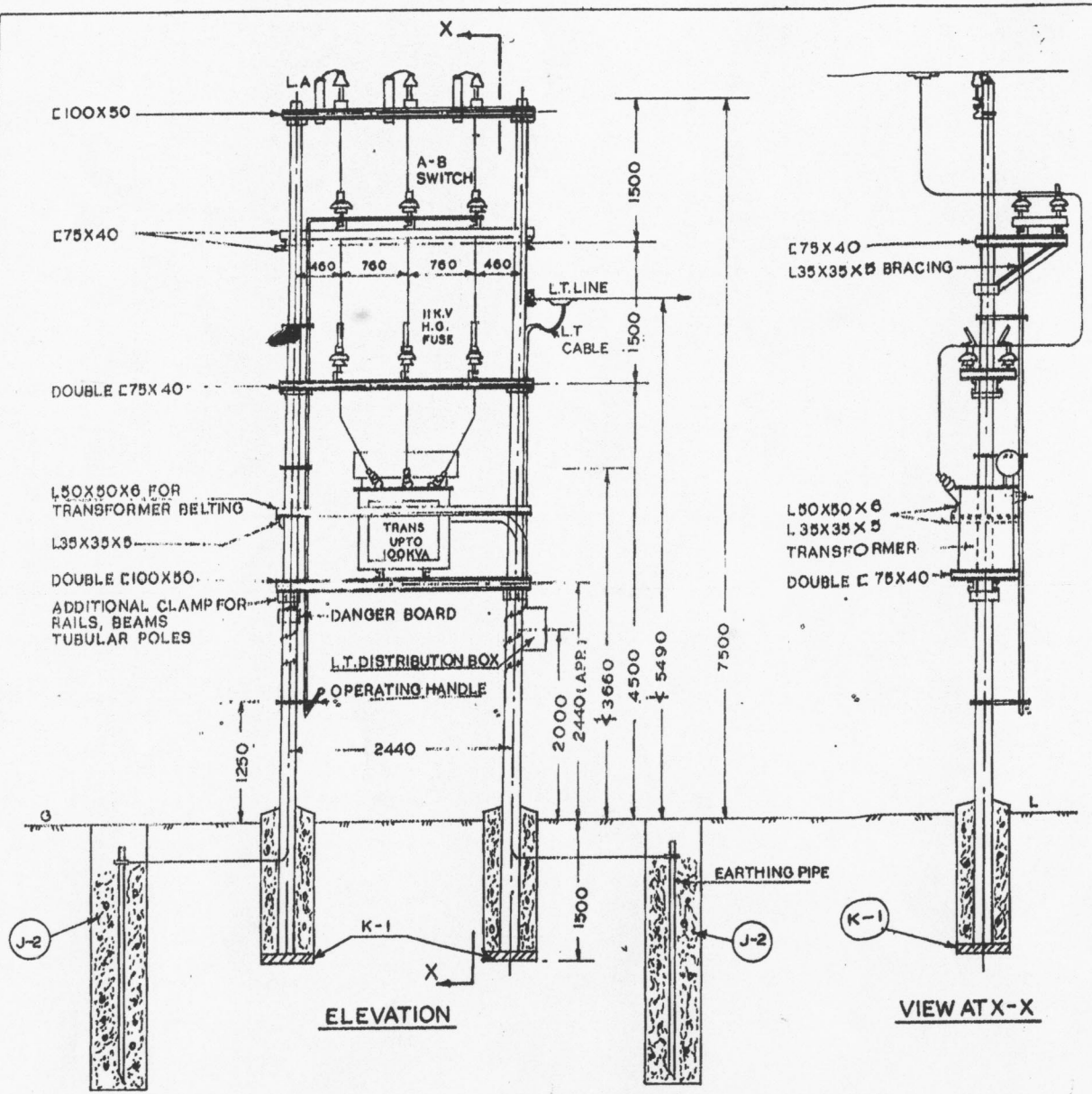
ALL DIMENSIONS ARE IN mm.

वितरण सब-स्टेशन के लिए
अर्थिंग व्यवस्था

EARTHING ARRANGEMENT FOR
DISTRIBUTION SUB-STATION

SCALE :- N.T.S	APRIL – 1983

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 स्थाननिर्धारण के लिए)
आरपार लाइन

11KV/433-250V
DISTRIBUTION SUB-STATION
(FOR ON LINE LOCATIONS-ACROSS LINE)

SCALE :- N.T.S | 1972/JAN - 1993

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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, Balasore.

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 Balasore 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 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 Balasore. and that the Superintending Engineer Electrical Circle Balasore 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.

8. Prior to bidding all the tenderer should clarify their doubts pertaining to tender, if any, from the SE, Electrical circle Balasore.

Sd/-
Collector & District Magistrate
Balasore