Section – I

INVITATION FOR BIDS (IFB)

Tender Notification: CSO/ 49/ Installation of 33/11 KV Substation & Lines

Date: 03.08.2011
1.0 The Registered Office of Western Electricity Company of Orissa Ltd. (WESCO) (herein after referred as CSO) invites sealed tenders from reputed Electrical Contractors with required license, either in individual capacity or as part of a joint venture agreement / consortium for carrying out various Electrical Installation works on ‘Turnkey’ basis in the jurisdiction of WESCO. The bidder must fulfill all the qualification requirements as specified in ITB stated below. The sealed envelopes shall be duly superscribed as “TENDER NOTICE/CSO/49/ Installation of 33/11 KV Substation & Lines due for opening on 25.08.2011”.

Note : (a) Two or more like minded contractors and/or manufacturers of electrical items, which are under scope of supply of the Contractor as per this tender specification, may form a Joint Venture / Consortium agreement amongst themselves and can apply against this Tender specification, provided they qualify the criteria specified in clause no. 5.0. The sample format of Joint Venture / Consortium agreement is enclosed as Annexure – V & VI of Vol.- II.

(b) However, if a bidder is quoting against one or more packages in his individual capacity, he can not be part of a joint venture / consortium agreement to participate in other package(s) as notified against this tender specification and vice versa.

2.0 SCOPE OF WORK :

Entire scope of works has been divided as 3 (Three) separate packages, each package covering the following works under Deogarh Electrical Division under WESCO. One or more or all of the below referred works are envisaged to be carried out under each Package:

(a) Construction of New 33/11 KV Primary Substation.
(b) Construction of New 33 KV Link Line with 100 sq.mm AAA Conductor
(c) Construction of New 11 KV Link Line with 55 sq.mm AAA Conductor.

Note: Major materials such as Transformer, AAA Conductor, VCB shall be issued by WESCO from their Burla stores to the contractor for installation at the works site. The contractor has to provide all other required materials to complete the work.
Brief details of proposed works under each package are described as below:

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Package Ref.</th>
<th>Work Description</th>
<th>Unit</th>
<th>Qty</th>
<th>EMD (In Rs.)</th>
<th>Work Completion Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A</td>
<td>(i) Construction of 2 X 3.15 MVA, 33/11 KV Primary Substation at Budhapal.</td>
<td>No.</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(ii) Construction of New 33 KV (3ph. 3w) Link Line with 100 sq. mm AAA Conductor</td>
<td>KM</td>
<td>30</td>
<td>Rs. 2.50 Lacs</td>
<td>6 calendar months from the date of issue of LOA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>from Rengali 132/33 KV Grid to the proposed 33/11 KV substation at Budhapal.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(iii) Construction of New 11 KV (3ph. 3w) Link Line (4 no’s) with 55 sq. mm AAA Conductor</td>
<td>KM</td>
<td>30</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>for power evacuation from the proposed 33/11 KV substation at Budhapal.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>B</td>
<td>(i) Construction of 2 X 3.15 MVA, 33/11 KV Primary Substation at Kandhal.</td>
<td>No.</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(ii) Construction of New 33 KV (3ph. 3w) Link Line with 100 sq.mm AAA Conductor</td>
<td>KM</td>
<td>0.2</td>
<td>Rs. 1.00 Lacs</td>
<td>3 calendar months from the date of issue of LOA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>from TEE to proposed 33/11 KV substation at Kandhal.</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>(iii) Construction of New 11 KV (3ph. 3w) Link Line (4 no’s) with 55 sq. mm AAA Conductor</td>
<td>KM</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>for power evacuation from the proposed 33/11 KV substation at Kandhal.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>C</td>
<td>(i) Construction of 2 X 3.15 MVA, 33/11 KV Primary Substation at Tileibani.</td>
<td>No.</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(ii) Construction of New 33 KV (3ph. 3w) Link Line with 100 sq. mm AAA Conductor</td>
<td>KM</td>
<td>17</td>
<td>Rs. 2.00 Lacs</td>
<td>4 calendar months from the date of issue of LOA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>from Rengalbeda 33/11 KV substation to proposed 33/11 KV substation at Tileibani.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(iii) Construction of New 11 KV (3ph. 3w) Link Line (4 no’s) with 55 sq. mm AAA Conductor</td>
<td>KM</td>
<td>25</td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td>for power evacuation from the proposed 33/11 KV substation at Tileibani.</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

2.1 The schedule of specifications with detail terms & conditions can be obtained from address given below against demand draft of Rs. 10000/- plus 4% VAT (per package) drawn in favour of North

TENDER NOTICE NO.: CSO/49/ INSTALLATION OF 33/11 KV SUBSTATION & LINES
Registered Office: NESCO, WESCO & SOUTHCO
Eastern Electricity Supply Company of Orissa Ltd., payable at Bhubaneswar. The tender papers will be issued on all working days up to 24.08.2011.

The tender documents can also be downloaded from the website: “www.wescoorissa.com”

In case tender papers are downloaded from the above website, then the bidder has to enclose a Demand Draft covering the cost of bid documents as stated above in a separate envelope with suitable superscription “Cost of Bid Documents : Tender Notice Ref : CSO/ 49 /Installation of 33/11 KV Substation & Lines”. This envelope should accompany the Bid Documents.

3.0 Offers will be received up to 2.00 PM. on 25.08.2011 and shall be opened at the address given below at 4.00 PM. on same day in presence of the authorized representatives of the bidders. The schedule of specifications with detail terms & conditions are enclosed. It is the sole responsibility of the bidder to ensure that the bid documents reach this office on or before the cut off due date of tender opening.

4.0 CSO reserves the right to accept / reject any or all Tenders without assigning any reason thereof and alter the quantity of materials mentioned in the Tender documents at the time of placing purchase orders. Tender will be summarily rejected if:

(i) Bid Security as noted above for packages bid for is not deposited in shape of Bank Draft payable at Bhubaneswar or Bank Guarantee enforceable in the Bhubaneswar branch of the issuing bank. Bid security submitted against previous Tenders, if any, will not be adjusted towards Bid Security against this Tender.

(ii) The offer does not contain “Supply & Installation Rates of individual items indicating break-up towards all taxes & duties”.

(iii) Complete Technical details are not enclosed.

(iv) Tender is received after due time due to any reason.

5.0 Qualification Criteria:-

The bidder must qualify all of the following requirements to be eligible to participate in the bidding against any one package. The bidder must quote for entire scope of works under one or multiple number of packages as mentioned above. In case the same bidder or consortium of bidders applies for more than one package, the qualifying criteria shall be added up and / or multiplied by, as the case may be.

(i) Minimum Annual Turnover :

In order to be eligible to quote for individual Packages the bidder must have Minimum Annual Turnover as stated below during any of the last five financial years (FY 2006-07, 2007-08, 2008-
Registered Office: NESCO, WESCO & SOUTHCO
09, 2009-10 & 2010-11). In proof of the Turnover, the bidder must enclose copies of Audited Annual Accounts of the relevant financial years.

<table>
<thead>
<tr>
<th>SL.No.</th>
<th>Package</th>
<th>Minimum Turnover (Rs In Cr.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A</td>
<td>2.5</td>
</tr>
<tr>
<td>2</td>
<td>B</td>
<td>1.0</td>
</tr>
<tr>
<td>3</td>
<td>C</td>
<td>2.0</td>
</tr>
</tbody>
</table>

(ii). Previous Works Experience:

In order to be eligible for quoting against any one package the Bidder, must have successfully executed works of similar nature as specified in scope under clause 2.0 of ITB, in this tender notification during any one year out of the last five financial years (FY 2006-07, 2007-08, 2008-09, 2009-10 & 2010-11). Bidder should have executed minimum quantum of individual works as under:

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Works Description</th>
<th>Minimum Quantum of Works completed &amp; handed over successfully</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Construction of New 33/11 KV or Higher Voltage Class substation</td>
<td>1 No.</td>
</tr>
<tr>
<td>2</td>
<td>(i) Construction of New 33 KV Line or (ii) Construction of New 11 KV Line</td>
<td>(i) 15 Km or (ii) 45 Km</td>
</tr>
</tbody>
</table>

Note:

(a) Bidder must enclose copies of the relevant Work Orders along with copies of Final Invoices and/or Performance Certificates duly signed by the competent authority of the client and/or Final Inspection Certificate issued by Electrical Inspector in proof of having executed the desired quantum works during any one year out of the last five financial years (FY 2006-07, 2007-08, 2008-09, 2009-10 & 2010-11).

(b) If the bidder is a joint venture / consortium they shall comply to the qualifying criteria wherein at least one partner shall have the stipulated previous works experience as stated above. The field experience of the other partner(s) shall not be added for qualifying the bid. However the annual turnover of all partners shall be added to determine, if the joint venture / consortium is meeting the Annual Average Turnover criteria as stated above. One of the partners shall be nominated as Lead Partner and the lead partner shall be authorized to incur liabilities and receive instructions for and on behalf of any and all partners of the joint venture / consortium and the entire execution of the contract including receipt of payments shall be done exclusively through the lead partner. This authorization
shall be evidenced by submitting by a Power of Attorney signed by legally authorized signatories of all the partners as per Annexure – V (Vol.-II). All partners of joint venture / consortium shall be liable jointly and severally for the execution of contract in accordance with the contract terms and a copy of the agreement entered into by the joint venture / consortium partners having such a provision shall be submitted with the Bid. A statement to this effect shall be included in the authorization mentioned as above as well as in the Bid form and in Contract form (in case of a successful bid).

(c) In addition to above the bidder should submit the following documents in part-I bid as qualifying terms.

(i) Valid electrical (HT) license issued by ELBO, Orissa for electrical works & at least “B “class civil license for civil works.
(ii) EPF registration
(iii) PF & ESI registration
(iv) Service Tax registration
(v) VAT Clearance Certificate
(vi) PAN & TIN No.
(vii) Credit facility from their banker of not less than (1/5) one fifth of their offer value.

6.0 Project Completion Schedules:

<table>
<thead>
<tr>
<th>Description</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Issue of Tender Document</td>
<td>03.08.2011 to 24.08.2011</td>
</tr>
<tr>
<td>Pre-bid Meeting</td>
<td>08.08.2011 at 3.30 PM</td>
</tr>
<tr>
<td>Submission of Bids</td>
<td>25.08.2011 up to 2.00 PM</td>
</tr>
<tr>
<td>Opening of Technical Bids</td>
<td>25.08.2011 at 4.00 PM</td>
</tr>
<tr>
<td>Receipt of Clarification from Bidders (if any)</td>
<td>28.08.2011</td>
</tr>
<tr>
<td>Opening of Price Bids</td>
<td>30.08.2011 (tentative)</td>
</tr>
<tr>
<td>Issue of LOI / Work Order</td>
<td>05.09.2011 (tentative)</td>
</tr>
<tr>
<td>Works completion</td>
<td>As mentioned at clause 2.0 above</td>
</tr>
</tbody>
</table>

7.0 All correspondences with regard to the above shall be made to the following address:

Dy. General Manager (Tech) / Dy. General Manager (MA & RA)
Central Services Office
(NESCO, WESCO & SOUTHCO)
Plot No. N1/22, Nayapalli, Bhubaneswar, Orissa-751012
Ph. No. (0674) 325 4109 / 4080, Fax: (0674) 255 8343
SECTION – II
INSTRUCTION TO BIDDERS (ITB)

Tender Notification: CSO/49 / INSTALLATION OF 33/11 KV SUBSTATION & LINES

Date : 03.08.2011
A. GENERAL

1.0 Western Electricity Supply Company of Orissa Ltd. (WESCO) hereinafter referred to as the “Purchaser” is desirous of construction of New 33/11 KV Sub Stations along with 33 KV & 11 KV Link Lines on ‘turnkey’ basis in their licensed area in Deogarh District under Orissa.

2.0 SCOPE OF WORK

The scope shall include supply of all materials to complete the job except the followings which shall be supplied by the Purchaser –

a) 33/11 KV Power Transformer & 33/0.4 Station Transformer.
b) AAA Conductor
c) Vacuum Circuit Breaker (VCB)

The scope of the Proposal for the balance materials to be supplied by the bidder to complete the job shall be on the basis of a single Bidder’s responsibility, completely covering supply and erection of all the equipments specified under the accompanying Technical Specifications including other services. It will include the following:-

(i) Detailed survey of substation, line and preparation of SLD / BOQ to be done by the bidder
(ii) Complete manufacture, including shop testing & supply of materials from the approved vendor (materials which are to be supplied by the bidder)
(iii) Providing Engineering drawing, data, operational manual, etc for the Purchaser’s approval;
(iv) Packing and transportation from the manufacturer’s works to the site.
(v) Receipt, storage, preservation and conservation of equipment at the site.
(vi) Pre-assembly, if any, erection testing and commissioning of all the equipment;
(vii) Reliability tests and performance and guarantee tests on completion of commissioning;
(viii) Loading, unloading and transportation as required.
(ix) Erection of equipments in Sub-station including civil works.
(x) Erection of lines of specified voltage.
(xi) Testing, Commissioning of substations and lines / installations
(xii) Storing before erection
(xiii) Getting the substations & lines inspected by Electrical Inspector after completion of work at a particular location.

Transportation of all above required materials from Purchaser’s Burla (for materials to be supplied by purchaser) to site and all other required materials (to be supplied by the contractor) from supplier’s premises to work site, construction of new electrical / civil structures, safe custody of the items and return of unused purchaser supplied materials to the Purchaser’s stores.
3.0 DISCLAIMER

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

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

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

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

4.0 COST OF BIDDING

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

B. BIDDING DOCUMENTS

5.0 BIDDING DOCUMENTS

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

<table>
<thead>
<tr>
<th>Volume - I</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Invitation for Bids (IFB)</td>
<td>Section - I</td>
</tr>
<tr>
<td>(b) Instructions to Bidders (ITB)</td>
<td>Section - II</td>
</tr>
<tr>
<td>(c) General Conditions of Contract (GCC)</td>
<td>Section – III</td>
</tr>
<tr>
<td>(d) Technical Specifications (Works &amp; Supply materials)</td>
<td>Section – IV (Part-A, B, C, D)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Volume - II</th>
<th>Annexure</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Bid Proposal Letter</td>
<td>Annexure – I</td>
</tr>
<tr>
<td>(b) Declaration Form</td>
<td>Annexure - II</td>
</tr>
<tr>
<td>(C) Proforma for Contract Performance BG</td>
<td>Annexure – III</td>
</tr>
<tr>
<td>(d) Proforma of BG for Advance Payment</td>
<td>Annexure – IV</td>
</tr>
<tr>
<td>(e) Form of Power of Attorney for Joint Venture</td>
<td>Annexure – V</td>
</tr>
<tr>
<td>(f) Form of Joint Venture/Consortium Agreement</td>
<td>Annexure – VI</td>
</tr>
<tr>
<td>(g) Letter of compliance of Qualifying Requirement</td>
<td>Annexure – VII (A), (B)</td>
</tr>
<tr>
<td>(h) Details of Commercial deviation</td>
<td>Annexure – VIII</td>
</tr>
<tr>
<td>(i) Details of Technical Deviation</td>
<td>Annexure - IX</td>
</tr>
<tr>
<td>(j) Additional Information</td>
<td>Annexure – X</td>
</tr>
<tr>
<td>(k) Bought out &amp; Sub contracted Items</td>
<td>Annexure - XI</td>
</tr>
<tr>
<td>(l) Work Completion Schedule</td>
<td>Annexure – XII</td>
</tr>
<tr>
<td>(m) Check-list</td>
<td>Annexure – XIII</td>
</tr>
<tr>
<td>(n) Proforma of Indemnity Bond for free issue materials</td>
<td>Annexure – XIV</td>
</tr>
</tbody>
</table>

TENDER NOTICE NO.: CSO/49/ INSTALLATION OF 33/11 KV SUBSTATION & LINES
Registered Office: NESCO, WESCO & SOUTHCO

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

6.0 AMENDMENT OF BIDDING DOCUMENTS

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

6.02 The Amendment shall be part of the Bidding Documents, pursuant to Clause 5.01, and it will be notified in writing by Fax/e-mail to all the Bidders who have received the Bidding Documents and confirmed their participation to Bid, and will be binding on them.

6.03 In order to afford prospective Bidders reasonable time in which to take the Amendment into account in preparing their Bids, the Purchaser may, at its discretion, extend the deadline for the submission of Bids.

C. PREPARATION OF BIDS

7.0 LANGUAGE OF BID

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

8.0 LOCAL CONDITIONS

8.1 It will be imperative on each Bidder to fully inform himself of all local conditions and factors which may have any effect on the execution of the Contract covered under these documents and specifications. The Purchaser shall not entertain any request for clarifications from the Bidders, regarding such local conditions.

8.2 It must be understood and agreed that such factors have properly been investigated and considered while submitting the proposals. No claim for financial adjustment to the Contract awarded under these specifications and documents will be entertained by the Purchaser. Neither any change in the time schedule of the Contract nor any financial adjustments arising thereof shall be permitted by the Purchaser, which are based on the lack of such clear information or its effect on the cost of the works to the Bidder.

9.0 DOCUMENTS COMPRISING THE BID

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

(a) Bid Form, Price & other Schedules (STRICTLY AS PER FORMAT) and Technical Data Sheets completed in accordance with Clause 9.0, 10.0, 11.0 and Technical Specification;
(b) All the Bids must be accompanied with the required bid security as mentioned in the Section-I against each tender.
(c) Power of Attorney indicating that the person(s) signing the Bid have the authority to sign the Bid and thus that the Bid is binding upon the Bidder during the full period of its validity, in accordance with clause 12.0.

10.0 BID FORM

10.01 The Bidder shall complete an ‘Original’ and another one ‘Copy’ of the Bid Form and the appropriate Price & Other Schedules and Technical Data Sheets furnished in the Volume-II of the Bidding Documents.
10.02 **Bid Security**

The bidder is required to submit Bid Security as indicated against each package in Section – I of this Tender Specification. The bid security is required to protect the Purchaser against the risk of Bidder’s conduct which would warrant the security’s forfeiture.

The bid security shall be denominated in the currency of the bid, and shall be in the following form:

(a) Bank guarantee issued by any scheduled bank strictly as per the format enclosed and shall be valid for a period of thirty (30) days beyond the validity of the bid. The Bank Guarantee shall be enforceable in the local Bhubaneswar branch of the issuing Bank.

(b) Bank Draft in favour of North Eastern Electricity Supply Company of Orissa Ltd., payable at Bhubaneswar.

Unsuccessful bidders’ bid security will be discharged or returned as promptly as possible but not later than thirty (30) days after the expiration of the period of bid validity.

The successful bidder’s bid security will be discharged upon furnishing the performance security.

The bid security may be forfeited:

(a) if the Bidder:
   i) withdraws its bid during the period of bid validity specified by the Bidder in the Bid Form; or

(b) in the case of a successful Bidder, if the Bidder fails:
   (i) to sign the Contract, or
   (ii) to furnish the required performance security.

10.03 Bids containing deviation from provisions relating to the following clauses will be considered as non responsive:

a) Price Basis and Payments & Price Adjustment:

b) Bid Guarantee:

c) Contract Performance Guarantee:

d) Liquidated damages:

e) Completion period

11.0 **BID PRICES**

11.01 The Bidder shall complete the appropriate Price Schedules included herein, stating the Unit Price for each item & total Price.

11.02 The prices offered shall be inclusive of all costs as well as Duties, Taxes and Levies paid or payable during execution of the supply work, break up of price constituents, should be there.

11.03 Prices quoted by the Bidder shall be “Firm” and not subject to any price adjustment during the performance of the Contract. A Bid submitted with an adjustable price quotation will be treated as non-responsive and rejected.

12.0 **BID CURRENCIES**

Prices shall be quoted in Indian Rupees Only.
13.0 PRICE BASIS AND PAYMENTS

13.01 The Bidder shall submit their price bids as per the enclosed formats (Annexure – 1 to 3) both in Hard Format (Print out) and in Soft Format (in CD). Bidders submitting a system of pricing other than that specified in the BOQ cum Price Schedule of individual packages as enclosed along with these tender documents, run the risk of rejection of their bids.

13.02 Bidder shall indicate bid prices in Indian Rupees only.

14.01 All taxes, cess, duties and levies, including excise duties, sales taxes, VAT, service tax payable by the Bidders in respect of the transaction between the Bidders and their vendors/sub-suppliers / sub-contractors while procuring any components, sub-assemblies, raw materials and equipment shall be included in the bid price and no claim on this behalf will be entertained by the Purchaser.

The quoted price should be inclusive of all taxes and duties. No extra amount on account of taxes & duties shall be paid or reimbursed.

14.02 As regards the Income Tax, surcharge on Income Tax and other corporate taxes, the Bidder shall be responsible for such payment to the concerned authorities.

14.03 TDS (Income Tax & Works Contract Tax) as applicable shall be deducted from the bills as per the Act.

15.0 PRICE IS FIRM

16.0 TIME SCHEDULE

The basic consideration and the essence of the Contract shall be strict adherence to the time schedule for performing the specified Works.

17.0 CONTRACT QUALITY ASSURANCE

17.01 The Bidder shall include in his Proposal the Quality Assurance Programme containing the overall quality management and procedures which he proposes to follow in the performance of the Works during various phases as detailed in relevant clause of the General Technical Conditions.

17.02 At the time of Award of Contract, the detailed Quality Assurance Programme to be followed for the execution of the Contract will be mutually discussed and agreed to and such agreed Programme shall form a part of the Contract.

18.0 INSURANCE

The Bidder’s insurance liabilities pertaining to the scope of Works are detailed out in Clauses titled ‘Insurance’ in General Terms and Conditions of Contract and in Erection Conditions of Contract of this Volume I. Bidder’s attention is specifically invited to these clauses. Bid price shall include all the cost in pursuance of fulfilling all type of insurance liabilities under the Contract till handing over of respective installations.

19.0 PERIOD OF VALIDITY OF BIDS

19.01 Bids shall remain valid for 180 days from the date of opening of the Bid.
Notwithstanding anything contained above, the Purchaser may solicit the Bidder’s consent to an extension of the Period of Bid Validity. The request and the responses thereto shall be made in writing by Fax/e-mail.

**20.0 ALTERNATIVE BIDS**

Bidders shall submit Bids, which comply with the Bidding Documents. Alternative Bids will not be considered. The attention of Bidders is drawn to the provisions of Clause 22.03 & 22.04 regarding the rejection of Bids, which are not substantially responsive to the requirements of the Bidding Documents.

**21.0 FORMAT AND SIGNING OF BID**

21.01 The original Bid Form and accompanying documents (as specified in Clause 9.0), clearly marked "Original Bid", plus one copy must be received by the Purchaser at the date, time and place specified. In the event of any discrepancy between the original and the copies, the original shall govern.

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

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

**D. SUBMISSION OF BIDS**

**22.0 SEALING AND MARKING OF BIDS**

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

22.02 The Technical Documents and the Bid Security shall be enclosed in a sealed envelope and the said envelope shall be superscribed with “Technical & Bid Security”. The price bid shall be inside another sealed envelope with superscription “Price Bid”. Both these envelopes shall be sealed inside another big envelope. All the envelopes should bear the Name and Address of the Bidder and marking for the Original and Copy. The envelopes should be super-scribed with “Tender Notice No. & Due date of opening”.

22.03 The Bidder has the option of sending the Bids in person. Bids submitted by Telex/Telegram/Fax will not be accepted. No request from any Bidder to the Purchaser to collect the proposals from Airlines/Cargo Agents etc shall be entertained by the Purchaser.

**23.0 DEADLINE FOR SUBMISSION OF BIDS**

23.01 The original Bid, together with the required copies, must be received by the Purchaser at the address specified no later than 2.00 PM. on 25.08.2011.

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

**24.0 ONE BID PER BIDDER**

Each Bidder shall submit only one Bid by itself. A Bidder who submits or participates in more than one Bid will cause all those Bids to be rejected.
25.0 LATE BIDS

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

26.0 MODIFICATIONS AND WITHDRAWAL OF BIDS

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

27.0 INFORMATION REQUIRED WITH THE BID

27.01 The bids must clearly indicate the name of the manufacturer, the type of model of each principal item of equipment proposed to be furnished and erected. The bid should also contain drawings and descriptive materials indicating general dimensions, materials from which the parts are manufactured, principles of operation, the extent of pre-assembly involved, major construction equipment proposed to be deployed, method of erection and the proposed erection organization structure.

27.02 Above information shall be provided by the Bidder in the form of separate sheets, drawings, catalogues, etc. in two copies

27.03 Any bid not containing sufficient descriptive material to describe accurately the equipment proposed may be treated as incomplete and hence rejected. Such descriptive materials and drawings submitted by the Bidder will be retained by the Purchaser. Any major departure from these drawings and descriptive material submitted will not be permitted during the execution of the Contract without specific written permission of the Purchaser.

27.04 Oral statements made by the Bidder at any time regarding quality, quantity or arrangement of the equipment or any other matter will not be considered.

27.05 Standard catalogue pages and other documents of the Bidder may be used in the bid to provide additional information and data as deemed necessary by the Bidder.

27.06 The Bidder, along with his proposal, shall submit a list of recommended erection equipment and materials which will be required for the purpose of erection of equipment and materials supplied under the Contract.

In case the information submitted along with the Bid contradicts specification requirements, the specification requirements will govern, unless otherwise brought out clearly in the Technical/Commercial Deviations Schedule.

E BID OPENING & EVALUATION OF BID

28.0 OPENING OF BIDS BY PURCHASER

28.01 The Purchaser (authorized representative) will open bids in the presence of Bidders' representatives one for each bidders who choose to attend at the date and time for opening of bids in the Invitation to Bid or in case any extension has been given thereto, on the extended bid opening date and time notified to all the Bidders who have purchased the Bidding document. The Bidders' representatives who are present shall sign in a register evidencing their attendance.

28.02 The Bidders' names, bid prices, modifications, bid withdrawals and the presence or absence of the requisite bid guarantee and such other details as the Purchaser, at its discretion, may consider appropriate will be announced at the opening.

28.03 No electronic recording devices will be permitted during bid opening.
29.0 PROCESS TO BE CONFIDENTIAL

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

30.0 CLARIFICATION OF BIDS

To assist in the examination, evaluation and comparison of Bids, the Purchaser may, at its discretion, ask the Bidder for a clarification of its Bid. All responses to requests for clarification shall be in writing and no change in the price or substance of the Bid shall be sought, offered or permitted.

31.0 PRELIMINARY EXAMINATION OF BIDS / RESPONSIVENESS

31.01 Purchaser will examine the Bids to determine whether they are complete, whether any computational errors have been made, whether required sureties have been furnished, whether the documents have been properly signed, and whether the Bids are generally in order.

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

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

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

32.0 EVALUATION AND COMPARISON OF BIDS

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

32.02 The evaluation of the Bids shall be a stage-wise procedure. The following stages are identified for evaluation purposes:

In the first stage, the Bids would be subjected to a responsiveness check. The Technical Proposals and the Conditional ties of the Bidders would be evaluated.

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

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

(a) Work Schedule

(b) Deviations from Bidding Documents

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

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

34.0 COMPARISON OF BIDS

34.01 The bids shall be compared on the basis of the total prices (i.e. for supply portion and prices for services to be rendered as quoted by the Bidder) for the entire scope of the Proposal as defined in the Bidding Document. Unconditional discount if any shall be taken into account while evaluation of the project price as a whole.

34.02 All evaluated bid prices of all the Bidders shall be compared among themselves to determine the lowest evaluated bid and, as a result of this comparison, the lowest Bid will be selected for the award of the Contract.

35.0 CONTACTING THE PURCHASER

Bids shall be deemed to be under consideration immediately after they are opened and until such time official intimation of award/ rejection is made by the Purchaser to the Bidders. While the bids are under consideration, Bidders and/or their representatives or other interested parties are advised to refrain from contacting by any means, the Purchaser and/or his employees/ representatives on matters related to the bids under consideration. The Purchaser, if necessary, will obtain clarifications on the Bids by requesting for such information from any or all the bidders, either in writing or through personal contacts as may be necessary. Bidders will not be permitted to change the substance of the bids after the bids have been opened.

F. AWARD OF CONTRACT

36.0 CONTACTING THE PURCHASER

36.01 From the time of Bid opening to the time of contract award, if any Bidder wishes to contact the Purchaser on any matter related to the Bid, it should do so in writing.

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

37.0 THE PURCHASER’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 to annul the Bidding process and reject all Bids at any time prior to award of Contract, without thereby incurring any liability to the affected Bidder or Bidders or any obligation to inform the affected Bidder or Bidders of the grounds for the Purchaser’s action.

38.0 AWARD OF CONTRACT

The Purchaser will award the Contract to the successful Bidder whose Bid has been determined to be the lowest evaluated responsive Bid, provided further that the Bidder has been determined to be qualified to satisfactorily perform the Contract. Purchaser reserves the right to award order other bidders in the tender, provided it is required for progress of project & provided he agrees to come to the lowest rate.
39.0 THE PURCHASER'S RIGHT TO VARY QUANTITIES

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

40.0 LETTER OF INTENT/ NOTIFICATION OF AWARD

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

41.0 PERFORMANCE SECURITY

41.01 Within 15 days of the receipt of Notification of Award/ Letter of Intent from the Purchaser, the successful Bidder shall furnish the Performance Security in the form of Bank Guarantee for an amount of 10% (Ten percent) of the Contract Price in accordance with the General Conditions of Contract in the Performance Security Form provided in Vol.-II, Annexure - III of the Bidding Documents. Upon submission of the performance security, the bid security shall be released. The Bank Guarantee shall be enforceable in the Bhubaneswar branch of the issuing Bank.

41.02 The performance Guarantee shall cover additionally the following guarantees to the Purchaser.

a. The successful Bidder guarantees the successful and satisfactory operation of the equipment furnished and erected under the Contract, as per the specifications and documents.

b. The successful Bidder further guarantees that the equipment provided and installed by him shall be free from all defects in design, material and workmanship and shall upon written notice from the Purchaser fully remedy free of expenses to the Purchaser such defects as developed under the normal use of the said equipment within the period of guarantee specified in the relevant clause of the General Terms and Conditions in this Volume I/ Special Conditions of Contract.

41.03 The Performance Guarantee is intended to secure the performance of the entire Contract. However, it is not to be constructed as limiting the damages under clause entitled “Equipment Performance Guarantee” in Technical Specifications, and damages stipulated in other clauses in the Bid documents.

41.04 The Performance Guarantee will be returned to the Contractor without any interest at the end of guarantee period, unless otherwise specified in the Special Conditions of Contract.

42.0 CORRUPT OR FRAUDULENT PRACTICES

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

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

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

   (ii) “Fraudulent practice” means a misrepresentation of facts in order to influence a procurement process or the execution of a contract to the detriment of the Purchaser, and includes collusive practice among Bidders (prior to or after Bid submission) designed to establish Bid prices at artificial non-competitive levels and to deprive the Purchaser of the benefits of free and open competition.
(b) Will reject a proposal for award if it determines that the Bidder recommended for award has engaged in corrupt or fraudulent practices in competing for the contract in question;

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

42.02 Furthermore, Bidders shall be aware of the provision stated in the General Conditions of Contract.

43.0 Submittals required after award of contract

43.01 Within 30 days of the effective date of contract the contractor shall provide five copies of an outline programme of production, inspection, testing, delivery, survey, erection, pre-commissioning and commissioning in chart form. Included in the programme will be the detailed schedule of drawing to be submitted.

43.02 Each month from the effective date of contract, the contractor shall submit three hard copies of monthly progress reports not latter than the seventh day of the following month. One copy shall also be sent through Email.

43.03 The format for presentation of programme is MS Project version 4.0.

43.04 The design aspect of the progress report shall include a comprehensive statement on drawing and calculations submitted for approval.

44.0 Drawings

44.01 Within 15 days of placement of LOA, the contractor shall submit, for approval by the DGM (Tech), CSO, a schedule of the drawings to be produced. The schedule shall also provide a programme of drawing submission, for approval by the DGM (Tech.). All drawings and design should be submitted to DGM (Tech.) within the period specified above.

44.02 All detail drawings submitted for approval shall be to scale not less than 1:20. All important dimensions shall be given and the material of which each part is to be constructed shall be indicated on the drawings. All documents, drawings, samples (if required by the employer) shall be submitted in accordance with the provisions of this specification and shall become the property of the employer.

44.03 All drawings submitted by the contractor shall be in sufficient details to indicate the type, size, arrangement, material description, bill of material, weight of each component, break up for packing & shipment, the external connection, fixing arrangement and the dimensions required for installation and interconnection with other equipment and materials, clearances and any other information specifically requested in the specification.

45.0 Final As built drawings

After completion of work on site all drawings shall be revised where necessary to show the equipment as installed and three copies submitted duly signed by the site Engineer In charge. Following approval, two reproducible transparencies and four prints shall then be provided as required by the Engineer in Charge.

46.0 Approval procedure of sub vendors & drawings of bought out materials

46.01 The contractor shall submit all drawings, documents and type test reports, QAP, Name of Sub vendor, samples (as applicable) etc, to the order issuing authority within 15 days of award of LOA for approval to DGM (Tech), CSO. If modifications to be made if such are deemed necessary, the contractor has to resubmit them for approval.
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without delaying the initial deliveries or completion of the contract work. The contractor should ideally recommend minimum 2 no.s sub-vendors per item.

46.02 Three copies of all drawings, GTP, QAP shall be submitted for approval and three copies for any subsequent revision.

46.03 If the drawings will be as per the technical specifications, DGM (T) CSO will return the drawings & documents to the contractor marked with “Approved” stamp.
SECTION - III

(GENERAL CONDITION OF CONTRACT)

Tender Notification: CSO/ 49/ INSTALLATION OF 33/11 KV
SUBSTATION & LINES

Date: 03.08.2011
GENERAL CONDITION OF CONTRACT (GCC)

1.0 General Instructions

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

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

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

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

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

2.0 Definition of Terms

2.01 The ‘Contract’ means the agreement entered into between the Purchaser and the Contractor as per the Contract Agreement signed by the parties, including all attachments and appendices there to and all documents incorporated by reference therein.

2.02 ‘Purchaser’ shall mean WESCO and shall include its legal representatives, successors and assigns.

2.03 ‘Contractor’ shall mean the Bidder whose bid will be accepted by the Purchaser for the award of the Works and shall include such successful Bidder’s legal representatives, successors and permitted assigns.

2.04 Sub-Contractor’ shall mean the person named in the Contract for any part of the works or any person to whom any part of the Contract has been sublet by the contractor with the consent in writing of the Engineer and will include the legal representatives, successors and permitted assigns of such person.

2.05 ‘Engineer’ shall mean the officer appointed in writing by the Purchaser to act as Engineer from time to time for the purpose of the Contract.

2.06 ‘Consulting Engineer’ /’Consultant’ shall mean any firm or person duly appointed as such from time to time by the Purchaser.

2.07 The terms ‘Equipment’, ‘Stores’ and ‘Materials’ shall mean and include equipment, stores and materials to be provided by the Contractor under the Contract.

2.08 ‘Works’ shall mean and include the furnishing of equipment, labour and services, as per the Specifications and complete erection, testing and putting into satisfactory operation including all transportation, handling, unloading and storage at the Site as defined in the Contract.

2.09 ‘Specifications’ shall mean the specifications and Bidding Document forming a part of the Contract and such other schedules and drawings as may be mutually agreed upon.
2.10 ‘Site’ shall mean and include the land and other places on, into or through which the works and the related facilities are to be erected or installed and any adjacent land, paths, street or reservoir which may be allocated or used by the Purchaser or Contractor in the performance of the Contract.

2.11 The term ‘Contract Price’ shall mean the lump-sum price quoted by the Contractor in his bid with additions and/or deletions as may be agreed and incorporated in the Letter of Award, for the entire scope of the works.

2.12 The term ‘Erection Portion’ of the Contract Price shall mean the value of field activities of the works including erection, testing and putting into satisfactory operation including successful completion of performance and guarantee tests to be performed at Site by the Contractor including cost of insurances.

2.13 ‘Manufacturer’s Works’ or Contractor’s Works’, shall mean the place of work used by the manufacturer, the Contractor, their collaborators/associates or sub-Contractors for the performance of the Contract.

2.14 ‘Inspector’ shall mean the Purchaser or any person nominated by the Purchaser from time to time, to inspect the equipment; stores or Works under the Contract and/or the duly authorized representative of the Purchaser.

2.15 ‘Notice of Award of Contract’/ ‘Letter of Award’ shall mean the official notice issued by the Purchaser notifying the Contractor that his bid has been accepted.

2.16 Date of Contract shall mean the date on which notice of Award of Contract/ Letter of Award has been issued.

2.17 ‘Month’ shall mean the calendar month. ‘Day’ unless herein otherwise expressly defined shall mean calendar day or days of 24 hours each.

2.18 ‘Writing’ shall include any manuscript, type written or printed statement, under or over signature and/or seal as the case may be.

2.19 When the ‘Approved’, ‘Subject to Approval’, ‘Satisfactory’, ‘Equal to’, ‘Proper’, ‘Requested’, ‘As directed’, ‘Where Directed’, ‘When Directed’, ‘Determined by’, ‘Accepted’, ‘Permitted’, or words and phrase of like importance are used the approval, judgment, direction etc. is understood to be a function of the Purchaser/Engineer.

2.20 Test on completion shall mean such tests as prescribed in the Contract to be performed by the Contractor before the work is taken over by the Purchaser.

2.21 ‘Start up’ shall mean the time period required to bring the equipment covered under the Contract from an inactive condition, when construction is essentially complete, to the state ready for trial operation. The start-up-period shall include preliminary inspection and check-out of equipment and supporting sub-system, initial operation of the complete equipment covered under the Contract to obtain necessary pre-trial operation date, perform calibration and corrective action, shut-down, inspection and adjustment prior to the trial operation period.

2.22 ‘Initial Operation’ shall mean the first integral operation of the complete equipment covered under the contract with the sub-system and supporting equipment in service or available for service.

2.23 ‘Trial Operation’, ‘Reliability Test’, ‘Trial Run’, ‘Completion Test’, shall mean the extended period of time after the start-up-period. During this trial operation period the unit shall be operated over maximum attainable load range. The length of trial operation shall be as determined by the Engineer, unless otherwise specified elsewhere in the Contract.
2.24 ‘Performance and Guarantee Tests’, shall mean all operational checks and tests required to determine and demonstrate capacity, efficiency, and operating characteristics as specified in the Contract Documents.

2.25 The term ‘Final Acceptance’/ ‘Taking Over’ shall mean the Purchaser’s written acceptance of the works performed under the Contract, after successful commissioning/ completion of Performance and Guarantee Tests, as specified in the accompanying Technical Specifications or otherwise agreed in the contract.

2.26 ‘Commercial Operation’ shall mean the condition of operation in which the complete equipment covered under the Contract is officially declared by the Purchaser to be available for continuous operation at different loads up to and including rated capacity. Such declaration by the Purchaser, however, shall not relieve or prejudice the Contractor of any of his obligations under the Contract.

2.27 ‘Guarantee Period’ / ‘Maintenance Period’ shall mean the period during which the Contractor shall remain liable for repair or replacement of any defective part of the works performed under the contract.

2.28 ‘Latent Defects’ shall mean such defects caused by faulty designs, material or work-man-ship which cannot be detected during inspection, testing etc, based on the technology available for carrying out such tests.

2.29 ‘Drawing’, ‘Plans, shall mean all:

a. Drawings furnished by the Purchaser/Consultant as a basis of Bid/Proposals.

b. Supplementary drawings furnished by the Purchaser/Consultant to clarify and to define in greater detail the intent of the Contract.

c. Drawings submitted by the Contractor which his bid provided such drawings are acceptable to the Purchaser/Consultant.

d. Drawings furnished by the Purchaser/Consultant to the Contractor during the progress of the work; and

e. Engineering data and drawings submitted by the Contractor during the progress of the work provided such drawings are acceptable to the Engineer/Purchaser.

2.30 ‘Codes’ shall mean the following including the latest amendments and/or replacements, if any:

a) Indian Electricity Act, 2003 and Rules and Regulations made there under.

b) Indian Factory Act, 1948 and Rules and Regulations made there under.

c) Indian Explosives Act, 1984 and Rules and Regulations made there under.

d) Indian Petroleum Act, 1934 and Rules and Regulations made there under.

e) A.S.M.E. Test Codes

f) A.I.E.E. Test Codes

g) American Society of Materials Testing Codes

h) Standards of the Indian Standards Institution

i) Other Internationally approved standards and/ or rules and regulations touching the subject matter of the Contract.
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2.31 Words imparting the singular only shall also include the plural and vice-versa where the context so requires

2.32 Words imparting ‘Person’ shall include firms, companies, corporations and associations or bodies of individuals, whether incorporated or not.

2.33 Terms and expressions not herein defined shall have the same meaning as are assigned to them in the Indian Sale of goods Act (1930), failing that in the Indian Contract Act (1872) and failing that in the General Clauses Act (1897) including amendments thereof, if any.

2.34 In addition to the above the following definition shall also apply

a) ‘All equipment and materials’ to be supplied shall also mean ‘Goods’

b) ‘Constructed’ shall also mean erected and installed.


3.0 APPLICATION

These General Conditions shall apply to the extent that they are not superceded by provisions in other parts of the Contract.

4.0 STANDARDS

The goods supplied under this contract shall conform to the standards mentioned in the Technical Specifications, and, when no applicable standard is mentioned, to the authoritative standard appropriate to the goods and such standards shall be the latest issued by the concerned institution.

5.0 LANGUAGE AND MEASURES

All documents pertaining to the Contract including specifications, schedules, notices, correspondences, operating and maintenance instructions, drawings or any other writing shall be written in English language. The metric System of measurement shall be used exclusively in the Contract.

6.0 CONTRACT DOCUMENTS

6.01 The term Contract Documents shall mean and include the following which shall be deemed to form an integral part of the contract:

a) Invitation to Bid including letter forwarding the bidding Documents, Instructions to Bidders, General Terms and Conditions of Contract and all other documents including under Volume-I and the Special Conditions of Contract.

b) Specifications of the equipment to be furnished and erected under the Contract as brought out in the accompanying Technical Specifications.

c) Contractor’s Bid proposal and the documents attached thereto including the letters of clarifications thereto between the Contractor and the Purchaser/Consultant prior to the Award of contract except to the extent of repugnancy.

d) All the materials, literature, data and information of any sort given by the Contractor along with his bid, subject to the approval of the Purchaser/Consultant.
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e) Letter of Award and any agreed variations of the conditions of the documents and special terms and conditions of Contract, if any.

6.02 In the event of any conflict between the above mentioned documents the matter shall be referred to the Engineer whose decision shall be considered as final and binding upon the parties.

7.0 USE OF CONTRACT DOCUMENTS AND INFORMATION

7.01 The Contractor shall not, without the Purchaser’s prior written consent, disclose the contract, or any provision there of, or any specification, plan, drawing, pattern, sample or information furnished by or on behalf of the Purchaser in connection therewith, to any person other than a person employed by the Contractor in the performance of the contract. Disclosure to any such employed person shall be made in confidence and shall extend only so far as may be necessary for the purpose of such performance.

7.02 The Contractor shall not, without the Purchaser’s prior consent, make use of any document or information enumerated in various contract documents except for the purpose of performing the contract.

7.03 The Contractor shall not communicate or use in advertising, publicity, sales releases or in any other medium, photographs or other reproduction of the works under this Contract, or descriptions of the site, dimensions, quantity, or other information, concerning the works unless prior written permission has been obtained from the Purchaser.

Any document, other than the Contract itself, enumerated in various contract documents shall remain the property of the Purchaser and shall be returned (in all copies) to the Purchaser on completion of the Contractor’s performance under the Contract if so required by the Purchaser.

8.0 CONSTRUCTION AND NATURE OF THE CONTRACT

8.01 Notwithstanding anything stated elsewhere in the bid documents, the Contract to be entered into will be treated as a divisible Supply and Erection Contract.

9.0 Scope of Work

9.01 The “Scope of Work” shall be on the basis of Bidder’s responsibility, completely covering the obligations, responsibility and workmanship, provided in this Bid Enquiry whether implicit or explicit.

9.02 The Purchaser reserves the right to vary the quantity i.e. increase or decrease, which shall be communicated to successful bidder during project execution.

9.03 All relevant drawings, data and instruction manuals and other necessary inputs shall be under the scope of contract.

10.0 General Requirements

10.01 The contractor shall supply, deliver best quality goods.

10.02 The company also reserves the right to add from the scope of work or delete from the scope of work so assigned to the Supplier, if the circumstances so warrant.

10.03 The contractor shall be responsible for loading and unloading of all materials with proper material handling equipment.
11.0 Terms of Payment

11.01 Payment for Supply Materials (Electrical Works):
   a) 10% advance payment shall be released against submission of Advance Bank Guarantee for equivalent amount, which shall remain valid for a period covering the works completion time plus three months grace period. The Bank Guarantee shall be enforceable on the Bhubaneswar branch of the issuing Bank.

   b) 60% payment along with full taxes and duties shall be released within 30 days of receipt of materials at works site & after verification by the Engineer-in-Charge at the site stores of the Contractor.

   c) 20% payment shall be released after installation & commissioning. This payment shall be released on pro-rata basis subject to the extent of materials already installed as per the certificate of the Engineer-In-Charge as submitted against clause no. 11.02 (b), stated below.

   d) Final 10% payment shall be released as per clause no. 11.05 stated below.

11.02 Payment for Electrical Installation Work:
   a) 10% advance payment shall be released against submission of Advance Bank Guarantee for equivalent amount, which shall remain valid for a period covering the works completion time plus three months grace period. The Bank Guarantee shall be enforceable on the Bhubaneswar branch of the issuing Bank.

   b) The contractor shall raise monthly running bill based on the works carried out and certified by the Purchaser's Engineer-in-Charge. 80% payment against the monthly running bill with taxes & duties on pro-rata basis shall be released within 30 days of receipt of the certified bill copy at the Corporate Office of the Purchaser.

   c) Final 10% payment shall be released as per clause no. 11.05 stated below.

11.03 Payment for Control Room Building Work (Item No. 5 of BOQ of Substation):
   a) 10% advance payment shall be released against submission of Advance Bank Guarantee for equivalent amount, which shall remain valid for a period covering the works completion time plus three months grace period. The Bank Guarantee shall be enforceable on the Bhubaneswar branch of the issuing Bank.

   b) 80% against value of work executed by the contractor will be released within 30 days of submission of Running Bill duly certified by Engineer-in-charge on prorate basis as below –

   1. Completion of Excavation, Foundation & work up to Plinth level = 20%
   2. Completion of work up to Building Lintal Level = 20%
   3. Completion of work up to Building Roof Casting = 20%
   4. Completion balance works in all respect including civil, PHED & Electrical works as per approved drawing & TS = 20%

   c) Final 10% payment shall be released as per clause no. 11.05 stated below

11.04 Payment for Boundary wall Work with Gate & Bore Well (Item No. 3, 4 & 6 of BOQ of Substation):
   a) 10% advance payment shall be released against submission of Advance Bank Guarantee for equivalent amount, which shall remain valid for a period covering the works completion time plus three months grace period. The Bank Guarantee shall be enforceable on the Bhubaneswar branch of the issuing Bank.

TENDER NOTICE NO.: CSO/49/ INSTALLATION OF 33/11 KV SUBSTATION & LINES
b) 80% value of work shall be paid after completion of Boundary work in all respect.

11.05 **Payment against Final Bill**

After completion of the work, the contractor shall raise a final bill covering both Supply portion & Installation portion, thereby adjusting all amount already claimed and received against the running bills. In case of any deviation from the quantity as per the scope of work, work order shall be amended to that extent. Final bill shall be raised covering the balance 10% payment along with the additional scope of work which shall be paid after completion of all formalities including material reconciliation, statutory compliance, handing over/lifting of balance materials, etc.

11.06 All Payments shall be made after certification from Purchaser’s Engineer-In-charge. All Payments are subject to receipt of correct Documents and also submission of 10% Composite Performance Bank Guarantee as per clause 14 stated below.

12.0 **Price Validity**

All bids submitted shall remain valid, firm and subject to unconditional acceptance by Purchaser for 240 days post bid opening date. For awarded Contract, the prices shall remain valid and firm till contract completion.

13.0 **Warranty / Guarantee**

13.01 The bidder shall guarantee for the quality of workmanship for a minimum period of 24 months from the date of handing over of the works to the authorized engineer of the Purchaser.

13.02 If during the defect liability period any services performed found to be defective, these shall be promptly rectified by contract its own cost (including the cost of dismantling and reinstallation) on the instruction of Purchaser.

14.0 **Composite Performance Bank Guarantee**

14.01 Within Fifteen (15) days from the date of the Award notice, the successful bidder shall submit a Composite Performance Bank Guarantee (PBG) in favour of Purchaser equivalent to Ten percent (10%) of the total price of the Contract. **Failing submission of PBG, no materials under the scope of supply by the Purchaser, shall be issued to the successful bidder. The BG shall be enforceable on the Bhubaneswar bank of the issuing Bank.**

14.02 The Bank Guarantee established under Clause 9.01 shall be forfeited without recourse to the Contractor and payable against the presentation by Purchaser to the bank with a claim that the Contractor has failed to comply with any term or condition set forth in the Contract.

14.03 The Bank Guarantee established will be automatically and unconditionally forfeited without recourse if Purchaser in its sole discretion determines that Contractor has failed to comply with any Terms or Condition set forth in the contract.

14.04 The Bank Guarantee shall be kept valid for a period of 24 months from the date of completion of installation & commissioning with additional claim period of 90 days beyond that. The Bank Guarantee will be released without interest within thirty (30) days from the last date up to which the Performance Bank Guarantee has to be kept valid.
Registered Office: NESCO, WESCO & SOUTHCO

15.0 Technical information / data.

The company and the contractor, to the extent of their respective rights permitting to do so, shall exchange such technical information and data as is reasonably required by each party to perform its obligations and responsibilities. The company and the contractor agree to keep each other in confidence and to use the same degree of care as it uses with respect to its own proprietary data to prevent its disclosure to third parties of all technical and confidential information. The technical information, drawings, records and other document shall not be copied, transferred, traced or divulged and / or disclosed to third party in full / part not misused in any other form. This technical information, drawing etc. shall be returned to the company with all approved copies and duplicates. In the event of any breach of this contract, the contractor shall indemnify the company against any loss, cost of damages or claim by any party in respect of such breach.

16.0 Effective Date of Commencement of Contract:

The date of the issue of the Letter of Intent shall be treated as the effective date of commencement of contract.

17.0 Taxes & Duties:

All taxes, duties, levies of whatsoever nature including entry tax, octroi, sales tax, VAT, turnover tax, service tax, income tax, work contract tax etc., levied by State or Central Governments or local bodies and in force on the date of submission of bid shall be to the contractor’s account. The contractor shall furnish their Excise/Sales Tax registration number, PAN No. etc. in the bid documents as well as Invoice/Challans etc.

18.0 Time – The Essence of Contract

The time and the date of completion of the works as stipulated in the Letter Of Intent / Purchase order issued to the Contractor shall be deemed to be the essence of the “Contract”. The work has to be completed not later than the aforesaid Schedule and date of completion.

19.0 Liquidated Damages (LD)

19.01 If the completion of the works is delayed beyond the supply schedule as stipulated in purchase order/LOI, then the Contractor shall be liable to pay to the Purchaser as LD for such delay, a sum of 0.5% of the contract price for every week delay or part thereof. The LD shall be computed on the unexecuted value of works as per the installation schedule.

19.02 The total amount of LD for delay under the contract will be subject to a maximum of five percent (5%) of the contract price

19.03 The Purchaser may, without prejudice to any method of recovery, deduct the amount for such damages from any amount due or which may become due to the Contractor or from the Performance Bank Guarantee or file a claim against the contractor.

20.0 The Laws and Jurisdiction of Contract:

20.01 The laws applicable to this Contract shall be the Laws in force in India.

20.02 All disputes arising in connection with the present Contract shall be settled amicably by mutual consultation failing which shall be finally settled as per the rules of Arbitration and Conciliation Act, 1996 at the discretion of Purchaser. The jurisdiction of arbitration shall be at Bhubaneswar, Orissa, India.
21.0 Events of Default

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

(a) Contractor fails or refuses to pay any amounts due under the Contract;
(b) Contractor fails or refuses to execute the works conforming to this Bid document / specifications, or fails to execute the work within the period specified in work order or any extension thereof;
(c) Contractor becomes insolvent or unable to pay its debts when due, or commits any act of bankruptcy, such as filing any petition in any bankruptcy, winding-up or reorganization proceeding, or acknowledges in writing its insolvency or inability to pay its debts; or the Contractor's creditors file any petition relating to bankruptcy of Contractor;
(d) Contractor otherwise fails or refuses to perform or observe any term or condition of the Contract and such failure is not remediable or, if remediable, continues for a period of 30 days after receipt by the Contractor of notice of such failure from Purchaser.

22.0 Consequences of Default.

(a) If an Event of Default shall occur and be continuing, Purchaser may forthwith terminate the Contract by written notice.
(b) In the event of an Event of Default, Purchaser may, without prejudice to any other right granted to it by law, or the Contract, take any or all of the following actions;
   (i) present for payment, to the relevant bank the Performance Bank Guarantee;
   (ii) get the work completed through the engagement of any third party; and/or
   (iii) recover any losses and/or additional expenses Purchaser may incur as a result of Contractor's default.

23.0 Force Majeure

23.01 The term “Force Majeure” as employed herein include, but are not limited to, acts of God or force of nature, landslide, earthquake, flood, fire, lightning, explosion, major storm (hurricane, typhoon, cyclone etc.) or major storm warning, tidal wave, shipwreck and perils of navigation, act of war (declared or undeclared) or public enemy, strike (excluding employee strikes, lockouts or other industrial disputes or action solely among employee of Contractor or its subcontractors) act or omission of sovereign states or those purporting to represent sovereign states, blockade, embargo, quarantine, public disorder, sabotage, accident or similar events beyond the control of the parties or either of them.

Force Majeure shall not include occurrences as follows:

(b) Late delivery of materials caused by congestion at Contractor's facilities or elsewhere, an oversold condition of the market, inefficiencies, or similar occurrences.
(c) Late performance by Contractor and/or Sub-Contractor caused by unavailability of raw materials, supervisors or labour, inefficiencies or similar occurrences.
(d) Mechanical breakdown of any item of Contractor's or its Sub-Contractor's equipment, plant or machinery.
(e) Delays due to ordinary storm or inclement weather or
(f) Non-conformance by Sub-Contractor.

Unless the delay arises out of a Force Majeure occurrence and is beyond both Contractor's and Sub-Contractor's or Contractor's control and an alternate acceptable source of services, equipment or material is unavailable. Additionally, Force Majeure shall not include financial distress of Contractor or any Sub-Contractor.
23.02 In the event of either party being rendered unable by Force Majeure to perform any obligation required to be performed by them under the Contract, the relative obligation of the party affected by such Force Majeure shall be suspended for the period during which such cause lasts. Time for performance of the relative obligation suspended by Force Majeure shall then stand extended by the period for which cause lasts.

23.03 Upon the occurrence of any Force Majeure event, the party so affected in the discharge of its obligation shall promptly, but no later than seven (7) days give written notice of such event to the other party. The affected party shall make every reasonable effort to remove or remedy the cause of such Force Majeure or mitigate its effect as quickly as possible. If such occurrence results in the suspension of all or part of the Work for a continuous period of more than, the parties shall meet and determine the measures to be taken.

23.04 Any delay or failure in performance by either party hereto shall not give rise to any claims for damages or loss of anticipated profits it, and to the extent, such delay or failure is caused by Force Majeure.

24.0 Transfer and Sub-Letting
The Contractor shall not sublet, transfer, assign or otherwise part with the Contract or any part thereof, either directly or indirectly, without prior written permission of the Purchaser.

25.0 Third party insurance
Contractor shall take the Insurance of Equipment during Transit. Any Claim pertain to this shall be the responsibility of the Contractor.

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

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

28.0 Indemnification

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

28.02 Subject to this Clause 23.0 Purchaser shall, at its sole cost and expense, defend, indemnify and hold harmless Contractor and his assignees /or the employees of the Contractor whatsoever arising out of the negligence or willful act or omission or from the default of the Purchaser in the performance of the Contractor.
SECTION – IV
Part- I

(TECHNICAL SPECIFICATIONS & GTP FORMATS)

TECHNICAL SPECIFICATION

A) Control Room Building, Boundary wall & Civil Works
B) Electrical Works For 33/11 KV Substation
C) 33 KV & 11 KV Link Line to Substation
(A) TECHNICAL SPECIFICATION FOR CONSTRUCTION OF CONTROL ROOM BUILDING, BOUNDRY WALL AND CIVIL WORK

GENERAL

This specification covers the general requirements for exploration, design, manufacture, test, supply and construction of civil and architectural works for the 2x 3.15 MVA, 33 KV/11KV SS at various locations in Deogarh district under the jurisdiction of WESCO.

The Bidder shall perform the works to meet the requirements of this specification, as per the attached drawings (Indicative) and the relevant articles in these Contract Documents, as per the schedule of quantities and the instruction of the engineer in charge. The Bidder has to submit detail design and drawings for approval by the Purchaser before execution.

1.0 Standard and References.

1.1 All equipment, materials, fabrication and tests under these Specifications shall conform to the latest applicable ISS. Materials and Labour Specifications contained in the following list and specifications are to be executed as per applicable standards, manuals and specifications established and approved in the country of manufacturer, and approved as equal by the engineer in charge.

Any details not specifically covered by these standards and Specifications shall be subject to approval of DGM (Tech.), CSO, Bhubaneswar. In the event of contradictory requirements between the standards and these specification requirements, the terms of specifications shall apply.

Reference to standards and specifications or to equipments and materials of a particular manufacture shall be considered as followed by "or equivalent". The Bidder may propose equivalent standards, specifications, materials or equipment, which shall be equal in every respect to that specified. If the Bidder for any reason proposes equivalents to, or deviations from, the above standards, the Contractor shall state the exact nature of change, the reason for making the change and shall submit complete specifications of the materials or work, as well as copies of pertinent standards, for the approval of engineer in charge and decision of engineer in charge in the matter of quality will be final.
1.2 **Exploration Works for Soil Strength of Foundation for Structures and Equipment and Roads.**

The contractor shall, prior to executing exploration works, submit for the approval of Engineer in charge, Sub-contractor’s names, name of site engineer with their qualifications to which the exploration works would be sublet and plan of exploration works including test items, test points, quantities, applicable standards, test procedure and schedule of work performance.

The Contractor shall perform exploration work according to the approved plan and details of tests in coordination with the engineer- in- charge of WESCO. Report on test results including various data collected during the exploration works and Sub-contractor’s recommendations, on which design will be based, shall be approved by Engineer in charge. Subsurface investigation for soil strength of foundation for structures and equipment shall conform to the following requirements:

Thin-walled tube soil sampling in accordance with ISS shall be made at every meter for the first three meters of depth and every two-meter for the further depth. Standard penetration tests in accordance with 1SS shall be made at every meter for the first three meter depth and every two-meter for further depth after thin-walled tube soil samples have been taken.

Every undisturbed sample collected from thin-walled tube shall be subject to the following series of test:

- Natural moisture content
- Atterberg limits
- Unit weight
- Specific gravity determination
- Unconfined compression tests

Accurate log of all soil strata, penetration resistance test, unconfined compressive strength, soil classification, ground water table and other test results shall be recorded in the reports submitted.

1.3 **Design of Civil Work.**

The Contractor shall perform detailed design for each structure on the basis of design criteria and codes or regulations of international standards. Prior to proceeding with the design work, design conditions or design values that shall include other allowable stress safety factor, load conditions, and applicable standards shall be approved by DGM(T), CSO, Bhubaneswar.
The Contractor shall submit to DGM(T), CSO, Bhubaneswar for approval the Contractor's drawings, other calculation sheets bill of materials, construction method and schedule for construction of civil works. In case modification of detailed design of civil work is required, the Contractor shall promptly inform DGM (T), CSO, Bhubaneswar of such modification and shall submit modified approval drawings to DGM (T), CSO, Bhubaneswar for approval through the engineer in charge.

a) GATES AND BOUNDARY WALL

The Gate frames shall be made of heavy duty 50 mm MS pipe conforming to relevant IS with welded joints.

Main gate shall be 4.0 mtr widths. Two leafs of 2 mtr each and 2.8 mtr height

Small Men gate shall be 1.25 mtr width, single leaf, 2.8 mtr height

The gates shall be fabricated with welded joints to achieve rigid connections. The gate frames shall be painted with one coat of approved steel primer and two coats of synthetic enamel paint.

Gates shall be fitted with approved quality iron hinges, latch and latch catch. Latch and latch catch shall be suitable for attachment and operation of pad lock from either side of gates. Hinges shall permit gates to swing through 180 degree back against fence.

Gates shall be fitted with galvanized chain hook or gate hold back to hold gates open. Double gates shall be fitted with centre rest and drop bolt to secure gates in closed position.

Gates shall be installed in locations shown on drawings. Next to the main gate a men gate (1.25 m wide, single leaf) shall also be provided.

Bottom of gates shall be set approximately 40 mm above ground surface and necessary guiding mechanism along with Roller shall be fitted.

The contractor shall design and construct boundary wall around substation area as per requirements. The boundary wall shall be of height 2.5 M and shall be made of brick wall in cement sand mortar 1:5. The thickness of wall and its foundation depends on the design calculation produced by contractor and approved by Purchaser, but shall not be less than one brick length. The boundary wall shall be plastered on both external and internal faces with cement sand plaster 1:6 of thickness 20 mm. An additional barbed Y-shaped arm of MS angle 50x50x6 at an interval of 2 mtr. each with 3-rows (6nos) barbed wire A-4IS:278. Expansion joints shall be provided as per codal requirements. MS grating shall be provided at required locations for drainage purposes. Top and bottom side of MS grating shall be supported on concrete block or beam. The boundary wall shall be painted with minimum two coats of weather coat paint of approved make colour wash over a base coat of white cement paint. The steel work shall be given two coats of synthetic enamel paint of approved make over one coat of primer. A tentative drawing as enclosed for guidance purpose.
b) CONTROL ROOM BUILDING.

A. General

The scope for new control room building includes the design, engineering and construction including anti-termite treatment, plinth protection, DPC of Building including sanitary, water supply, electrification, etc. of the control room building. The single storied building shall be of RCC framed structure of concrete of M20 grade (Min.). For design the following requirement shall be taken care of for new substation. Before execution, the design of RCC Structures should be got approved by the contractor from the Purchaser.

The contractor shall provide and install a Sign Board of 4ft x 3ft in size at each S/s as per details to be finalized during detailed Engineering. The cost of Sign Board shall be included in the cost of control room building.

B. Control room Building

1.0 Average floor area requirements shall be 15 x 7 sq. mts, which may vary at the time of detailed engineering to suit actual site requirements. The layout of the control room shall be finalized as per detailed engineering to suit Project requirements.

2.0 The different rooms required for C.R. building have been furnished below.

a) Control Room  
b) JEs' Room  
c) Battery Room  
d) Store Room  
e) W.C/Bath/W.B  
f) Portico

An open space of 1 m minimum shall be provided on the periphery of the rows of panel board and equipment generally in order to allow easy operator movement and access as well as maintenance.

Any future possibility of annexe building shall be taken care of while finalizing the layout of the control room building.

Minimum headroom of 3 M below soffit of beams/false ceiling shall be considered for rooms. The roof shall flat roof as finalized during detailed engineering.

2.1 Design

a) The buildings shall be designed:
   1. To the requirements of the National Building Code of India, and the standards quoted therein.
   2. For the specified climate & loading conditions.
   3. To adequately suit the requirements of the equipment and apparatus contained in the buildings and in all respects to be compatible with the intended use and occupancy.
   4. With a functional and economical space arrangement.
   5. For alien expectancy of structure, systems and components not less than that of the equipment, which is contained in the building, provided regular maintenance is carried out.
6. Be aesthetically pleasing. Different buildings shall show a uniformity and consistency in architectural design.

7. To allow for easy access to equipment and maintenance of the equipment.

8. With, wherever required, five retarding materials for walls, ceilings and doors, which would prevent supporting or spreading of fire.

9. With materials preventing dust accumulation.

b) Suitable expansion joints shall be provided in the longitudinal direction wherever necessary with provision of twin columns.

c) Individual members of the building frame shall be designed for the worst combination of forces such as bending moment, axial force, shear force, torsion etc.

d) Permissible stresses for different load combinations shall be taken as per relevant IS Codes.

e) All cable vaults shall be located above ground levels i.e. cable vaults shall not be provided in basements of the buildings.

f) The building lighting shall be designed in accordance with the requirements of relevant section.

g) One emergency exit shall be provided in control room building.

2.2 Design loads

Building structures shall be designed for the most critical combinations of dead loads, super-imposed loads, equipment loads, crane load, wind loads, seismic loads and temperature loads.

Dead loads shall include the weight of structures complete with finishes, fixtures and partitions and should be taken as per IS: 1911.

Super-imposed loads in different areas shall include live loads, miner equipment loads cable trays, small pipe racks/hangers and erection, operation and maintenance loads. Equipment loads shall constitute, if applicable, all load of equipments to be supported on the building frame.

For crane loads an impact factor of 30% and lateral crane surge of 10% (lifted weight + trolley) shall be considered in the analysis of frame according to provisions of IS:875, The horizontal surge shall be 5% of the static wheel load.

The wind loads shall be computed as per IS 875, Seismic Coefficient method shall be used for the seismic analysis as per IS 1893 with importance factor 1.5.

For temperature loading, the total temperature variation shall be considered as 2/3 of the average maximum annual variation in temperature. The average maximum annual variation in temperature for the purpose shall be taken as the difference between the mean of the daily minimum temperature during the coldest month of the year and mean of daily maximum temperature during the hottest month of the year. The structure shall be designed to withstand stresses due to 50% of the total temperature variation.

Wind and Seismic forces shall not be considered to act simultaneously.

Floors/ slabs shall be designed to carry loads imposed by equipment, cables piping travel of maintenance trucks and equipment and other loads associated with building. Floors shall be designed for loads as per relevant IS. Cable and piping loads shall also be considered additionally for floors where these loads are expected.
In addition, beams shall be designed for any incidental point loads to be applied at any point along with beams. The floor loads shall be subject to Purchaser’s approval.

For consideration of loads on structures, IS: 875 shall strictly adhere to. Any other load coming in the structure, not mentioned in IS 875 shall be calculated as per relevant IS code and NBC.

Only ISI mark Steel (TATA/SAIL) sections shall be used for construction.

2.3 Submission

The following information shall be submitted for review and approval.

1. Design criteria shall comprise the codes and standards used, applicable climatic data including wind loads, earthquake factors maximum and minimum temperatures applicable to the building locations, assumptions of dead and live loads, including equipment loads, impact factors, safety factors and other relevant information.

2. Structural design calculations and drawing (including construction/fabrication) for all reinforced concrete and structural steel structures.

3. Fully, dimensioned concept plan including floor plans, cross sections, longitudinal sections elevations and perspective view of each building. These drawings shall be drawn at a scale not smaller than 1:75 and shall identify the major building components.

4. Fully dimensioned drawings showing details and sections drawn to scales of sufficient size to clearly show sizes and configuration of the building components and the relationship between them.

5. Product information of building components and materials, including walls partitions flooring ceiling, roofing, door and windows and building finishes.

6. A detailed schedule of building finishes including colour schemes.

7. A door and window schedule showing door types and locations, door lock sets and latch sets and other door hardware.

8. Safe bearing capacity of the soil below the foundation is to be calculated after testing in an Govt. laboratory.

9. All other designs, calculations, details, drawings or any other submission as required by the Purchaser time to time after award of contract.

Approval of the above information shall be obtained before ordering materials or starting fabrication or construction as applicable.

2.4 Finish Schedule

The finishing schedule is given in subsequent clauses.

2.5 Flooring

Flooring in various rooms of control room building shall be as for detailed schedules given in Table-1

2.6 Walls

Control room buildings shall be of framed structure. All walls shall be non-load bearing walls. Min. thickness of external walls shall be 230 mm (one brick) with 1:6 cement sand mortar. Bricks shall be Klin burn brick, Class-A.

2.7 Plastering.
All internal walls shall have minimum 12 mm thick 1:6 cement sand plaster on either side of wall. The ceiling shall have 6 mm minimum thick 1:4 cement sand plaster.

### 2.8 Finishing

All external surfaces shall have 18 mm cement plaster in two coats, under layer 12 mm thick cement plaster 1:5 and finished with a top layer 6 mm thick cement plaster 1:6 (DSR 13.19) with water proofing compound. The paint shall be antifungal quality of reputed brand suitable for masonry surfaces for high rainfall zone. White cement primer shall be used as per manufacturer’s recommendation.

Internal finish Schedule is given Table-1 below.

#### TABLE-1

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Location</th>
<th>Flooring &amp; Skirting 150mm high</th>
<th>Wall Internal</th>
<th>Ceiling</th>
<th>Doors, Windows, Ventilators</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Control Room, Relay Room</td>
<td>Precast Terrazo tiles (DSR’02, Itemno 11.29A.2 &amp;11.31.2)</td>
<td>Oil bound washable distemper on smooth surface applied with 2mm thick Plaster of Paris putty,(DSR’02-13.40A &amp; 13.77.2)</td>
<td>White Wash (DSR’02-13.70.1)</td>
<td>1) Standard steel rolled section frames with 5 mm glass. DSR’02-10.12, 10.13 and 10.14 2) Flush door shutters-DSR’02-9.25.2</td>
</tr>
<tr>
<td>2.</td>
<td>Sub-station In charge, Office, corridor, staff room</td>
<td>Precast Terrazo tiles (DSR’02, Itemno 11.29A.2 &amp;11.31.2)</td>
<td>Oil bound washable distemper on smooth surface applied with POP putty,(DSR’02-13.40A &amp; 13.77.2)</td>
<td>White Wash (DSR’02-13.70.1)</td>
<td>1) Standard steel rolled section frames with 5 mm glass. DSR’02-10.12, 10.13 and 10.14 2) Flush door shutters-DSR’02-9.25.2</td>
</tr>
<tr>
<td>3.</td>
<td>Battery room</td>
<td>Acid and Alkali Resistant tiles. DSR’02-11.36 C. 1&amp;11.36 C.1.1</td>
<td>Dado of acid resistant tile 1.2Mhigh and Paint above 1.2 M to ceiling DSR’02-11.36C. 2.1,11.36C.2&amp;13.96.1</td>
<td>Acid resistant Paint. DSR’02-13.96.1</td>
<td>Standard (preferably aluminium) rolled section frames with 5 mm glass. DSR’02-10.12, 10.13 and 10.14 2) Flush door shutters-DSR’02-9.25.2 Painted with acid resistant Paint.DSR’02-13.96.1</td>
</tr>
<tr>
<td>4.</td>
<td>Toilet</td>
<td>Ceramic glazed tiles in flooring DSR’02-11.74</td>
<td>DADOP glazed tile 2.1M high for toilet (DSR-02-11.73)</td>
<td>White Wash DSR’02-13.70.1)</td>
<td>1) Standard steel rolled section frames with 5 mm glass. DSR’02-10.12, 10.13 and 10.14 2) Flush door shutters-DSR’02-9.25.2</td>
</tr>
<tr>
<td>5.</td>
<td>Other areas not specified</td>
<td>Terrazo tiles (DSR’02-11.29A.2&amp;11.31.2-0)</td>
<td>Oil bound distemper, DSR:02-13.40A &amp; 13.77</td>
<td>White Wash (DSR’02-13.70.1)</td>
<td></td>
</tr>
</tbody>
</table>

#### 2.9 Roof

Roof of the C.R. Building shall consist of Cast-in-situ RCC slab treated with a water proofing system which shall be an integral cement based treatment conforming to CPWD specification (item no. 25.8 of DSR 1997). The water proofing treatment shall be of following operations.

(a) Applying and grouting a slurry coal of neat cement using 2.75 kg/m² of cement admixed with proprietary water proofing compounds conforming to IS: 2645 over the RCC slab including cleaning the surface before treatment.
(b) Laying cement concrete using broken bricks/brick bats 25 mm to 100mm size with 50% of cement mortar 1:5 (1 cement: 5 coarse sand) admixed with proprietary water proofing compound conforming to IS: 2645 over 20mm thick layer of cement mortar of min 1:5 (Cement: 5 coarse sand) admixed with proprietary water proofing compound conforming to IS 2645 to required slope and treating similarly the adjoining walls up to 300mm height including rounding of junctions of walls and slabs.

(c) After two days of proper curing applying a second coat of cement slurry admixed with proprietary water proofing compound conforming to OS: 2645.

(d) Finishing the surface with 20mm thick joint less cement mortar of mix 1:4 (1 cement:4 coarse sand) admixed with proprietary water proofing compound conforming to IS:2645 and finally finishing the surface with trowel with neat cement slurry and making of 300 x 300 mm square.

(e) The whole terrace so finished shall be flooded with water for a minimum period of two weeks for curing and for final test. All above operations to be done in order and as directed and specified by the Engineer-in-charge with average thickness of 120 mm and minimum thickness khurra at 65 mm.

2.10 Glazing

Minimum thickness of glazing shall be 5.5 mm as per IS: 2835 Sun film shall be provided for all windows/doors/of AC rooms if any.

2.11 Doors and Windows

The details of doors and windows of the control room building shall be as per finish schedule TGable-1 and tender drawing with the relevant IS code. Rolling steel shutters and rolling steel grills shall be provided as per layout and requirement of buildings. Paints used in the work shall be of best quality specified in CPWD specification.

2.12 Plumbing & Sanitation

(i) All plumbing and sanitation shall be executed to comply with requirements of the appropriate byelaws, rules and regulations of the Local Authority having jurisdiction over such matters. The Contractor shall arrange for all necessary formalities to be met in regard to inspection, testing, obtaining approval and giving notices etc.

(ii) PVC syntex make Roof water tank of adequate capacity depending on the number of users for 24 hours storage shall be provided. Minimum 1 Nos. 500 liters capacity shall be provided.

(iii) Galvanized MS pipe of medium class conforming to IS: 1239 shall be used for internal & external piping work for potable water supply.

(iv) Sand CI pipes with lead joints conforming to IS:1729 shall be used for sanitary works above ground level.

(v) Each toilet shall have the following minimum fittings.

(a) WC(Western type) 390 mm high with toilet paper roll holder and all fittings Or WC (Indian Type) Orissa Pattern (580 x 440 mm) with all fittings (both types of WCs shall be provided at alternate locations)

(b) Urinal (430 x 260 x 350 mm size) with all fittings.

(c) Wash basin (550 x 400 mm) with all fittings.

(d) Bathroom mirror (600 x 400 mm x 6mm thick) with all fittings.

(e) CP brass towel rail (600 x 20mm) with C.P. brass brackets.

(f) Soap holder and liquid soap dispenser.

(vi) All fittings, fastener, grating shall be chromium plated.

(vii) All sanitary fixtures and fittings shall be of approved quality and type manufactured by well known manufactures. All items brought to site must bear identification marks of the type of the Manufacturer.
Soil, waste and drain pipes, for underground works shall be stoneware for areas not subject to traffic load. Heavy-duty cast iron pipes shall be used otherwise.

3.0 MISCELLANEOUS GENERAL REQUIREMENTS

1. Dense concrete with controlled water cement ratio as per IS-code shall be used for all underground concrete structures such as pump-house, tanks, water retaining structures, cable and pipe trenches etc. for achieving water-tightness.

2. All joints including construction and expansion joints for the water retaining structures shall be made water tight by using PVC ribbed water stops with central bulb. However, kicker type (externally placed) PVC water stops shall be used for the base slab and in other areas where it is required to facilitate concreting. The minimum thickness of PVC water stops shall be 5 mm and minimum width shall be 230 mm.

3. All steel sections and fabricated structures that are required to be transported on sea shall be provided with anti corrosive paint to take care of sea worthiness.

4. All mild steel parts used in the water retaining structures shall be hot-double dip galvanized. The minimum coating of zinc shall be 750 gm/sq.m for galvanized structures and shall comply with IS: 2629 and IS: 2633. Galvanizing shall be checked and tested in accordance with IS: 2633. The galvanizing shall be followed by the application of an etching primer and dipping in black bitumen in accordance with BS: 3416.

5. A screed concrete layer not less than 100 mm thick and of grade not weaker than M10 conforming to IS: 456-1978 shall be provided below all water retaining structures. A sliding layer of bitumen paper or craft paper shall be provided over the screed layer to destroy the bond between the screed and the base slab concrete of the water retaining structures.

6. Bricks having minimum 75kg/cm 2 compressive strength can only be used for masonry work. Contractor shall ascertain himself regarding the availability of bricks of minimum 75kg/cm2 compressive strength before submitting his offer.

7. Doors and windows on external walls of the buildings (other than areas provided with insulated metal claddings) shall be provided with RCC sunshade over the openings with 300 mm projection on either side of the openings. Projection of sunshade from the wall shall be minimum 450 mm over window openings and 750 mm over door openings.

8. Service ladder with hand rail made of painted steel structure shall be provided at rear side of the building for access to roofs.

9. Angles 45 x45x5 mm (minimum ) with lugs shall be provided for edge protection all round cut outs/openings in floor slab, edges of drains supporting grating covers, edges of RCC cable/pipe trenches supporting covers, edges of manholes supporting covers, supporting edges of manhole precast cover and any other place where breakage of corners of concrete is expected.

10. Anti termite chemical treatment shall be given to column pits, wall trenches, foundations of buildings, filling below the floors etc. as per IS: 6313 and other relevant Indian standards.

11. For all civil works covered under this specification, nominal mix by volume batching as per CPWD specification is intended. The relationship of grade of concrete and ratio of ingredients shall be as below.

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Mix</th>
<th>Cement</th>
<th>Sand</th>
<th>Coarse</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>M10</td>
<td>1</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>2.</td>
<td>M15</td>
<td>1</td>
<td>2</td>
<td>4</td>
</tr>
</tbody>
</table>
3. M 20 1 1.5 3

The material specification, workmanship and acceptance criteria shall be as per relevant clauses of CPWD specification and approved standard Field Quality Plan.

12. The details given in tender drawings shall be considered along with details available in this section of the specification while deciding various components of the building.

13. Items/components of buildings not explicitly covered in the specification but required for completion of the project shall be deemed to be included in the scope.

4.0 INTERFACING

The proper coordination & execution of all interfacing civil works activities like fixing of conduits in roofs/walls/floors, fixing of foundation bolts, fixing of lighting fixtures, fixing of supports/embedment, provision of cutouts etc. shall be the sole responsibility of the Contractor. He shall plan all such activities in advance and execute in such a manner that interfacing activities do not become bottlenecks and dismantling breakage etc is reduced to minimum.

Earth Work.

Excavation. Excavation shall conform to the dimensions and elevations as shown on the approved drawings. The general cut slope shall not be steeper than 1 : 1.5; however, where the Contractor shall not excavate the slope to satisfy the condition above, temporary supports to the sides of excavations shall be required by means of timbering, sheet piling or shoring.

When foundations rest on excavated surface other than rock, special care shall be taken not to disturb the bottom of excavation. When subsoil for foundat materials suitable for use, as Engineer shall approve backfill in charge. However, surplus excavated materials shall be designated by Engineer in charge and shall be removed to a distant place by the contractor free of cost to WESCO.

Backfilling. The Contractor shall place and compact the backfill materials to the grades and dimensions to be shown on the approved drawings or as per the instruction of engineer in charge. The materials to be used for backfill, the amount thereof and the manner of depositing the materials shall be approved by Engineer in charge.

Placing of Concrete.

General Conditions. Prior to placing concrete, the Contractor shall submit to Engineer in charge for approval the mixed proportion, the characteristics of each materials of concrete, the concrete placing schedule, placing equipment and method of execution of work. No concrete shall be placed until all formwork, treatment of surface, placing of reinforcement and other parts to be embedded have been inspected and approved by Engineer in charge.

Placing of concrete shall not be permitted under the following conditions, unless specifically approved by Engineer in charge:

1. When it rains.

2. When illumination is imperfect for night work.

3. When Engineer in charge orders to stop.
**Preparation for Placing.** Treatment of foundation surfaces. All surfaces of foundation upon or against which the concrete is to be placed shall be cleaned and moistened thoroughly before the placing. When concrete is placed upon or against earth foundations, the Contractor shall, in accordance with the direction of Engineer in charge remove all objectionable substances such as standing water, flowing water, fragments of wood.

Treatment of surfaces of construction joints. Prior to placing the concrete upon or against the hardened concrete, the surface of the construction joints shall be cleaned, moistened and removed of all laitance, defectable or loose concrete and unsound foreign materials.

**Transporting and Conveying.** The concrete which has elapsed more than 60 minutes after being discharged from the mixer and/or in which slump loss exceeds 3.0 cm as it is delivered to the site for placing shall be disposed of at the place designated by Engineer in charge. All such wasted concrete shall be borne to the Contractor's account. Concrete shall be placed with a vertical drop not greater than 1.0 m except where suitable equipment is provided to prevent segregation or where specifically authorized. Concrete, which has segregated during transportation, shall be remixed. Re-tempering of concrete shall not be permitted.

**Placing.** After the surface of unformed construction joint has been cleaned and the placing of concrete has been approved by EIC in accordance with the provisions of the preceding sub-articles, surface of unformed construction joint shall be covered with a layer of mortar before it begins to set. The mortar shall be of richer cement content than concrete without coarse aggregate. The cost of mortar shall be included in unit price bid for concrete. Concrete shall be deposited in all cases, as nearly as practicable, directly in its final position and shall not be caused to flow such that will permit lateral movement or cause segregation of the coarse aggregate, mortar or water from the concrete mass.

**Consolidation.** Immediately after placing, every layer of concrete shall be consolidated to maximum practicable density so that it closes snugly against all surfaces of reinforcement bars and embedded fixtures and against all corners of the forms. Consolidation of concrete shall be by electric or pneumatic power-driven, immersion type vibrators or other approved means.

**Concrete Construction Tolerance.**
Variation in alignment, grade and dimensions of the structures from the established
alignment, grade and dimensions shall be remedied or removed and replaced by the Contractor at his own expense.

**Repair of Concrete.**

The Contractor shall repair at his own expense the imperfections of concrete surfaces and the irregularities, which do not meet the specified dimensions. Repairing work shall be performed and completed within 24 hours after the removal of forms, in accordance with the direction of Engineer in charge.

**Curing.**

Prior to placing concrete, the Contractor shall obtain Engineer in charge approval in respect of the method to protect and cure concrete and the facilities he proposes to use. After concrete has been placed, it shall be protected and cured strictly in accordance with the method approved by Engineer in charge.

All costs for the curing of concrete shall be included in the unit price bid for concrete.

**5.0 Forms.**

**General Conditions.** Forms shall be used, wherever necessary, to confine and shape the concrete to the required Bay extensions, and as directed by Engineer in charge. Forms shall be of steel & have sufficient strength to withstand the pressure resulting from placing and vibrating of the concrete and shall be maintained rigidly in positions. Forms shall be sufficiently tight to prevent loss of mortar from concrete. Each form shall be so prepared that each section may be removed individually without injuring the concrete.

The costs of all labor and materials for forms and for any necessary treatment of coating of forms shall be included in the unit price bid for concrete, for which forms are to be used. No separate payment for form will be made for forms.

**Removal of Forms.** Forms shall not be removed without the approval of Engineer in charge. As a rule, the forms shall be removed at the following minimum times after concrete have been placed.

- Side form of column beam and wall: 2 days
- Supporting form of roof and beam: 20 days

After supporting form of form is removed, the shoring system shall be remained at least for 14 days.
Tests.
The Contractor shall make all necessary tests for determining the mixed proportion of each type of concrete, including tests of aggregates. In order to control the quality of concrete to be placed, the Contractor shall perform the following field tests:

**Slump Test.** A slump test will be made from each of the first three batches mixed each day. An additional slump test will be made for each additional 40 cubic meters of concrete placed in any one day. Slump will be determined in accordance with 1SS.

**Air Test** An air content test will be made from each batch of concrete from which test cylinders are made. Air content will be determined in accordance with 1SS.

**Compression Test.** Two sets of three concrete compression test cylinders will be made each day when concrete is placed. One set of each group will be tested at an age of 7 days and the other set will be tested at an age of 28 days. The third set will be an extra set to be tested only if needed. Concrete test cylinders will be made, cured and stored in accordance with 1SS. Cylinders will be tested in accordance with 1SS.

All costs for the tests shall be included in the unit price bid for concrete in the Price and Schedule.

**Steel Reinforcement.** The Contractor shall place all reinforcement bars in the concrete structures as shown on the approved drawings and directed by Engineer in charge. The make of steel shall be reputed make (TATA/ SAIL/ RINL) to be approved by WESCO.

6.0 **Quality.**
The reinforcement bars used for concrete structures shall be deformed bars, torsion bars and round bars and dimensions, shapes, tensile strength, yield point, elongation and other properties, shall conform to international standards and the contractor shall clean the Oxide if any from the surface of the bar before use of same and shall apply two coats of anti corrosive paints to the bars. The cost of such paint shall be borne by the contractor.

6.1 **Placing.**
Reinforcement bars shall be accurately placed and special care shall be exercised to prevent the reinforcement bars from being displaced during the placement of concrete. Intersecting points and splices of reinforcement bars shall be fixed by using suitable clips or
annealed wires, the diameter of which shall be more than 0.9 mm. The reinforcement bars in structures shall be placed and supported by use of lumps of mortar, metal spacers, metal hangers or other satisfactory devices to ensure required coverage between the reinforcement bars and the surface of concrete. Drawings of bar list shall be submitted for approval.

7.0 **Detail Drawings.**

The contractor shall furnish details of each type of foundation drawings to DGM(T), CSO, Bhubaneswar for approval to take up the work. No change in the design and drawings, shall be made without the written approval of Engineer in charge. The detail drawings shall include:

1. Detail dimensions of foundation.
2. Details of setting dimensions of foundation.
3. Details of placing of all reinforcing steel which shall conform to the Building Code Requirements for Reinforced Concrete and Manual of Standard Practice for Detailing Reinforced Concrete Structure unless otherwise as specified herein.
4. Details of type, size and length of each reinforcing steel including details of bar bending.

8.0 **Masonry**

**General.** The Contractor shall perform masonry and finishing work. Materials to be used for the work shall be approved by Engineer in charge. Samples of the materials, used in the work, shall also be submitted to Engineer in charge for approval:

**Mortar and Plaster.**

**Materials.** Cement shall be Mixed Portland cement conforming to the requirements of BS.12: 1958. or equivalent ISS. Sand shall be sharp, fine granules, composed of hard, strong, durable, uncoated particles free from clay or earthy materials and well-graded and grading shall confirm to the following requirements by weight:

<table>
<thead>
<tr>
<th>Sieve Sizes</th>
<th>Percent Passing by Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. 4</td>
<td>100</td>
</tr>
<tr>
<td>No. 8</td>
<td>95-100</td>
</tr>
<tr>
<td>No. 16</td>
<td>60-100</td>
</tr>
<tr>
<td>No. 30</td>
<td>35-70</td>
</tr>
<tr>
<td>No. 50</td>
<td>15-35</td>
</tr>
</tbody>
</table>
Water shall be clean and free from impurities, such as iron, salt, sulphur and organic matters.

a. **Common Brick.** Common brick shall be Kiln burnt, class –A, laid plumb, true to Bay extension, level and in accurately spaced courses. Brick shall be wet prior to lying and shall be damp when laid, but without a surface film of water. Samples shall be submitted by the contractor to be approved by Engineer In charge WESCO before erection. The brick shall be laid in running bond with stretchers breaking joints with the course below. Full size brick shall be used to greatest possible extent instead of cutting or breaking brick. Brick shall be laid with joints approximately one centimeter thick. All bricks to be used shall be Class-A brick and have a minimum crushing strength of 75 kg/cm²

b. **Anchors.** Brick masonry shall be tied to adjoining columns with diameter of 6 mm reinforcing bars sufficiently long to extend into the masonry not less than 20 centimeters and spaced at 25 centimeters center, unless otherwise indicated.

### 8.1 Illumination System

The Contractor shall provide the illumination system for s/y according to the requirements. The Contractor’s designed drawings shall be submitted to Engineer in charge for approval.

- Six Numbers of 1x400 Watt HPSV outdoor Light fittings( Make – PHILIPS / CGL) along with Tubular Poles are to be provided.
- Inside Control room Building 12 numbers of 2x40 W Flourcent industrial Tube Light fittings are to be provided.
- Inside Control room Building 7 numbers of ceiling fans are to be provided.
- Inside battery room and near each canopy Bulkhead fittings are to be provided.

### 8.2 Painting

Painting shall include the preparation of surfaces to be painted, the protection of surfaces, the furnishing and applying of paint materials and work of a general nature incidental to painting, which is required to be properly executed and complete the painting work.

**Surfaces to be Painted.**

Painting under these Specifications shall include painting of the following surfaces: All exposed ungalvanized interior and exterior ferrous metal surfaces. Exposed galvanized sheet metal surfaces of scuppers and down pouts. Surfaces of shop-primed equipment and materials. Exposed surfaces of
galvanized sheet metal. Abraded or damaged areas of shop finish painted surfaces of equipment furnished under other Articles of Contract will be repaired or repainted under those Articles or Contract. Exposed surfaces of galvanized electrical conduit, conduit boxes and fittings shall be painted only where these surfaces are adjacent to painted parts of the building structure or equipment. Such surfaces, when painted, shall be painted using painting materials and colors matching the adjacent surfaces.

**Materials.** A list of the painting materials and their colors, which are to be applied to the specified surfaces, shall be submitted to Engineer in charge for approval.

**Paint Systems.** All shop-primed surfaces shall be spot primed over the shop applied prime coat or otherwise repaired as directed by Engineer in charge. Galvanized surfaces, which are to be painted, shall be cleaned, etched or otherwise prepared for painting in strict conformity with the instructions of the paint manufacturer. Any chemical treatment of galvanized surfaces shall be followed by thorough rinsing with clean water.

**Metal Surfaces.** Except for zinc-galvanized surfaces, all steel surfaces shall be painted, rust-resistance paint shall be applied in one coat and finished paint shall be applied in two coats. Parts embedded in concrete shall not be painted. The material shall be Rust Ileum; the color of paint shall be determined by Engineer in charge.

**Concrete, Concrete Masonry and Plaster Surfaces.** These surfaces shall be given a prime coat and two finish coats (weather coat paint of ASIAN make Apex ultima brand) of paint or as approved by Engineer in charge.

9.0 **Drainage system.**

9.1 **General Requirement.**

The drainage system is to drain the entire storm run off water and all other water using pipe converting system, open gutter and cable trench system to the public drainage pit outside the substation in accordance with the instruction of Engineer in charge. The Contractor shall perform and be responsible for drainage system according to the following specified items. All the Contractor’s designed drawings shall be submitted to Engineer in charge for approval.

9.2 **Principal Areas of Drainage.**

1. Switchyard area and cable trench.

2. Road surface.

3. Control room Area building.

9.3 **Design Criteria.**

- Coefficient of run off is 0.5 except for road and switchyard, which is 0.9.

- Preferably flow velocity 0.3 - 1.0 meter per second.
- Gravitational flow for drainage.

9.4 **Drainage Pipe.**
The Contractor shall design, furnish and install all pipes including roof down pipes for drainage system and shown in the drawing for approval.

9.5 **Concrete Gutter.**
Concrete gutter shall be reinforced concrete. The function of gutter is to drain the surface run off from the road surface and nearby area. The size and slope of the gutter shall have adequate capacity for drainage of the area.

9.6 **Sump.** Sump shall be provided for pipe changes in size, direction and inspection and at inlet of nearby area. The maximum distance as road inlet sump shall not be more than 30 Meters. The sump shall be of reinforced concrete type. The sump cover shall be of either galvanized steel grating or cast iron. Only cast iron cover shall be used for inspection sump and under traffic sump. The Steel grating shall be strong enough for the load. Ions become mucky on top due to construction operation or any other reason, such subsoil shall be removed and replaced by one or more layers of compacted sand or compacted crushed rock, as directed by Engineer in charge.

10.0 **WATER SUPPLY**

(i) Contractor shall make its own arrangement for construction water.

(ii) The contractor shall carry out all the plumbing/erection works required for supply of water in control room building.

(iii) The details of tanks, pipes, fittings, fixtures etc for water supply are given elsewhere in the specification under respective sections.

(iv) A scheme shall be prepared by the contractor indicating the layout and details of water supply which shall be got approved by the Purchaser before actual start of work including all other incidental items not shown or specified but as may be required for complete performance of the works.

(v) Bore wells and pumps for water supply are in the scope of contractor meeting the day-to-day requirement of the drinking water supply.

(vi) If the water is supplied by Municipal Corporation then bore well for water supply purposes is not required to be carried out by contractor. Contractor shall also make necessary arrangement/formalities to receive water connection from corporation.

11.0 **SEWERAGE SYSTEM**

(i) Sewerage system shall be provided for control room building.
(ii) The Contractor shall construct septic tank and soak pit suitable for 5 users if outside of Municipal Corporation zone. Otherwise, all necessary arrangement for the disposal of sewerage to the Municipal Corporation’s end shall be arranged by the contractor at his own cost for regularizing the disposal activity.

(iii) The system shall be designed as per relevant IS Codes.

12.0 STATUTORY RULES

1. Contractor shall comply with all the applicable statutory rules pertaining to factories act (as applicable for the State). Fire Safety Rules of Tariff Advisory Committee, Water Act for pollution control etc.

2. Provisions for fire proof doors, no. of staircases, fire separation wall, plastering on structural members (in fire prone areas) etc. shall be made according to the recommendations of Tariff Advisory Committee.

3. Statutory clearance and norms of State Pollution Control Board shall be followed as per Water Act for effluent quality from plant.

4. Requirement of sulphate resistant cement (SRC) for sub structural works shall be decided in accordance with the Indian Standards based on the findings of the detailed soil investigation to be carried out by the Bidder.

5. Foundation system adopted by Bidder shall ensure that relative settlement and other criteria shall be as per provision in IS:1904 and other Indian Standards.

6. All water retaining structures designed as uncracked section shall also be tested for water tightness at full water level in accordance with clause No.10 of IS:3370 (Part-1).

7. Construction joints shall be as per IS: 456.

8. All underground concrete structures like basements, pumps houses, water retaining structures etc. shall have plasticizer cum water proofing cement additive conforming to IS: 9103. In addition, limit on permeability as given in IS: 2645 shall also be met with. The concrete surface of these structures in contact with earth shall also be provided with two coat of bituminous painting for water/damp proofing. In case of water leakage kin the above structures, Injection Method shall be applied for repairing the leakage.

9. All building/construction materials shall conform to the best quality specified in CPWD specifications if not otherwise mentioned in this specification.

10. All tests as required in the standard field quality plans have to be carried out.site shall verify all these soil data before final detail erections are undertaken.
(B) Electrical Works to be Executed in 2x3.15 MVA, 33 KV/11KV Sub Station.

WESCO shall issue to Bidder from their nearest store the following items only to be installed at site –

- Power and Station Transformer
- VCBs, CT, PT,CRP Panel
- AAA Conductor

The bidder shall arrange at his own cost for transportation of above materials to site including the required balance items to be supplied by them to complete the work, using own loading and unloading equipments, own security and storage arrangement, arranging project license, inspection by the competent authority.

The contractor shall undertake the supply and execution of the entire substation along with 33 KV & 11 KV Link Line work except the above supply above items. Contractor shall supply all equipments, materials, civil works, consumables etc. except above mentioned materials to complete the substations, lines in all respect.

GENERAL CONSTRUCTIONAL PRACTICES

1.0 SURVEY AND GEOTECHNICAL INVESTIGATION

1.1 The bidder shall carry out detailed survey and Geo Technical Investigation of the area as per specification given else where in this document for finalization of the following:

a. The layout of the sub-station as per the enclosed single line diagram, boundary wall, location of 33 and 11 kv bays control room, incoming and outgoing 33/11 kv lines, location, culverts, roads etc.

b. Design the foundation of control room building and foundation of various equipments.

c. Design of the earth grid system for the sub-station along with earth pit.

The above drawings/documents should be submitted to DGM (Tech.), CSO within 15 days of placement of LOA.

2.0 STRUCTURAL

2.1 All the supports shall be of 150x 150 Painted JOIST POLE & Painted MS channel & angle as per drawings of suitable cross section for new 33/11kv Substation.

2.2 Minimum strength of the structural foundation concrete shall be M20 conforming to IS: 456 as per drawing.

2.3 Blinding concrete below foundations, cable trenches, shall be PCC of minimum grade M-7.5.
2.4 Blinding concrete under brick foundation shall be minimum 150 mm thick in PCC of minimum grade M-10

3.0 SPECIFIC REQUIREMENT FOR EARTHING SYSTEM
3.1 Each earthing lead from the neutral of the transformer shall be directly connected to two pipes electrodes in treated earth pits, which in turn and shall be connected to station earthing grid. All the rod electrode shall be buried in cement concrete pit with a cast iron cover hinged to a cast iron frame to have an access to the joints.

3.2 Earthing terminal of each lighting arrester, and lighting down conductors shall be directly connected to rod electrode which in return shall be connected to station earthing grid.

4.0 LIGHTNING PROTECTION
4.1 Lightening protection system installation shall be in strict accordance with the latest edition of Indian Electricity Rules, Indian Standards and codes of practise and Regulations existing in the locality where the system is installed.

4.2 Direct stroke lightening protection (DSLP) shall be provided in the switchyard by electrodes mounted on Joist pole structure.

4.3 25 mm dia 1000 mm long MS solid rod electrode shall be provided with each lightining mast.

4.4 Lightening protection system down conductors shall not be connected to conductors of earthing grid above ground level. Also no intermediate earthing connection shall be made to lightening arrester, arrester, transformer earthing leads which shall be directly connected to rod electrode.

4.5 Connection between each down conductor and rod electrode shall be made via joints located approximately 1500 mm from ground level. The joints shall be directly connected to earthing system.

4.6 Down conductors shall be cleated at the structures at 1000 mm interval.

5.0 BAY EQUIPMENT AND LAYOUT
5.1 The disposition of major equipments is shown in enclosed single line diagram. The equipment connections are proposed to be with ACSR/AAAC conductor (Bus) conforming to relevant IS. The equipment spacing shall be so chosen that adequate safety clearances as well as working clearances are available and all requirements of codes and standard indicated elsewhere are complied with.

6.0 EQUIPMENT ERECTION
6.1 All support insulators, circuit breaker, CTs, PTs and other fragile equipment shall preferably be handled with cranes with suitable booms and handling capacity.

6.2 The slings shall be of sufficient length to avoid any damage to insulator due to excessive swing, scratching by sling ropes etc.

6.3 For cleaning the insulators only muslin or leather cloth shall be used.
6.4 Handling equipment, sling ropes etc. Should be tested before erection and periodically for strength.

6.5 The Contractor shall arrange at site all the equipment, instruments and auxiliaries required for testing and commissioning of equipment.

7.0 STORAGE OF EQUIPMENT
The Contractor shall provide and construct adequate storage shed for proper storage equipment. Weather sensitive equipment shall be stored indoors. All equipment during storage shall be protected against damage due to acts of nature or accidents. The storage instruction of the equipment manufacturer/Purchaser shall be strictly adhered to.

8.0 INSTALLATION OF CABLES
8.1 Power and control cables shall be laid in separate tiers. The order of laying of various cables shall be as follows, for cables other than directly buried.
   a) Power cables on top tiers.
   b) Control, instrumentation and other service cables in bottom tiers.

8.2 Single core cable in trefoil formation shall be laid with a distance of three times the diameter of cables between trefoil centre lines. All power cables shall be laid with a minimum centre to centre distance equal to twice the diameter of the cable.

8.3 Power and control cables shall be securely fixed to the trays/supports. Trefoil clamps for single core cables shall be pressure die-cast aluminium (LM-6), Nylon-6 or fibre glass and shall include necessary fixing nuts, volts, washer, etc. These are required at every 2 meter of cable run. Vertical and inclined cable runs shall be secured with 25 mm wide and 2 mm thick aluminium strip clamps at every 2 m. Horizontal runs in cable tray and trenches shall be secured using 4 mm nylon cord at every 2m.

8.4 Cable shall not be sent below the minimum permissible limit. The minimum bending radius of power cables shall be 12D and that of control cables shall be 10D, where D is overall diameter of the cable.

8.5 Where cables cross roads, drains and rail tracks, the cables shall be laid in reinforced spun concrete or steel pipes, buried at not less than one meter depth.

8.6 In each cable run some extra length shall be kept at a suitable point to enable one (for LT cables) or two (for HT cables) straight through joints to be made, should the cable develop fault at a later date.

8.7 Selection of cable drums for each run shall be so planned as to avoid using straight through joints & splicing.

8.8 Control cable terminations inside equipment enclosure shall have sufficient lengths so that switching of termination in terminal blocks can be done without requiring any splicing.

8.9 Metal screen and armour of the cable shall be bonded to the earthing system of the station, wherever required.

8.10 Rollers shall be used at intervals of about 2.0 meters, while pulling cables.
8.11 All due care shall be taken during unreeling, laying and termination of cable to avoid damage due to twist, kink, sharp bends etc.

8.12 Cable ends shall be kept sealed to prevent damage.

8.13 Inspection of receipt, unloading and handling of cables shall generally be in accordance with IS:1255 and other Indian Standard Codes or practises.

8.14 Wherever cables pass through floor or through wall openings or other partitions, wall sleeves with bushes having a smooth curved internal surface shall be used as not to damage the cables. These sleeves shall be supplied, installed and properly sealed at no extra charges.

8.15 The erection work shall be carried out in neat workmanlike manner and the areas of the work shall be cleaned of all scrap materials after the completion of work in each area every day. Contractor shall remove the RCC/steel trench covers before taking up the work and shall replace all the trench covers after the erection work in that particular area is completed or when further work is not likely to be taken up for some time.

8.16 In case the outer sheath of a cable is damaged during handling/installation, the Contractor shall repair it at his own cost, and to the satisfaction of the Engineer-in-Charge. In case any other part of a cable is damaged, the same shall be replaced by a healthy cable, at no extra cost i.e. the Contractor shall not be paid for supply, installation and removal of the damaged cable.

8.17 All cable terminations shall be appropriately tightened to ensure secure and reliable connections. The Contractor shall cover the exposed part of all cable lugs whether supplied by him or not with insulating type, sleeve or paint.

9.0 CONDUITS, PIPES AND DUCT INSTALLATION

9.1 Contractor shall supply and install conduits, pipes and ducts as specified and as shown in detailed drawings. Flexible conduits should be used between fixed conduit and equipments terminal boxes. Where vibration is anticipated, the flexible conduit shall be as per the relevant IS.

9.2 Contractor shall have his own facility for bending cutting and threading the conduits at site. Cold bending should be used.

9.3 All conduit/pipes shall be extended on both sides of wall/floor/openings. Exposed conduits/pipes shall be adequately clamped at an interval of about 2 m. The fabrication and installation of supports and the clamping are included in the scope of work.

9.4 For underground runs, Contractor shall be excavated and back fill as necessary.

10.00 ACDB, DCDB, JUNCTION BOXES

Contractor shall supply and install ACDB, DCDB & junction boxes complete with terminal as required for auxiliary power supply required in switchyards & control room. The brackets, bolts, nuts and screws required for the erection shall be included.

10.1 (i) Excavation in all type of soil including rock, Construction of Foundation of 33/11KV Transformer, All columns and Equipment structures, as per schedule of quantity,
all retaining wall of the Substation. And laying and fixing of rail as per the instruction of
the engineer in charge and approved drawings for the transformer.

(ii) Supply, Erection all required Substation structures.

(iii) Supply, Erection, testing and commissioning of the following equipments.

(a) 33 KV Isolators with and without Earth switch and mechanism box and
accessories

(b) 33 KV Post Insulators

(c) Substation earthing, earth mat laying and connection to equipments and
structures.

(d) Spreading of coarse sand (220 mm thick) and 40 mm size hard granite stone
metals

(100 mm thick) in the S/S portion with suitable retention wall.

(e) Bus bar stringing and jumpering work to equipment and bus bar.

(f) Conducting Pre commissioning test of all equipment, and
furnishing the test results for approval of the Engineer in Charge.

(g) Arranging statutory inspection and getting clearance from the authority.

(h) Erection, testing and commissioning of Power and Station
Transformer including filtering of transformer Oil.

(i) Charging the bays and final handing over to WESCO.

(j) Making of sub station retaining wall

(k) Putting of Main and wicket Gate of the sub-Station

(m) Construction of the boundary wall

(n) Construction of Control room

(o) Construction of approach road.

(p) Construction of 33 KV & 11 KV Link Lines to Substation

10.2 Erection of Structure and Equipments.

After the column/supporting structures are erected respective equipment (33 KV/11 KV) shall
be erected carefully by suitable crane. But isolators are to be erected as three phase unit basis
and other item like VCB, CT, PT, LA, PI etc. are to be erected on single phase unit basis and
rigidly mounted on the supporting structures.

After the earth mat design is finalized, the earth mats with 90X6 mm G.I. flat are to be laid and
connected to earth pits, connection to each equipment. Then flats are to be connected
with each other with an over lap of 150 mm, duly welded painted with black bituminous paint,
wrapped with HT tapes. Excavation in all type of soil shall be carried in a depth of 800 mm with
back filling.

33 KV & 11KV bus bars are to be strung in 150 x 150mm, long R.S.Joist. Both the bus shall be executed with fitting of suitable tension insulators, all hard wares and clamps required, jumpering of equipment with crimping by compressors, or by suitable clamps as per site requirement and instruction of engineer in charge. All the equipments of each 33 KV & 11KV bays are to be connected by suitable jumpers and clamps.

10.2.1 All the WESCO supplied equipment’s will be received by the contractor during erection after executing indemnity bond in the approved proforma for the cost of the equipment and structures. Indemnity bond will be valid till successful commissioning and handling over to be site Engineer or his authorized agency after commissioning. The equipment shall be issued to the contractor from the Central Store of WESCO. The contractor shall do the transportation from store to site and the cost of transport for such equipments shall be included in his bid. As safe custody of the equipments will be under the scope of the contractor, he is advised to take a composite insurance policy for the transit storage cum Erection for these equipments to cover all the risks at his cost.

11.0 MATERIALS TO BE SUPPLIED BY WESCO.

1. 3.15 MVA, 33/11KV Transformers
2. 100KVA, 33/0.43KV Transformer
3. 33 KV & 11 KV VCB with CT, PT & CR Panels
4. AAA Conductor

MATERIALS TO BE SUPPLIED BY THE CONTRACTOR

a. All materials except Transformers, VCB, AAA Conductor.
b. G.I earthing pipes of 3050 mm length 50 mm dia. Medium duty of TATA/JINDAL makes.
c. Salt and charcoal for earthing 100 Kg each for each pit.
d. All coarse aggregate.(12-20 mm H.G Chips)
e. All fine aggregate (Clear river sand)
f. All materials required for shoring, shuttering
g. All T&P
h. All labour
i. Substation yard filling with clear clear river sand
j. 40 mm size uniform H.G Metals for spreading in the S/S
l. All sundries, PVC tapes, Ferrules, Lugs.
m. Doing all pre commissioning tests
n. Arranging electrical inspection including deposit of statutory fees of electrical inspector.

All Cement required

o. All size of Tor. Steel required
p. K.B bricks
q. All Paints
r. All type of GI Flats for the earth mat, risers etc.
s. All type of cable trays.
t. Any other materials not specifically mentioned but likely to be used for executions conceived by the Contractor

11.1 Climatic Condition:
The climatic conditions shall be

(a) Maximum temperature of air in shade = 45 deg. C
(b) Minimum temperature of air in shade = 7 deg. C
(c) Maximum temperature of air in sun = 50 deg. C
(d) Maximum humidity = 100 %
(e) Av. No. of thunder storm days per annum = 90 days
(f) Minimum rainfall per annum = 2000 mm
(g) Average of dust storm days per annum = 20 days
(h) Average rainfall per annum = 1500 mm
(i) Maximum ambient temperature daily average = 45 deg. C
(j) Maximum Wind pressure = 260 kg/m²

11.2 The contractor will employ adequate no. of skilled labor of required category for Erection to achieve high standard workmanship. Experienced skilled staff such as Supervisor / Electrician possessing valid license from Electrical Licensing Board of Orissa
shall be engaged for carrying out Erection / testing and commissioning work. Ground mat design utilizing the available size of G.I flats / G.I earthing devices with the purchaser shall be made and submitted for approval by the contractor. The contractor shall do the laying of ground mat and construction of earth pits. The materials like Charcoal, salt, etc. required for earth pits shall be supplied by contractor. Equipment earthing shall be done by contractor and G.I flats required shall be supplied by Contractor.

12.0 All pre-commissioning tests on the equipment shall be carried out by the contractor. Commissioning of equipments shall be carried out after receipt of clearance from the site Engineer and Chief Electrical Inspector. Payment of Statutory Electrical Inspection fees and filing of paper for such inspection shall be done by contractor. The contractor at his cost shall supply all other materials required for erection testing and commissioning. Services of commissioning Engineer where required would be on the contractor’s account.

13.0 Work Schedule.

The work schedule for completion of erection of 33/11 KV Sub-Station commissioning shall be furnished to engineer in charge. Completion of erection and commissioning are to be done as per the approved work schedule & Pert Chart.

14.0 Whenever required the restoration or shut down works to be carried out in an emergency basis round the clock for which incentive in shape of labor will be paid and mobilization charges over and above the normal rates, as per actual work done. Bidders are requested to quote for the above purpose in their price bid.

15.0 FIELD TEST OF ELECTRICAL EQUIPMENT

After the completion of individual adjustments and tests of each equipment during installation and upon all equipment being ready for operation, the Contractor shall carry out the field tests, but not limited to those listed hereinafter, in the presence of EIC.

15.1 ITEM OF FIELD TESTS

1. Measurement of insulation resistance
2. AC withstand voltage test
3. Primary and secondary injection tests
4. All field tests as desired by the engineer in charge
5. Operating times of the Breaker

15.2 REQUIREMENTS FOR FIELD TESTS

The field tests shall be carried but in presence of Engineer in charge under the following conditions:

1. Engineer in charge will make available power at 400/230V 50 HZ one point for carrying out the tests under this chapter. If power is required at other source and place, the
contractor will make his own arrangement.

2. AC withstand test voltage for conductors and outdoor equipment shall be normal operation voltage and withstand voltage test shall be carried for ten (10) minutes by the normal voltage mentioned above.

3. The field tests shall be carried out, by the Contractor after measurement, adjustment and individual tests of all the equipment have been completed.

4. The Contractor shall provide expendables and lead wires and other materials required for the field tests. The Contractor shall be responsible for providing all measuring instruments and tools required for the tests; however, the Engineer in charge subject to prior agreement may loan the measuring instruments and tools for the test to the Contractor.

5. Preparation of test record sheets and test reports shall be the responsibility of the Contractor shall submit the results of field tests for approval.

6. **MEASUREMENT OF INSULATION RESISTANCE**

   Measurement of insulation resistance of the equipment shall be performed by 5 KV megger under the following procedures. For control circuits the insulation resistance shall be measured by 500 V Megger. Insulation resistance (phase to phase and phase to ground) of the equipment shall be measured. If required for the tests, the measurement of insulation resistance shall be performed under the conditions that the 33 KV and 11 KV equipments are in the circuit with breaker and isolators are in closed condition.

**16.0 AC WITHSTAND VOLTAGE TEST**

After completion of the measurement of insulation resistance mentioned above, AC withstand voltage test shall be performed by the normal operation voltage of the existing power system in accordance with the following procedure:

**16.1 33 KV Main Circuit.**

The 33 KV circuit breakers and 33 KV disconnecting switches, shall be closed, succeeding, normal operation voltage shall be charged on the equipments and the bus conductors for ten (10) minutes for AC withstand voltage test. The indication value of meters mounted on the board during the AC withstand voltage test shall be recorded on the test record sheets prepared by the Contractor.

**16.2 TEST OF PROTECTIVE RELAYS AND DEVICES**

The Contractor shall perform the sequence test of all protective relays circuit and device after that the fault simulation test of protective relay boards shall be performed to confirm
normal operation of protective relays and fault indication. The test shall be performed prior to proceeding with the AC withstand voltage tests. The test shall include:

a) Primary and secondary injection tests.

b) Sequence tests.

c) Characteristic and accuracy test.

d) Calibration and setting test.

e) Insulation tests.

The Contractor shall submit the final relay settings for approval. All settings shall be coordinated with the existing relay settings. The contractor shall make the insurance of all the equipment when the materials are at his cost. Any damage done during erection shall be to contractors account including during the transit after receiving from WESCO store.
(C) TECHNICAL SPECIFICATION FOR CONSTRUCTION OF 33 KV & 11 KV LINK LINE TO SUBSTATION:-

1.0 Scope :-

The scope shall include supply of all materials to complete the 33 KV & 11 KV Line work on Turnkey basis except supply of the followings which shall be supplied by WESCO to Bidder from their store and to be installed by the Bidder at site –

a) 100 Sq.mm AAA Conductor for 33 KV Line
b) 55 Sq.mm AAA Conductor for 11 KV Line

The scope of the Proposal for the balance materials to be supplied by the bidder to complete the job shall be completely covering supply and erection of all the equipments specified under the accompanying Technical Specifications including other services. It will include the following:-

(ii) Detailed survey of line and preparation of SLD / BOQ to be done by the bidder

(ii) Complete manufacture, including shop testing & supply of materials from the vendors to be approved by WESCO (materials which are to be supplied by the bidder)

(iii) Providing Engineering drawing, data, operational manual, etc for the Purchaser’s approval

(iv) Packing and transportation from the manufacturer’s works to the site.

(iii) Receipt, storage, preservation and conservation of equipment at the site.

(v) Pre-assembly, if any, erection testing and commissioning of all the equipment;

(vii) Reliability tests and performance and guarantee tests on completion of commissioning;

(vii) Loading, unloading and transportation as required.

(viii) Erection of equipments including civil works.

(ix) Erection of lines of specified voltage.

(xiii) Testing, Commissioning of lines / installations

(xiv) Storing before erection at site

(xv) Getting the substations & lines inspected by Electrical Inspector after completion of work at a particular location.

Bidder should arrange to transport materials to be supplied by WESCO (from their store) to site and all other required materials (to be supplied by bidder) from supplier’s premises to work site for installation. The scope also includes return of balance WESCO supplied materials (if any) to WESCO store after completion of work.

2.0 SURVEY (detail & check, estimating of quantities & spotting of Poles)

The basic Route alignment of proposed 33 KV & 11 KV Line is enclosed. The bidder has to carry out the detailed survey.
Walk over survey, Theodolite survey, profile survey (if required) shall have to be carried out to establish the Route alignment by the contractor for new 33 KV, 11 KV lines. If the line is passing in any Municipal/ NAC areas permission from local bodies has to be obtained prior to execution of work. Suitable distance from the side of the road has to be made towards placement of line poles.

2.1 CHECK SURVEY
The contractor shall undertake the check survey during execution on the basis of the alignment profile drawing and tower schedule approved by the employer. If during check survey necessity arises for minor change in route to eliminate way leave or other unavoidable constraints, the contractor may change the said alignment after obtaining prior approval from the employer.

2.2 GENERAL: Preliminary route alignment in respect of the proposed 33KV &11KV transmission lines has been fixed by the employer subject to alteration of places due to way leave or other unavoidable constraints. The Right of way shall be solved by the contractor and all expenses there of shall be borne by him. However WESCO shall render all helps in co-ordination with law and order department for solving the same. Involvement of Forest land should be restricted as far as possible.

2.3 CLEARANCES
For the purpose of computing the vertical clearance of an over-head line, the maximum sag of any conductor shall be calculated on the basis of the maximum sag in still air and at the maximum temperature, as per REC specifications. Similarly, for the purpose of computing any horizontal clearance of an over-head line, the maximum deflection of any conductor shall be calculated on the basis of the wind pressure, as per REC specifications. Following clearances shall be maintained by the contractor while executing the work, in conformation to the Indian Electricity Rules 1956.

2.3.1 Clearance above Ground of the Lowest Conductor

1. No conductor of an over-head line, including service lines, erected across a street shall at any part thereof be at a height less than

   (a) For low and medium voltage lines 5.8 meters
   (b) For high voltage lines 6.1 meters

2. No conductor of an over-head line, including service lines, erected along any street shall at any part thereof be at a height less than

   (a) For low and medium voltage lines 5.5 meters
   (b) For high voltage lines 5.8 meters

3. No conductor of an over-head line including service lines, erected elsewhere than along or across any street shall be at a height less than.

   (a) For low, medium and high voltage lines up to And including 11,000 volts, if bare 4.6 meters
   (b) For low, medium and high voltage lines 4.0 meters
Up to and including 11,000 volts, if insulated

(c) For high voltage lines above 11,000 volts 5.2 meters

4. For extra-high voltage lines the clearance above ground shall not be less than 5.2 meters plus 0.3 meter for every 33,000 volts or part thereof by which the voltage of the line exceeds 33,000 volts: Provided that the minimum clearance along or across any street shall not be less than 6.1 meters.

2.3.2 Clearance from Buildings of Low and Medium Voltage Lines and Service Lines

Where a low or medium voltage over-head line passes above or adjacent to or terminates on any building, the following minimum clearances from any accessible point, on the basis of maximum sag, shall be observed:-

a. For any flat roof, open balcony, verandah roof and lean-to-roof

   (i) When the line passes above the building a vertical clearance of 2.5 meters from the highest point; and

   (ii) When the line passes adjacent to the building a horizontal clearance of 1.2 meters from the nearest point, and

The horizontal clearance shall be measured when the line is at a maximum deflection from the vertical due to wind pressure.

2.3.3 Clearance from Buildings of High and Extra-High Voltage Lines

(i) Where a high or extra-high voltage over-head line passes above or adjacent to any building or part of building it shall have on the basis of maximum sag a vertical clearance above the highest part of a building immediately under such line, of not less than

   (a) For High Voltage Lines up to and including 33,000 volts 3.7 meters

(ii) The horizontal clearance between the nearest conductor and any part of such building shall, on the basis of maximum deflection due to wind pressure, be not less than:-

   (a) For high voltage lines up to and including 11,000 volts 1.2 meters

   (b) For high voltage lines above 11,000 volts and up to and including 33,000 volts 2.0 meters

2.3.4 Provisional quantities/numbers of different types of Joist poles / PSC poles have been estimated and indicated in the BOQ Schedule given. However final quantities for work shall be as determined by the successful bidder, on completion of the detail survey, preparation of route profile drawing and designing of the different types of structures/Joist poles/PSC poles as elaborated in the specification and scope of work.
2.3.5 The contractor shall undertake detailed survey on the basis of the tentative alignment fixed by the employer. The said preliminary alignment may, however, change in the interest of economy to avoid forest and hazards in work. While surveying the alternative route the following points shall be taken care by the contractor.

(a) The line is as near as possible to the available roads in the area.
(b) The route is straight and short as far as possible.
(c) Good farming areas, religious places, forest, civil and defense installations, aerodromes, public and private premises, ponds, tanks, lakes, gardens, and plantations are avoided as far as practicable.
(d) The line should be far away from telecommunication lines as reasonably possible. Parallelism with these lines shall be avoided as far as practicable.
(e) Crossing with permanent objects are minimum but where unavoidable preferably at right angles.
(f) Difficult and unsafe approaches are avoided.
(g) The survey shall be conducted along the approved alignment only.
(h) For river crossing/ Crossing of Nallas: Taking levels at 25 meter interval on bank of river and at 50 meter interval at bed of river so far as to show the true profile of the ground and river bed railway/road bridge, road The levels shall be taken at least 100 m. on either side of the crossing alignment. Both longitudinal and cross sectional shall be drawn preferably to a scale of 1:2000 at horizontal and 1:200 vertical.

After completing the detailed survey, the contractor shall submit the final profile and tower schedule/pole schedule (with no. of stay or struct) for final approval of the employer. To facilitate checking of the alignment, suitable reference marks shall be provided. For this purpose, concrete pillars of suitable sizes shall be planted at all angle locations and suitable wooden/iron pegs shall be driven firmly at the intermediate points. The contractor shall quote his rate covering these involved jobs.

3.00 ROUTE SURVEY

3.01 Successful bidder shall carry out detailed survey and prepare the detailed route of 33 KV, 11 KV & 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, 11 KV & LT Lines, shall be prepared and submitted by the bidder, showing the proposed pole position, ground clearance, conductor sag and various crossing i.e. railway lines, communication lines, EHT lines, rivers, road and stream crossing on the map to a scale of 1:25000. All LT lines along with pole location are to be marked on village / mouza maps / patwari maps / to a scale 1:5000.

3.02 Pole Spotting

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

<table>
<thead>
<tr>
<th>Sl No.</th>
<th>Line Class</th>
<th>Support (Height in mtrs/KG class)</th>
<th>Conductor Type</th>
<th>Nominal Conductor size in sq mm</th>
<th>Max span in mtrs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>33 KV, 3 Ph</td>
<td>PSC (9/415/10/425)</td>
<td>AAAC</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>3</td>
<td>11 KV, 3 Ph (for new line &amp; fdr bifurcation)</td>
<td>PSC (8/200/9/300)</td>
<td>AAAC</td>
<td>55</td>
<td>70</td>
</tr>
</tbody>
</table>

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

I. SP (Single Pole support) 0° – 10° deviation.
II. DP (Double Pole support) 0° – 60° deviation.
III. FP (Four Pole support) 60° – 90° deviation.

b) Road Crossing
At all major road crossings, the poles shall be fitted with strain type insulator 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 surface shall not be less than 6.1 meters.

c) Railway Crossings
At the time route survey, the railway crossings shall be finalized as per the regulation laid by the Railway Authorities. The following are the important features of the prevailing regulations (revised in 1987):

I. The crossing shall normally be at right angle to railway track.
II. Railway crossing shall be by the use of underground cable of appropriate size.

d) Power Line Crossing
Where the proposed line required to cross over another line of the same voltage or lower voltage, provision for 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 work 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 suitable re-routing as to obtain necessary sectional clearances, otherwise crossing through 11KV cables shall be proposed.

e) Telecommunication Line Crossing
I. 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.
II. When the angle of crossing has to be below 60 degree, the matter will be referred to the authority in-charge of the telecommunication system. On a request from the Contractor, the permission of the telecommunication authority may be obtained by the Purchaser. Also, in the crossing span, power line support will be as near the telecommunication line as possible, to obtain increased vertical clearance between the wires.
III. HT line shall be routed with requisite suppression with parallel telecommunication line to avoid inductance during faults.

f) 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.

g) Clearance from Ground, Building, Trees etc.
Clearance from ground, buildings, trees & telephone lines shall be provided in conformity with the Indian Electricity Rules, 1956 as amended up to date. The bidder shall select the height of the poles such that all electrical clearances are maintained. Joist / Rail poles of required approved size shall be used for all road & drain crossings, if required. In case of exceptional terrain, rail pole may be used with the approval of Purchaser.

The planting depth of the poles shall be governed by IS : 1678. However, if due to 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.

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 and 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 33KV & 2.5 for 11KV line PSC supports.
b) Wind Pressure on Pole & conductor – As per IS 802
c) In addition to wind load on cross-arms, insulator 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 33KV line & 4.6m for 11KV line for bare conductors at locations other than road crossings.
f) The live metal clearance shall be as per IS: 5613 and shall be min. 330mm for 33KV line.

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

4.00 CONSTRUCTION

The construction of over head-lines may be divided into the following parts:-

a) Pit marking, pit digging.
b) Erection of supports and concreting.
c) Providing of guys to supports.
d) Mounting cross-arms, pin and insulators,
e) Paying and stringing of the conductor.
f) Sagging and Tensioning of Conductors and pin binding.
g) Crossings.
h) Guarding.
i) Earthing.
5.00 POLES

5.01 Erection of Pole, PCC footing and compaction of soil

Pits are to be 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. Excavation cost for pits shall be included by the Contractor in the bid for following type of soils inclusive of dewatering of pits and shoring and shuttering wherever necessary.

   i. All type of soils and soil conditions including hard rock.
   ii. Hard rock.

No separate claim for dewatering during excavation, shoring and shuttering shall be entertained. For hard rock, the excavation cost per location shall remain same for all type of foundations.

Controlled blasting shall be permitted only case of hard and rocky soil. The Contractor shall be responsible for any damage or accidents arising out of the process of blasting. Blasting shall not be permitted if the area around location is inhabited. In such case, the Contractor shall have to follow other methods like drilling etc.

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 normal concrete mix at the time of the pole erection.

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

Following arrangements shall be adopted for proper erection of PCC type poles and properly compacting of the soil around the base / foot of the poles, under this package:

1. All the PSC pole 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 support. The pole shall then be kept in the vertical position with the help of 25mm (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 pole 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 PCC pole.
4. Concreting of foundation up to 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:
For all 33KV poles.

ii. At all the tapping points and dead ends 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 1KM from the last Jhama filled pole structure.

vi. Both side poles at all the crossing for road, nallah, railway crossing etc.

vii. Where rail poles, double pole and four pole structures.

5. In case the route of 33/11KV lines encounters marshy low laying area, special type of foundations shall be used. In such a case, different 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 location shall be made to the Contractor.

6.00 Earthing of Poles

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

6.02 All DP & Four pole structure & 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.

7.00 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. Prior written approval should be obtained from engineer in charge to use said type of arrangement.

8.00 PROVIDING OF GUYS/STRUT POLES TO SUPPORT

8.01 The arrangement for guys shall be as per REC construction standards for PSC poles. Strut poles/flying guys wherever required shall be installed on various pole locations as per REC construction standards. For selection ongoing locations REC guidelines & construction practises & IS :5613 shall be followed.

8.02 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 $30^\circ/45^\circ$ as the case may be.
8.03 G.I. stay wires of size 7/4mm(8 SWG) & 7/3.15mm (10SWG) with G.I turn buckle rod of 20 mm dia & 20 mm dia G.I stay rods shall be used for 33KV & 11KV line respectively.

8.04 The anchor plate shall be fixed to 300mm x 300mm galvanized MS plate of 6mm thickness. Galvanized M.S. rod of 20 mm dia with a bolt arrangement at one end and other end is given shape of 40mm dia circle to bind 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 concrete & earth & boulder fill shall be as per the drawing mentioned.

8.05 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.

8.06 If the guy wire proved to be hazardous, it should be protected with suitable asbestos pipe filled with concrete of about 2m length above the ground level, painted with white and black strips so that, it may be visible at night.

9.00 Erection of stay sets
The contractor shall install the stay set complete in all respect. This includes excavation of pit in all kinds of soil with PCC in the ratio 1:2:4 as specified which shall be placed in the bottom of the pit. The rest (upper half) of the pit shall be filled with excavated soil duly compacted layer by layer. An angle between 30 to 45 degrees shall be maintained between stay wire and the pole. The stay wire shall be used with a stay insulator at a height of 5 mts. above ground level with F.I. turn buckle.

10.00 CROSS ARMS
10.01 Cross Arms for 33KV and 11KV Overhead Power Lines shall be made out of 100x50x6 mm and 75x40x6 mm Galvanized M.S. channel. Cross Arms made out of M.S. Angle shall not be used. Cross Arms shall conform to the enclosed specifications.

10.02 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 practise 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 line man should climb the pole with necessary tools. The cross-arm shall then tied to a hand line 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.

11.00 INSTALLATION OF LINE MATERIALS
11.01 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 or 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.

a) Strain insulators shall be used at terminal locations or dead end locations and where the angle of deviation of line is more than $10^\circ$. Strain insulators shall be used at major crossings.

b) 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 so that the strap can move freely in horizontal direction.

11.02 Helical Fittings

Helically formed fittings conforming to REC standard No-25 shall be used for 11KV & 33 KV lines.

11.03 Handling of Conductor and Earth wire

a) 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 or rub against the ground or objects, which could scratch or damage the strands.

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

11.04 Monitoring of Conductors during Stringing

The conductors 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.

11.05 Crossings

a) 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 operation 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 over head power lines. The Contractor shall be entirely responsible for the proper handling of the conductor, earth wire and accessories in the field.

b) Guarding shall be provided at all road crossings. The guarding shall consists of GI guard cross arm of length 2.5mtrs made out of 75 x 40 x 6 mm channel and shall be hot dipped galvanized generally conforming to IS:2633/72. The clamp shall also be hot dipped galvanized generally conforming to IS:2633/72. Guarding shall be erected with ground and 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 33 KV line. Binding wire & suitable I bolt & nut bolts for cross arm to cross arm. Guard wire shall be separately earthed at both ends. Protective guarding for 11KV lines crossing the roads / canals or any other lines shall be as per the enclosed drawing crossing the roads / canals or any other lines shall be as per the enclosed drawing line guarding arrangement shall be as per REC construction standard M6.

c) 11KV railway lines shall be constructed by using XLPE insulated armoured UG cable of 3Cx95sq.mm aluminum conductor. For the propose DP structure with PCC poles shall be erected at both ends of rail way crossing. The incoming DP structure shall have AB switch arrangement. The cable shall be routed through GI pipe and clamped to the pole. The bidder should include the cost of DP structure with PCC pole along with all structural material, channels, clamps, connectors, hardwire and accessories like anti climbing device, danger board, earthing arrangements, insulator, AB switch & support structure for AB switch etc. The cost of cable shall include the cable cost along with the cost of termination kits.

11.06 Anti-climbing Devices

Anti Climbing Devices shall be provided with G.I. Barbed Wire, they shall be provided and installed by the Contractors for all poles. The barbed wire shall conform to IS: 278 (Grade A1). The barbed wire shall be given chromating dip as per procedure laid down in IS:1340. A typical drawing for anti Climbing Device is attached in drawing.

12.0 PHASE PLATE

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

12.1 NUMBER PLATE

The number plate shall be mild steel vitreous enameled at back and front, 200 mm x 150 mm, 2 mm thick, rectangular shape and inscribed thereon shall be the number of the tower location preceded by letter corresponding to the short name of the line and the type of towers. There shall be two fixing bolts on both end of the plates. The dimension and details of the number plate shall be as per IS: 5613 (Part-II/Section1 & Section-2), 1985.
12.2 DANGER PLATE

These shall be of mild steel vitreous enameled at back and front 250 x 200 mm, 2mm thick, rectangular shape and inscribed thereon shall be in signal red the work 'DANGER' with its Odia and Hindi translation and also with the inscription of Bone and Scull and voltage of the line. There shall be two holes on the plates for fixing. This shall conform to IS: 2551 (latest edition). The fixing of the plate should be above 3 (three) meters from ground level.

12.3 Painting Materials

All the metal parts except G.I. parts are to be painted with one coat of red oxide and one coat of aluminum paint to the satisfaction of the Engineer-in-charge.

13.00 STRINGING OF CONDUCTORS

a) The works include spreading of conductors or HT/LT cables without any damage and stringing with proper tension without any kinks/damage including binding of conductors 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.

b) While transporting conductor drums to site, precaution is to be taken so that the conductor does not get damaged. The drum shall be mounted on cable rum 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 aluminium snatch block (pulley) mounted on the poles for this propose.

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

d) Conductor splices shall not crack or otherwise be susceptible to damage in the stringing operation. The conductor shall use only such equipments/method 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 recommendation 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.

e) All the joints of 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 fitting shall be of the self centring
type. After compressing the joint, the aluminium sleeve shall have all corner rounded; burs and sharp edges removed and smoothened.

f) 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 shall the joints along with protection can be passed over it smoothly.

13.01 Permitted Extra Consumption of Contractor Supplied Material
The quantity of conductor, insulator, earth-wire, hardware fittings, conductor & earth-wire accessories indicated in BPS are tentative and actual quantity will depend upon final survey (check survey). Payment for contractor supplied line materials shall be made for the quantities incorporated in the works plus permitted extra quantities as mentioned below
Contractor shall make every effort to minimize the breakage, losses and wastage of the line material during erection. However the Contractor shall permitted the extra consumption up to the limit as specified in the table below and shall be permitted to dispose of the scrap, if any, at their end. Note:

<table>
<thead>
<tr>
<th>Sl no.</th>
<th>Item</th>
<th>% of Permitted Extra Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Conductor</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>HT &amp; LT Cable</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Cable (control)</td>
<td>1</td>
</tr>
</tbody>
</table>

In case of conductor the permitted extra consumption limit of 1% is inclusive of sag, jumpering, damages, losses & wastages.
The Contractor shall not required to return to the Purchaser empty conductor/earth-wire left over drums and shall dispose of the same at his cost.

13.02 Tensioning and Sagging operations

a) The tensioning and sagging shall be done in accordance with the approved stringing charts or sag tables. The “initial” stringing chart shall be used for the conductor and the “final” chart for the earth-wire. The Conductors shall be pulled up to the desired sag left in running blocks for at least one hour after which the sag shall be rechecked and adjusted, if necessary before transferring the conductors from the running blocks to the suspension clamps. The conductor shall be clamped within 36 hour of sagging in.

b) The sag will be checked in the first and in the last section span for sections up to eight spans and in one additional intermediate span for sections with more than eight spans. The sag shall also be checked when the conductors have been drawn up and transferred from running blocks to the insulator clamps.
c) At sharp vertical angles, conductor and earth-wire sags and tension shall be checked for quality of both sides of the angle and running block. The suspension insulator assemblies will normally assume vertically when the conductor is clamped. Tensioning and sagging operations shall be carried out in calm weather when rapid changes in temperature are not likely to occur.

13.03 Clipping in

Clipping of the conductors into position shall be done in accordance with the manufacturer’s recommendations. Jumpers at section and angle towers shall be formed to parabolic shape to ensure maximum clearance requirements. Fasteners in all fittings and accessories shall be secured in position. The security clip shall be properly opened and sprung into position.

13.04 Fixing of Conductors Accessories

Conductor accessories supplied by the Contractor shall be installed by Contractor as per the design requirements and manufacturer’s instruction within 24 hours of the conductor clamping. While installing the conductor accessories, proper care shall be taken to ensure that the surface are clean and smooth and no damage occurs to any part of the conductors.

13.05 Replacement

If any replacements are to be effected after stringing and tensioning or during maintenance e.g. replacement of cross arms, the conductor shall be suitably tied to the pole at tension points or transferred to suitable roller pulleys at suspension points.

14.00 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 tapping 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.

Whenever 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.

15.00. Earthing

Earthing shall generally be carried out in accordance with the requirements of Indian Electricity Rules, 1956 and the relevant regulations of the Electricity Supply Authority concerned and as indicated below:

(a) All metallic supports shall be earthed.
(b) For PSC poles the metal cross-arms and insulator pins shall be bonded and earthed at every pole for HT lines.
(c) All special structures on which switches, transformers, fuses, etc., are mounted / likely to mount should be earthed.
(d) The supports on either side of the road, railway or river crossing should be earthed.
(e) All supports (Steel & PSC) HT lines passing through inhabited areas, road crossings and along such other places, where Earthing of all poles is considered desirable from safety considerations should be earthed.

16.00 In special locations and special structures, road crossings etc., pipe Earthing should be done on either side of the construction

At other locations the coil earthing may be adopted. The coil earthing shall be as per approved specification of Purchaser and buried 1500 mm deep as per REC standard J-1.

Following shall be the earthing requirements

<table>
<thead>
<tr>
<th>SI No</th>
<th>Description</th>
<th>Type of Earthing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Single Pole</td>
<td>1 No. Coil Earthing at each SP</td>
</tr>
<tr>
<td>2</td>
<td>Double Pole</td>
<td>1 Nos. Coil Earthing at each DP</td>
</tr>
<tr>
<td>3</td>
<td>Road Crossing</td>
<td>Pipe earthing on either side one each</td>
</tr>
<tr>
<td>4</td>
<td>Telephone Line Crossing</td>
<td>Pipe earthing on either side one each</td>
</tr>
<tr>
<td>5</td>
<td>DP with Isolating Switch /cable &amp; LA</td>
<td>Coil earthing 2 Nos. and GI Pipe earthing 1 No</td>
</tr>
</tbody>
</table>

17.00 Reference Standards

The codes and/or standards referred to in the specifications shall govern, in all cases wherever such references are made. In case of a conflict between such codes and/or standards and the specifications, latter shall govern. Such codes and/or standards, referred to shall mean the latest revisions, amendments/changes adopted and published by the relevant agencies unless otherwise indicated. Other internationally accepted standards which ensure equal or better performance than those specified shall also be accepted, subject to prior approval by the Purchaser. In case no reference is given for any item in these specifications, latest REC specification & Construction Standards shall be referred to.

18.00 HT/LT/Road Crossing Guarding

The contractor shall provide & install protective guarding as per REC construction standard for both 33 and 11 kV line. The guarding shall be provided at all the crossing i.e. road, telecommunication & power lines, railway line, nallah etc.

The contractor is required to follow local statutory regulations stipulated in Electricity (Supply) Act 1948, Indian Electricity Rules 1956 as amended and other local rules and regulations referred in these specifications.
19.00  FINAL CHECKING, TESTING AND COMMISSIONING

19.01  After completion of the works, final checking of the line shall be carried out by the Contractor to ensure that all foundation works, pole erection and stringing have been done strictly according to the specifications and as approved by the Purchaser. All the work shall be thoroughly inspected in order to ensure that:

i. Sufficient backfilled earth covers each foundation pit and is adequately compacted.

ii. All poles are used strictly according to final approved drawing and are free of any defect or damage whatsoever.

iii. The stringing of the conductors has been done as per the desired clearances.

iv. All conductor accessories are properly installed.

v. All other requirements for completion of works such as fixing of danger plate and anti-climbing device have been fulfilled.

vi. The insulation of the line as a whole is tested by the Contractor through provision of his own equipment, labour, etc., to the satisfaction of the Purchaser.

vii. All poles are properly grounded.

viii. The line is tested satisfactorily for commissioning purpose.
TECHNICAL SPECIFICATIONS OF

VENDOR SUPPLY ITEMS
GENERAL:

1.0 Technical specification

The detailed technical specifications for the equipments/materials have been enclosed in these sections. The specification given in these sections cover the design, manufacture, assembly, shop testing/inspection before dispatch, packing, forwarding, transportation to site, insurance (during transit, storage and erection), storage, erection, supervision, site testing and commissioning.

In case technical specification of any equipment/materials has not given in these sections, relevant IS or any recognized international standard shall be followed for such equipments/materials. In case construction/installation procedure is not specified relevant REC construction standard shall be followed.

2.0 INSPECTION

2.1 Regarding Bidder supplied materials the supplier shall keep the employer informed well in advance of the commencement of manufacture, progress of manufacture of various materials at various stages. So that arrangements could be made for inspection by the employer.

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

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

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

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

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

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

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

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

Cost of transportation of all materials from contractor’s store to the site of work as well as department supply items like Conductors, etc shall be borne by the contractor irrespective of mode of transportation and site condition.

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

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

Approval of Sub Vendor / Manufacturer:-

The prospective bidder may source materials from manufacturers who should have supplied at least the quantities as mentioned against each items to Electricity Supply Utilities / PSUs. The bidder should enclose Performance Certificates from the above users, issued in favour of the Sub Vendor / manufacturer, as proof of successful operation in field.

For approval of sub vendors/manufacturers, following documents to be submitted by the contractor to DGM (Tech.), CSO for each item separately within 15 days from the issue of LOA for approval.

   a) Credential of manufacturer.
   b) Type test of the similar item from any NABL Accredited Laboratory within the last 5 years, prior to the date of submission of the bid.
   c) The bidder should enclose Performance Certificates from the users issued in the name of the manufacturer as proof of successful operation in field.
   d) Detail drawings along with GTP of the material in 3 sets.
   e) Samples of materials (if asked)
   f) Quality Assurance Plan of the manufacturer.
   g) List of manufacturing equipments & testing equipment
(A) PSC Pole (9 Mtr x 415 Kg, 9 Mtr x 300 Kg, 10mtr x 425Kg & 8 Mtr x 200 Kg)

TECHNICAL SPECIFICATIONS

1. Qualification Criteria of Sub Vendor / Manufacturer:-

The prospective bidder may source PSC Poles from manufacturers who should have supplied at least the following quantity of PSC Poles to Electricity Supply Utilities / PSUs. The bidder should enclose Performance Certificates from the above users, issued in favour of the Sub Vendor / manufacturer, as proof of successful operation in field.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Size</th>
<th>Minimum Past Supply Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8 Mtr. X 200 Kg</td>
<td>1000</td>
</tr>
<tr>
<td>2</td>
<td>9 Mtr. X 300 Kg</td>
<td>1000</td>
</tr>
<tr>
<td>3</td>
<td>9 Mtr. X 415 Kg</td>
<td>200</td>
</tr>
<tr>
<td>4</td>
<td>10 Mtr. X 425 Kg</td>
<td>200</td>
</tr>
<tr>
<td>5</td>
<td>11 Mtr X 330 Kg</td>
<td>200</td>
</tr>
</tbody>
</table>

Applicable Standard:

The Poles shall comply with latest standards as under:

2. Materials:

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

2.2 Aggregates
Aggregates to be 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 sizes of aggregates shall in no case exceed 12 mm.

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

2.4 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.

2.5 Pres-Stressing Steel
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 design given in the annexure are for plain wires of 4 mm diameter with a guaranteed ultimate strength of 160 kg/mm². All pre-stressing steel shall be free from splits, harmful scratches, surface flaw, rough, aged and imperfect edges and other defects likely to impair its use in pre-stressed concrete.

2.6 Concrete Mix
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 pre-stressed concrete) and IS: 456 – 1978 (Code of practice for plain and reinforced concrete) subject to the following special conditions:
Minimum works cube strength at 28 days should be at least 420 Kg/cm².
The concrete strength at transfer should be at least 210 Kg/cm².
The mix should contain at least 380 Kg of cement per cubic meter of concrete.
The mix should contain as low water content as is consistent with adequate workability. 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.

3 Design Requirements
The poles shall be designed for the following requirements:

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 Purchaser. The bidder shall furnish necessary design calculations/details of alternative arrangements in this regard.

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

The factor of safety for all poles 9.0Mts. Shall not be less than 2.0 and for 8.0 M poles, the factor of safety shall not be less than 2.5.
The average permanent load shall be 40% of the working load.
The F.O.S. against first load shall be 1.0.
At average permanent load, permissible tensile stress in concrete shall be 30 kg/cm².
At the design value of first crack load, the modulus of rupture shall not exceed 53.0kg/cm² for M-40.
The ultimate moment capacity in the longitudinal direction should be at least one fourth of that in the transverse direction.
The maximum compressive stress in concrete at the time of transfer of pre-stress should not exceed 0.8 times the cube strength.
The concrete strength at transfer shall not be less than half, the 28 days strength ensured in the design, i.e. 420×0.5=210kg/cm². For model check calculations on the design of poles, referred to in the
annexure, a reference may be made to the REC "Manual on Manufacturing of solid PCC poles, Part-I-
Design Aspects".

4 **Dimensions and Reinforcements**
The cross-sectional dimensions and the details of pre-stressing wires should conform to the particulars
given in the enclosed drawing. The provisions of holes for fixing cross-arms and other fixtures should
conform to the REC specification No.15/1979.

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

All wires shall be accurately stretched with uniform pre-stressed in each wire. Each wire or 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.

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

6 **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, joining or coupling may be permitted provided the strength of the joint or
coupling is not less than the strength of each individual wire.

7 **Compacting**
Concrete shall be compacted by spinning, vibrating, shocking or other suitable mechanical means.
Hand compacting shall not be permitted.

8 **Curing**
The concrete shall be covered with a layer of sacking, canvass, Hessian or similar absorbent material
and kept constantly wet 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/cm² as applicable). The
cubes cast for the purpose of determining the strength at transfer should be coursed, a sear as
possible, under condition 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 manufacture shall supply, when required by the Purchaser or
his representative, result of compressive test conducted in accordance with IS: 456 (Code of practice
for plain and reinforced concrete) on concrete cubes made from the concrete used for the poles. If the
manufacture so desired, the manufacture shall supply cubes for test purpose and such cubes shall be tested in accordance with IS: 456 (Code of practice for plain and reinforced concrete).

9 Lifting Eye-Hooks or Holes
Separate eye-hooks or hoes 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 purpose, should be perpendicular to the broad face of the pole.

10 Holes for Cross Arms etc
Sufficient number of holes shall be provided in the poles for attachment of cross arms and other equipments.

11 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 times the overall length, measured from the end. The timber supported in the stack should be aligned in vertical line.

12 Earthing

(a) Earthing shall be provided by having length of 6 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 250 mm from top and 1000 mm below ground level.

(b) Earth wire shall not be allowed to come in contract with the pre-stressing w
### GUARANTEED TECHNICAL PARTICULARS
(To be submitted along with offer)

<table>
<thead>
<tr>
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<td>B</td>
<td>Weight</td>
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</table>

13. All the poles shall be provided with a RCC block base or MS base plate having dimensions as mentioned at 5.0.2 as per the site requirement to be decided by Engineer in Charge. The decision of Engineer in Charge will be Final.
14. 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 pit for foundation concreting & backfilling with proper compacting the soil. The backfilling should be done in layers (maxm. 0.5 mts at a time with sprinkling of water and by using wooden hammer. No stone more than 75 mm should be used during back filling.

15. Suspension type H/W fittings in all tangent locations and Four pair bolted type tension H/W fittings should be used in all new 33&11 Kv lines.45 KN & 70 KN normal B&S insulators will be used in suspension & tension locations respectively.

16. Concreting of foundation up to a minimum 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: The depth has to be increased to 2mtr or as required at site condition if poles more than 11 Mts. are to be used.

i) At all the tapping points and dead end poles.

ii) At all the points as per REC construction dwg. No. A-10 (for the diversion angle of 10-60 degree) or better there of as per the instruction of Engineer in charge. The decision of Engineer in charge will be final.

iii) Both side poles at all the crossing for road, Nallah railway crossings etc.

iv) Where Rail poles, Joist poles, double pole and four pole structures are to be erected.

17. Earthing of Support

17.1 Each pole shall be earthed with coil type earthing as per REC Construction Standard J-1.

17.2 All DP & Four pole structures & the poles on both sides of railway crossing shall be earthed by providing two nos. pipe earthing as per Drawing provided by WESCO.

17.3 Each tower/structures should be earthed by providing 2.5 mts.50x6 GI flat and 40 x 3000 mm heavy gauge ISI mark earthing pipe. The top of the earthing pipe should remain 600 mm below ground level. All railway X-ing locations two nos. earthing should be provided. In case the required footing resistance is not achieved on measurement, counterpoise earthing has to be provided as per the standard.
(B) EARHTING COIL

TECHNICAL SPECIFICATION

1. Qualification Criteria of Manufacturer:-

The prospective bidder may source Earthing Coil from manufacturers who must qualify all the following requirements:

a) The manufacturer must have successfully carried out Type Test of similar item from any NABL Accredited Laboratory within the last 5 years, prior to the date of submission of the bid.

b) The manufacturer should have supplied at least 1000 no.s to electricity supply utilities / PSUs. The bidder should enclose Performance Certificates from the above users issued in the name of the manufacturer as proof of successful operation in field.

2. SCOPE

The specification covers design, manufacture, testing and dispatch to the Purchaser’s stores of Earthing Coils for use in earthing of the HT & LT poles.

3. GENERAL REQUIREMENTS

Earthing coils shall be fabricated from soft GI Wire Hot Dip Galvanized. The Hot Dip galvanized wire shall have clean surface and shall be free from paint enamel or any other poor conducting material. The coil shall be made as per REC constructions standard. The Hot Dip galvanizing shall conform to IS: 2629/1966, 2633/1972 and 4826/1969 with latest amendments.

4. TESTS

4.1 Galvanizing Tests

Minimum Mass of Zinc

On GI Wire used 280 cm/m²

After Coiling-266 gm/m². The certificate from recognized laboratory shall be submitted towards mass of zinc.

4.2 Dip Test

Dip test shall stand 3 dips of 1 minute and one dip of ½ minute before coiling and 4 dips of 1 minute after coiling as per IS: 4826/1979

4.3 Adhesion Test

As per ISS 4826 – 1979.
### DIMENSIONAL REQUIREMENT

Nominal dia of GI Wire - 4 mm (Tolerance ±2.5%)
Minimum no. of turns – 115 Nos.
External dia of Coil (Min) – 50 mm
Length of Coil (Min) – 460 mm
Free length of GI Wire at one end coil (Min.) – 2500 mm
The turns should be closely bound. Weight of one finished Earthing Coils (min.) – 1.850 Kg.

---

### EARHTING COIL

**GUARANTEED TECHNICAL PARTICULARS**

(To be submitted along with Offer)

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>GENERAL TECHNICAL PARTICULARS</th>
<th>Bidder’s Offer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<td>No. of turns</td>
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<td>External dia of Coil</td>
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<td>4</td>
<td>Length of Coil</td>
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<tr>
<td>5</td>
<td>Mass of Zinc</td>
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</tr>
<tr>
<td>6</td>
<td>Total weight of Coil</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Whether drawing enclosed (yes)</td>
<td></td>
</tr>
</tbody>
</table>
1. **Qualification Criteria of Manufacturer:**

   The prospective bidder may source Stay Sets from manufacturers only must qualify all the following requirements:

   a) Manufacturer must have successfully carried out Type Test of similar item from any NABL Accredited Laboratory within the last 5 years, prior to the date of submission of the bid.

   b) The manufacturer should have supplied at least 1000 sets (both HT & LT taken together) to electricity supply utilities / PSUs. The bidder should enclose Performance Certificates from the above users issued in the name of the manufacturer as proof of successful operation in field.

2. **SCOPE**

   This specification covers design, manufacture, testing and dispatch of LT Stay Sets of 16 mm and HT stay sets 20 mm dia.

3. **GENERAL REQUIREMENTS**

   3.1 **16 MM Dia Stay sets (Galvanized) – LT Stay Set**

   This stay sets (Line Guy set) will consist of the following components:

   3.2 **Anchor Rod with one washer and Nut**

   Overall length of rod should be 1800 mm to be made out of 16 mm dia GI Rod, one end threaded up to 40 mm length with a pitch of 5 threads per cm and provided with one square GI washer of size 40X40x1.6mm and one GI hexagonal nut conforming to IS:1367:1967 & IS:1363:1967. Both washer and nut to suit threaded rod of 16 mm dia. The other end of the rod to be made into a round eye having an inner dia of 40mm with best quality welding.

   3.3 **Anchor Plate Size 200 x 200 x6 mm**

   To be made out of GI plate of 6 mm thickness. The anchor plate should have at its centre 18 mm dia hole.

   3.4 **Turn Buckle & Eye Bolt with 2 Nuts**

   To be made of 16 mm dia GI Rod having an overall length of 450mm, one end of the rod to be threaded up to 300 mm length with a pitch of 5 threads per cm and provided with two GI Hexagonal nuts of suitable size conforming toIS:1363:1967 & IS:1367:1967. The other end of rod shall be rounded into a circular eye of 40mm inner dia with proper and good quality welding.
3.5 **Bow with Welded Angle**

The other end shall be welded with proper and good quality welding to a GI angle 180 mm long having a dimension of 50x50x6mm. The angle shall have 3 holes of 18 mm dia each.

3.6 **Thimble**

To be made on 1.5 mm thick GI sheet into a size of 75x22x40mm and shape as per standard shall be supplied.

Average Weight of Finished 16mm Stay Sets shall be at least 7.702 KG (Minimum)

(Excluding Nuts Thimbles and Washer) 8.445 Kg. (Maximum)

3.7 **20 mm Dia Stays Sets for 33 Kv, 11 KV Lines (Galvanized) HT Stay Set**

The Stay Set (Line Guy Set) will consist of the following components:

3.8 **Anchor Rod with one Washer and Nut**

Overall length of Rod should be 1800mm to be made out of 20 mm dia GI rod oneend threaded up to 40 mm length with a pitch of threads per cm. And provided with one square G.I Washer of Size 50x50x1.6mm and one G.IHexagonal nut conforming to IS: 1363:1967 & IS:1367:1967. Both washer and nut to suit the threaded rod of 20mm. The other end of the rod to be made into a round eye having an inner dia of 40mm with best quality of welding. Dimensional and other details are indicated and submitted by bidders for Purchaser’s approval before start of manufacturing.

3.9 **Anchor Plate Size 300 x 300 x 8 mm**

To be made out of G.S. Plate of 8 mm thickness. The anchor plate to have at its centre 22mm dia hole.

3.10 **Turn Buckle, Eye Bolt with 2 Nuts.**

To be made of 20 mm dia G.I Rod having an overall length of 450 mm. One end of the rod to be threaded up to 300 mm length with a pitch of 4 threads per cm. The 20 mm dia bolt so made shall be provided with two G.I Hexagonal nuts of suitable size conforming to IS: 1363:1967 & IS: 1367:1967. The other end of the rod shall be rounded into a circular eye of 40mm inner dia with proper and good quality of welding. Welding details are to be indicated by the bidder separately for approval.

3.11 **Bow with Welded Channel:**

To be made out of 16mm dia G.I Rod. The finished bow shall have and overall length of 995 mm ad height of 450 mm. The apex or top of the bow shall be bent at an angle of 10R. he other end shall be welded with proper and good quality welding to a G.I Channel 200 mm long having a dimension of 100x50x4.7 mm. The Channel shall have 2 holes of 18 mm dia and 22 dia hole at its centre as per drawing No.3 enclosed herewith.

3.12 **Thimble 2 Nos.**

To be made of 1.5 mm thick G.Isheet into a size of 75x22x40mm and shape as per standard.
3.13 **Galvanizing**

The complete assembly shall be hot dip galvanized.

3.14 **Welding**

The minimum strength of welding provided on various components of 16mm and 20 mm dia stay sets shall be 3100 kg & 4900 kg respectively. Minimum 6mm filet weld or its equivalent weld area should be deposited in all positions of the job i.e. at any point of the weld length. The welding shall be conforming to relevant IS:823/1964 or its latest amendment.

3.15 **Threading**

The threads on the Anchor Rods, Eye Bolts and Nuts shall be as per specification IS: 4218:1967 (ISO Metric Screw Threads). The Nuts shall be conforming to the requirements of IS: 1367:1967 and have dimension as per IS 1363:1967. The mechanical property requirement of fasteners shall confirm to the properly clause 4.6 each for anchor rods and Eye bolt and property clause 4 for nuts as per IS: 1367:1967.

Average weight of finished 20 mm Stays Set: 14.523 Kg.(Min) (Excluding Nuts Thimble & Washer) :15.569 Kg.(Max.)

4. **TESTS**

The contractor shall be required to conduct testing of materials at Govt./Recognized testing laboratory during pre-dispatch inspection for Tensile Load of 3100 Kg/4900Kg. applied for one minute on the welding and maintained for one minute for 16 mm and 20mm dia stay sets respectively.

5. **IDENTIFICATION MARK**

All stay sets should carry the identification mark of the Purchaser (WESCO). This should be engraved on the body of stay rods to ensure proper identification of the materials. The nuts should be of a size compatible with threaded portion of rods and there should be not play or slippage of nuts. Welding wherever required should be perfect and should not give way after erection.

6. **TOLERANCES**

The tolerances for various components of the stay sets are indicated below subject to the condition that the average weight of finished stay sets of 16mm dia excluding nuts, thimbles and washers shall not be less than the weight specified above:-
# Guaranteed Technical Particulars

(To be submitted along with Offer)

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<thead>
<tr>
<th>Sl No.</th>
<th>Item Description</th>
<th>Specified Parameters</th>
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<td>Section Tolerances</td>
<td>HT Stay Set</td>
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<td>Galvanisation thickness</td>
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<tr>
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<td>Eye Bolt Rod</td>
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<tr>
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<td>Weight of complete set</td>
<td>LT Stay Set HT Stay Set</td>
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<tr>
<td>7</td>
<td>Whether drawing submitted</td>
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</tbody>
</table>

(D) STAY WIRE (7/8SWG) / (7/10 SWG) & (7/12 SWG)

TECHNICAL SPECIFICATIONS

1. **Qualification Criteria of Manufacturer:**

   The prospective bidder may source Stay Wire from manufacturers only who must qualify all the following requirements:

   a) The manufacturer must have successfully carried out Type Test of similar item from any NABL Accredited Laboratory within the last 5 years, prior to the date of submission of the bid.

   b) The manufacturer should have supplied at least 1000 Kg (all sizes taken together) to electricity supply utilities / PSUs. The bidder should enclose Performance Certificates from the above users issued in the name of the manufacturer as proof of successful operation in field.

2. **Application Standards**

   Except when they conflict with the specific requirements of this specification, the G.I Stay Stranded Wires shall comply with the specific requirements of IS: 2141-1979. IS: 4826-1979 & IS: 6594-1974 or the latest versions thereof.

3. **Application and Sizes**

   The G.I. stranded wires covered in this Specification are intended for use on the overhead power line poles, distribution transformer structures etc.

   The G.I stranded wires shall be of 7/8SWG 7/4 mm for 33 kv lines, 7/10SWG (7/3.15 mm for 11KV lines and 7/12 SWG 7/2.5 mm for LT lines standard sizes.
4. **Materials**

The wires shall be drawn from steel made by the open hearth basic oxygen or electric furnace process and of such quality that when drawn to the size of wire specified and coated with zinc, the finished strand and the individual wires shall be of uniform quality and have the properties and characteristics as specified in this specification. The wires shall not contain sulphur and phosphorus exceeding 0.060% each.

5. **Tensile Grade**

The wires shall be of tensile grade 4, having minimum tensile strength of 700 N/mm² conforming to IS:2141.

5.1 **General Requirements**

The outer wire of strands shall have a right-hand lay.

The lay length of wire strands shall be 12 to 18 times the strand diameter.

5.2 **Minimum Breaking Load**

The minimum breaking load of the wires before and after stranding shall be as follows:

<table>
<thead>
<tr>
<th>No. of Wires &amp; Const.</th>
<th>Wire Dia (mm)</th>
<th>Min. breaking load of the Single wire before stranding (KN)</th>
<th>Min. breaking load of the standard wire (KN)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 (6/1)</td>
<td>2.5</td>
<td>3.44</td>
<td>21.40</td>
</tr>
<tr>
<td>7 (6/1)</td>
<td>3.15</td>
<td>5.46</td>
<td>34.00</td>
</tr>
<tr>
<td>7 (6/1)</td>
<td>4.0</td>
<td>8.80</td>
<td>54.9</td>
</tr>
</tbody>
</table>

6. **Construction**

The galvanized stay wire shall be of 7-wire construction. The wires shall be so stranded together that when an evenly distributed pull is applied at the ends of completed strand, each wire shall take an equal share of the pull. Joints are permitted in the individual wires during stranding but such joints shall not be less than 15 metres apart in the finished strands.

The wire shall be circular and free from scale, irregularities, imperfection, flaws, splits and other defects.

7. **Tolerances**

A tolerance of (+) 2.5% on the diameter of wires before stranding shall be permitted.

8. **Sampling Criteria**

The sampling criteria shall be in accordance with IS:2141.

9. **Tests on Wires before Manufacture**

The wires shall be subjected to the following tests in accordance with IS: 2141.

- Ductility Test
- Tolerance on Wire Diameter
9.1 **Tests on Completed Strand**

The completed strand shall be tested for the following tests in accordance with IS:2141. Tensile and Elongation Test: The percentage elongation of the stranded wire shall not be less than 6%.

Chemical analysis Galvanizing Test

The Zinc Coating shall conform to "Heavy Coating" as laid down in IS:4826

10. **Marking**

Each coil shall carry a metallic tag, securely attached to the inner part of the coil bearing the following information:

a) Manufacturers name or trade mark  
b) Lot number and coil number  
c) Size  
d) Construction  
e) Tensile Designation  
f) Lay  
g) Coating  
h) Length  
i) Mass  
j) ISI certification mark, if any

11. **Packing**

The wires shall be supplied in 75–100 Kg. coils. The packing should be done in accordance with the provisions of IS: 6594

12. **Other Items:**

For remaining items of stay sets mentioned in the enclosed drawing, relevant applicable Indian standards shall be applicable.
## GURANTEED TECHNICAL PARTICULARS

(To be submitted along with offer)

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>GENERAL TECHNICAL PARTICULARS</th>
<th>7/08 SWG</th>
<th>7/10 SWG</th>
<th>7/12 SWG</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Nominal diameter of wire</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Tolerance in diameter</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Sectional Area (In Sq. mm.)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Tensile strength</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>Min. N/mm²</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>Max. N/mm²</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Minimum breaking load (KN)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Type of coating Heavy/Medium/Light</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Variety Hard/Soft</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Weight of Zinc coating (Gms/Sq. Mtr.) Min.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>No. of dips the coating is able to withstand as 18 ± 20°C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Adhesion Test (Wrap Test at 1 turn per second coiling while stress not exceeding % nominal tensile strength)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>Min. complete turn of wrap</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>Dia of mandrel on which wrapped</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Bend Test</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>A</td>
<td>Angle</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>Dia round a format to be bent</td>
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<td></td>
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</tr>
<tr>
<td>12</td>
<td>Freedom from defect</td>
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<tr>
<td>13</td>
<td>Chemical composition the MS Wire used shall not exceed</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>Sulphur 0.060%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>Phosphorous 0.065%</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
(E) GI WIRE 6 SWG & GI WIRE 8 SWG

TECHNICAL SPECIFICATIONS

1. **Qualification Criteria of Manufacturer:**

   The prospective bidder may source GI Wire from manufacturers only who must qualify all the following requirements:

   a) The manufacturer must have successfully carried out Type Test of similar item from any NABL Accredited Laboratory within the last 5 years, prior to the date of submission of the bid.

   b) The manufacturer should have supplied at least 1000 Kgs. (all sizes taken together) to electricity supply utilities / PSUs. The bidder should enclose Performance Certificates from the above users issued in the name of the manufacturer as proof of successful operation in field.

2. **SCOPE**

   This specification covers manufacture, testing and supply of hot dip galvanized MS solid wire of sizes 6 SWG (5 MM) & 8 SWG (4 MM) diameter.

3. **APPLICABLE STANDARDS**

   3.1 **ZINC**

   Zinc shall conform to grade Zen 98 specified in IS 209& IS:4826-1979 with upto date amendments.

   3.2 **ZINC COATING**

   Zinc coating shall be in accordance with IS:4826-1979 for heavily coated hard quality.

   3.3 **GALVANISING**

   Galvanizing shall be as per IS:2629-1966, IS 4826-1979 with up to date amendments.

   3.4 **UNIFORMITY OF ZINC COATING**

   Uniformity of zinc coating shall be as per IS: 2633-1972 with up to date amendments.

   3.5 **TENSILE PROPERTIES**

   The tensile strength of the wire after galvanizing shall be between 55-95 Kg/sq.mm ensuring MS wire mechanical properties as per IS-28:1972 8.1 to 8.3.

   3.6 **FREEDOM FROM DEFECTS**

   As per IS: 2629-1966 & 4826-1979 & with up to date amendments be ensured.

4. **MATERIAL**

   The mild steel wire shall have chemical composition maximum sulphur- 0.055%, phosphorous -0.055%, Carbon 0.25%.
5. **TESTS**

During the process of manufacturer/fabrication and all tests for chemical, mechanical, galvanizing as per IS- 280-1979, IS1521-1972, IS-1755-1961, IS:6745-1972 & 4826-1979 shall be carried out. The certificate towards, chemical composition shall be submitted for each lot offered for inspection.

The following tests shall be conducted in presence of the representative of the purchaser:
- Visual physical inspection and measurement of specified dimension
- Tensile strength and breaking load and elongation determined as per IS: 1521-1972 with up to date amendments

6. **PACKING & MARKING**

Packing shall be as per IS: 280-1979 and each coil shall be between 50-100 kg. marking shall be as per IS: 280-1972.

**GUARANTEED TECHNICAL PARTICULARS**
(To be submitted along with offer)

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>GENERAL TECHNICAL PARTICULARS</th>
<th>6 SWG</th>
<th>8 SWG</th>
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</thead>
<tbody>
<tr>
<td>1</td>
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<td>2</td>
<td>Tolerance in diameter</td>
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<tr>
<td>3</td>
<td>Sectional Area (In Sq. mm.)</td>
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<td>4</td>
<td>Tensile strength</td>
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<tr>
<td>A</td>
<td>Min. N/mm²</td>
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<tr>
<td>B</td>
<td>Max. N/mm²</td>
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<td></td>
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<td>Type of coating Heavy/Medium/Light</td>
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<td>7</td>
<td>Variety Hard/Soft</td>
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<td>8</td>
<td>Weight of Zinc coating (Gms/Sq. Mtr.) Min.</td>
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<td>9</td>
<td>No. of dips the coating is able to withstand as 18 ± 20°C</td>
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<td>10</td>
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<td>Bend Test</td>
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<tr>
<td>A</td>
<td>Angle</td>
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<tr>
<td>B</td>
<td>Dia round a format to be bent</td>
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<td>Freedom from defect</td>
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<td>13</td>
<td>Chemical composition the MS Wire used shall not exceed</td>
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<td></td>
</tr>
<tr>
<td>A</td>
<td>Sulphur 0.060%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>Phosphorous 0.065%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
(F) EYE BOLT FOR GUARDING

TECHNICAL SPECIFICATIONS

1. GENERAL REQUIREMENTS:

M20 eye bolts (120 mm long) shall preferably be of drop forged manufacture and shall be supplied complete with full thread and two full nuts.

Eye bolt 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 manufacture, each eye bolt shall be individually proof tested by the manufacture in accordance with ISO 272, 885, 888, 4759/1 to 125% of its safe working tensile load that is to 48kN. 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 3mm 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 load of M20 eye bolts and eye nuts.
1. **SCOPE:**

Scope covers manufacture, testing and supply of 3.53 mm dia Aluminum Binding Wire as per IS 398.

2. **MATERIALS:**

The material comprising the wire shall have the following chemical composition:

Aluminum 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 sections shall closely approximate that of true circle.

3. **Characteristics of Aluminum Binding wire**

<table>
<thead>
<tr>
<th>Diameter of wire</th>
<th>Cross sectional area of nominal dia. Wires (mm)</th>
<th>Weight of wire kg/km</th>
<th>Breaking Load (kN)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum</td>
<td>Nominal</td>
<td>Maximum</td>
<td></td>
</tr>
<tr>
<td>3.15</td>
<td>3.53</td>
<td>3.55</td>
<td>9.787</td>
</tr>
</tbody>
</table>

4. **Inspection and Tests**

The following routine checks and tests shall be carried out on 10% of the coils of aluminum 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 unless with the written approval of, and under conditions determined by the Purchaser.

4.1 **Physical properties**

The surface of the finished wires 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 true circle.

The wire shall be checked to ensure that its diameter and weight are within the values given in the table above characteristic of a aluminum binding wire.

4.2 **Ultimate tensile strength**

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

4.3 **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 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.

4.4 Packing & Delivery

The aluminium binding wire shall be delivered in 30m 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.

The coils shall be contained in non returnable wooden cases, with a gross weight not in excess of 300 kg. The number of coils contained shall be marked on the outside of each case.

GUARANTEED TECHNICAL PARTICULARS

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Description</th>
<th>Bidder’s Offer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Manufacturer Address</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Indian Standard No. IS 398 (Part-4) 1994</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Material of Binding Wire</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Dia. Of Wire</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Maximum D.C. resistance at 20 degree centigrade</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Individual Aluminium Alloy Strands</td>
<td></td>
</tr>
<tr>
<td>a)</td>
<td>Tensile breaking stress</td>
<td></td>
</tr>
<tr>
<td>b)</td>
<td>Elongation on 200 mm length in breaking</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Particulars of Raw Materials</td>
<td></td>
</tr>
<tr>
<td>7.1</td>
<td>Aluminium</td>
<td></td>
</tr>
<tr>
<td>a)</td>
<td>Minimum Purity of aluminium</td>
<td></td>
</tr>
<tr>
<td>7.2</td>
<td>Aluminium Alloy</td>
<td></td>
</tr>
<tr>
<td>a)</td>
<td>Aluminium redraw rod conforming to Elements</td>
<td></td>
</tr>
<tr>
<td>(a)</td>
<td>Si</td>
<td></td>
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<tr>
<td>(b)</td>
<td>Cu</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(c) Other Element (If any)</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Linear mass of Wire</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Modulus of Elasticity</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Coefficient of Linear Expansion (per deg. Cent.)</td>
<td></td>
</tr>
</tbody>
</table>
(H) 33 KV, 11 KV “V” CROSS ARM, BACK CLAMP FOR “V”

CROSS ARM & POLE TOP BRACKET (F CLAMP)

TECHNICAL SPECIFICATIONS

1. **Qualification Criteria of Manufacturer:**

   The prospective bidder may source the above items from manufacturers who must qualify the following requirements:

   The manufacturer should have supplied at least 1000 no.s (of each item) to electricity supply utilities / PSUs.

   The bidder should enclose Performance Certificates from the above users issued in the name of the manufacturer as proof of successful operation in field.

2. **MATERIALS:**

   a) Hot Dip Galvanised Cross arms and Pole Top Brackets for both 33 KV & 11kV construction at intermediate and light angle pole shall be fabricated from grade 43A mild steel of channel section and for heavy angle poles, end poles and section poles fabricated from grade 43A mild steel of angle section. The grades of structural steel shall conform to IS – 226: 1975.

   b) The 33 KV & 11 KV ‘V’ Cross arm shall be made out of 100x 50x5.6. mm MS Channel of (9.56 kg/mtr weight).

   The Back Clamp for both 33 KV & 11 KV shall be made out of 75 x 10 MS Flat and shall be suitably designed to fit PSC Pole 9 Mtr x 300 Kg, 8 Mtr x 200 Kg and 9 mtrx415kg

   c) The Pole Top Bracket (F Clamp) shall be made out of 75 x 10 MS Flat suitably designed to fit PSC Pole 9 Mtr x 300 Kg, 10X Mtr x 425 Kg & 9mtrx415 kg for both 33 KV & 11 KV.

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

   dimensions up to and including 50mm: +1mm: and dimensions greater than 50mm: +2%

   All steel members and other parts of fabricated material as delivered shall be free of warps, local deformation, 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 drawing or by the necessity of proper identification and fittings for
field assembly, the connection shall be match marked. A tolerance of not more than 1mm 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 2mm 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 back 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 the tolerance that will permit field erection within tolerance, 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.

3. **Fabrication has to be made as per drg. Of ' V ' X-arm, Back clamp & ' F ' clamp.**

3.1 **GALVANISING**

All type of cross arms back clamps, F clamps & stay clamps shall be hot dip galvanized, are as following:

All galvanizing shall be carried out by the hot dip process, in accordance with Specification IS 2629. However, high tensile steel nuts, bolts and spring washer shall be electro galvanized to Service Condition 4. The zinc coating (610 gms per sq.m) shall be smooth, continuous and uniform. It shall be free from acid spot and shall not scale, blister or be removable by handling or packing.

There shall be no impurities in the zinc or additives to the galvanic bath which could have a detrimental effect on the durability of the zinc coating.
Before picking, all welding, drilling, cutting, grinding and other finishing operations must be completed and all grease, paints, varnish, oil, welding slag and other foreign matter completely removed. All protuberances which would affect the life of galvanizing shall also be removed.

The weight of zinc deposited shall be in accordance with that stated in Standard IS 2629 and shall not less than 0.61kg/m² with a minimum thickness of 86 microns for items of thickness more than 5mm, 0.46kg/m² (64 microns) for items of thickness between 2mm and 5mm and 0.33kg/m² (47 microns) for items less than 2mm thick.

Parts shall not be galvanized if their shapes are such that the pickling solutions cannot be removed with certainty or if galvanizing would be unsatisfactory or if their mechanical strength would be reduced. Surfaces in contact with oil shall not be galvanized unless they are subsequently coated with an oil resistant varnish or paint.

In the event of damage to the galvanizing the method used for repair shall be subject to the approval of the Engineer in Charge or that of his representative.

In no case the repair of galvanisation on site will be permitted.

The threads of all galvanized bolts and screwed rods shall be cleared of spelter by spinning or brushing. A die shall not be used for cleaning the threads unless specifically approved by the Engineer in Charge. All nuts shall be galvanized. The threads of nuts shall be cleaned with a tap and the threads oiled.

Partial immersion of the work shall not be permitted and the galvanizing tank must therefore be sufficiently large to permit galvanizing to be carried out by one immersion.

After galvanizing no drilling or welding shall be performed on the galvanized parts of the equipment excepting that nuts may be threaded after galvanizing. To avoid the formation of white rust galvanized materials shall be stacked during transport and stored in such a manner as to permit adequate ventilation. Sodium dichromate treatment shall be provided to avoid formation of white rust after hot dip galvanization.

The galvanized steel shall be subjected to test as per IS-2633.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Description</th>
<th>Bidder’s offer</th>
</tr>
</thead>
<tbody>
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<td>33 Kv</td>
<td>11 Kv</td>
</tr>
<tr>
<td>1</td>
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</tr>
<tr>
<td>2</td>
<td>Grade of steel</td>
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<td>3</td>
<td>Steel standard</td>
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<td>Fabrication Standard</td>
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<tr>
<td>Sl. No.</td>
<td>Description</td>
<td>Unit</td>
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<tr>
<td>--------</td>
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</tr>
<tr>
<td>1</td>
<td>Type of crossarm</td>
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<td>2</td>
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<td>Steel standard</td>
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<td>Fabrication Standard</td>
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<td>Dimensions</td>
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<td>Steel section utilized</td>
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<td>7</td>
<td>Steel tensile strength</td>
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<td>8</td>
<td>Working load</td>
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<td>9</td>
<td>Details of galvanizing method utilized and</td>
<td></td>
</tr>
<tr>
<td></td>
<td>standard/specification conforming to?</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Weight of cross arm</td>
<td>kg</td>
</tr>
<tr>
<td>11</td>
<td>Whether drawing has been submitted with the</td>
<td></td>
</tr>
<tr>
<td></td>
<td>bid</td>
<td></td>
</tr>
</tbody>
</table>

**POLE TOP BRACKETS (F CLAMP)**

**GURANTEED TECHNICAL PARTICULARS**

(To be submitted along with offer)

**BACK CLAMP FOR “V” CROSS ARM**

**GURANTEED TECHNICAL PARTICULARS**

(To be submitted along with offer)
1. **PIN INSULATORS**

1.1 33 KV Pin Insulators.-IS-731/77 (Procelin Insulator for O/H power lines with nominal voltage greater than 1000 volts.

1.2 33 KV GI Pin: - Confirming to IS-2486 Part-I/1971.

1.3 11 KV Pin Insulators: - IS-731/77 (Procelin Insulator for O/H power lines with nominal voltage greater than 1000 volts.


2. **DISC –INSULATORS:**

2.1 Insulator Strings

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Particulars</th>
<th>Single Suspension string</th>
<th>Double Suspension string</th>
<th>Single Tension string</th>
<th>Double Tension string</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No. of standard Discs (nos)</td>
<td>1X3</td>
<td>2X3</td>
<td>1X4</td>
<td>2X4</td>
</tr>
<tr>
<td>1</td>
<td>33 KV</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>11 KV</td>
<td>1X2</td>
<td>2X2</td>
<td>1X3</td>
<td>2X3</td>
</tr>
<tr>
<td>2</td>
<td>Size of Disc (33 Kv/11 Kv)</td>
<td>255X145</td>
<td>255X145</td>
<td>280x170</td>
<td>280x170</td>
</tr>
</tbody>
</table>

All the above materials must conform to the schedules at C2 and C3.

2.2 **PORCELAIN GLAZE:**

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

2.3 **METAL PARTS:**

Cap and Ball pins:

Twin Ball pins shall be made with drop forged steel and caps with malleable cast iron. They shall be in one single piece and duly hot dip g galvanized. They shall not contain parts or pieces joined together, welded, shrunk fitted or by any other process from more than one piece of material. The pins shall be of high tensile steel, drop forged and heat malleable cast iron and annealed. Galvanizing shall be by the hot dip process with a heavy coating of zinc of very high purity with minimum of 6 dips. The bidder shall specify the grade, composition and mechanical properties of steel used for caps and pins.

2.4 **SECURITY CLIPS:**
The security clips shall be made of phosphor bronze or of stainless steel.

2.5 **FILLER MATERIAL:**

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

2.6 **MATERIAL DESIGN AND WORKMANSHIP:**

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

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

2.7 **INSULATOR SHELL:**

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

2.8 **METAL PARTS:**

a) The twin ball 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 and of such design that it will not yield or distort under loaded conditions. The head portion of the insulator or is under tension the stresses are uniformly distributed over the pinhole portion of the shell. The pinball shall move freely in the cap socket either during assembly of a string or during erection of a string or when a string is placed in position.

b) Metal caps shall be free from cracks, seams, shrinks, air holes, blowholes and rough edges. All metal surfaces shall be perfectly smooth with no projecting parts or irregularities which may cause corona. All load bearing surfaces shall be smooth and uniform so as to distribute the loading stresses uniformly. Pins shall not show any macroscopically visible cracks, insulations and voids.

2.9 **GALVANIZING:**

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

2.10 CEMENTING:

The insulator design shall be such that the insulating medium shall not directly engage with hard metal. The surfaces of porcelain and coated with resilient paint to offset the effect of difference in thermal expansions of these materials.

Specific Requirement for Insulators

The insulators shall confirm in the following specific conditions of respective IS given in the table below

<table>
<thead>
<tr>
<th>Insulator</th>
<th>Designation</th>
<th>Minimum mechanical failing load</th>
<th>Minimum Creepage distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>11 KV Pin Type-B of IS731</td>
<td>10 KN</td>
<td>320 mm</td>
<td></td>
</tr>
<tr>
<td>33 KV Pin Type-B of IS731</td>
<td>10 KN</td>
<td>580 mm</td>
<td></td>
</tr>
<tr>
<td>33KV/11KV Stay Type-C of IS 1445</td>
<td>88 KN</td>
<td>57 mm</td>
<td></td>
</tr>
<tr>
<td>LT Stay Type-C of IS 1445</td>
<td>44 KN</td>
<td>41 mm</td>
<td></td>
</tr>
</tbody>
</table>

2.11 SECURITY CLIPS (LOCKING DEVICES)

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

DISC INSULATORS (B & S Type)

GURANTEED TECHNICAL PARTICULARS
(To be submitted along with offer)

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Description</th>
<th>Bidder’s Offer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Manufacturer’s name</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Address of manufacturer</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Location of type testing</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Applicable standard</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Type of insulator (Porcelain or toughened glass)</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Dry impulse withstand voltage</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Wet power frequency, 1 minute, withstand voltage</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Dry, Critical Impulse Flashover Voltage</td>
<td></td>
</tr>
<tr>
<td>Sl. No.</td>
<td>Description</td>
<td>Bidder’s Offer (33 Kv &amp; 11 Kv separately)</td>
</tr>
<tr>
<td>--------</td>
<td>------------------------------------------------------------------------------</td>
<td>-----------------------------------------</td>
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<tr>
<td></td>
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<tr>
<td>1</td>
<td>Manufacturer’s name</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Address of manufacturer</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Location of type testing</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Applicable standard</td>
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<tr>
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<td>Type of insulator (Porcelain or toughened glass)</td>
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<tr>
<td>8</td>
<td>Dry, Critical Impulse Flashover Voltage</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Dry, power frequency, Critical Flashover Voltage</td>
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</tr>
<tr>
<td>10</td>
<td>Wet, power frequency, Critical Flashover Voltage</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Power frequency Puncture Voltage</td>
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<tr>
<td>12</td>
<td>Safe Working Load</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Minimum Failing Load</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Creepage Distance</td>
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</tr>
<tr>
<td>15</td>
<td>Protected Creepage Distance</td>
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</tr>
<tr>
<td>16</td>
<td>Type and Grade of Materials : Insulator</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Type and Grade of Materials : Thimble</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Type and Grade of Materials : Cement</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Type of semi conducting Glaze</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Radius of conductor Groove</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Colour of Insulator</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Weight of Insulator</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Number of Insulators per Crate</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Gross Weight of Loaded Crate</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>Whether drawing showing dimensional details have been furnished along with Bid</td>
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### HT STAY INSULATOR & LT STAY INSULATORS

**GURANTEED TECHNICAL PARTICULARS**  
(To be submitted along with offer)

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<thead>
<tr>
<th>Sl. No.</th>
<th>Description</th>
<th>Bidder’s Offer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Manufacturer’s name</td>
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<td>Address of manufacturer</td>
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<tr>
<td>3</td>
<td>Location of type testing</td>
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</tr>
<tr>
<td>4</td>
<td>Applicable standard &amp; Type</td>
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</tr>
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<td>5</td>
<td>Type of insulator (Porcelain or toughened glass)</td>
<td></td>
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<td>6</td>
<td>Dry impulse withstand voltage</td>
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<td></td>
</tr>
<tr>
<td>9</td>
<td>Dry, power frequency, Critical Flashover Voltage</td>
<td></td>
</tr>
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<td></td>
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<tr>
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<td>Power frequency Puncture Voltage</td>
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<td>12</td>
<td>Safe Working Load</td>
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</tr>
<tr>
<td>13</td>
<td>Minimum Failing Load</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Creepage Distance</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Protected Creepage Distance</td>
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</tr>
<tr>
<td>16</td>
<td>Type and Grade of Materials : Insulator</td>
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</tr>
<tr>
<td>17</td>
<td>Colour of Insulator</td>
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</tr>
<tr>
<td>18</td>
<td>Weight of Insulator</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Number of Insulators per Crate</td>
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<tr>
<td>20</td>
<td>Type of semi conducting Glaze</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Minimum dia of Stay wire hole</td>
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</tr>
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<td>Whether drawing showing dimensional details have been furnished along with Bid</td>
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</tr>
<tr>
<td>23</td>
<td>Whether Type Test Certificate have been furnished</td>
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<td>24</td>
<td>Other particulars (if any)</td>
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**GURANTEED TECHNICAL PARTICULARS of GI PIN**  
(To be submitted along with offer)

<table>
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<th>Description</th>
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<tbody>
<tr>
<td>1</td>
<td>Manufacturer’s name</td>
<td>33 KV GI PIN</td>
</tr>
<tr>
<td>2</td>
<td>Address of manufacturer &amp; Address</td>
<td>11 KV GI PIN</td>
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<td>3</td>
<td>Standard applicable specification</td>
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<td>4</td>
<td>Minimum failing load</td>
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</tr>
<tr>
<td>A</td>
<td>Dimensions (mm)</td>
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</tr>
<tr>
<td>B</td>
<td>Total length</td>
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<tr>
<td>B</td>
<td>Shank length</td>
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</tbody>
</table>

Gross Weight of Loaded Crate

Whether drawing showing dimensional details have been furnished along with Bid

Whether Type Test Certificate have been furnished

Other particulars (if any)
LONG ROD INSULATOR

33KV Long Rod Insulator in conformity to IS: 2486, IEC:433 & IS:731 can be used preferably in Saline affected area. The technical requirements are as under.

1. minimum nominal Creepage distance : 850 mm
2. Lightning impulse withstand voltage : 170KVP
3. Wet Power Frequency withstand voltage : 75 KV
4. Tensile load : 70KN

(K) 11 KV Distribution Class Lighting Arrestors

Technical Specifications

1. Scope of Work

The specification covers the design, manufacture, shop & laboratory testing before dispatch, supply, delivery, erection, testing & commissioning of 9 KV, static class heavy rating, gapless, metal (zinc) oxide lighting arrestors complete along with clamps, complete fitting and accessories for installation on outdoor type 11 kv switchgear, transmission lines, transformers etc.

2. Specific parameters & layout conditions

3. Technical Particulars

The lighting arrestors shall confirm the following standard technical requirements. The Insulation values shall be enhanced considering the altitude of operation & other atmospheric conditions.

4. System parameters

(i) Nominal system voltage : 11Kv
(ii) Highest system voltage : 12Kv
4.1 Lighting Arrestors

(i) Type: Gapless Metal oxide – outdoor
(ii) Arrestor rating (KV rms): 9
(iii) Continuous Operating voltage (kV rms): 7.65
(iv) Nominal discharge Current: 5 Rating (KA)
(v) Long Duration discharge class: Distribution Class
(vi) Degree of protection: IP 55
(vii) Maximum residual voltage at 5 KA (KV peak): 32
(viii) Maximum switching lighting residual 24 Voltage (kVP) at 1Ka
(ix) Partial discharge at 1.05 COV not greater that (PC): 50
(x) High current impulse withstand voltage: 100 at 65 kA (kVP)

4.2 Insulator Housing

(i) Power frequency withstand test voltage (Wet) (kV rms): 28
(ii) Lighting impulse withstand / tests voltage (kVP): 75
(iii) Creep age distance not less than: 320
(iv) Pressure relief class: B

4.3 Galvanization

(i) Fabricated Steel Articles
   a) 5 mm thick cover Articles: 610 g/m²
   b) Under 5 mm but not less than 2 mm thickness : 460 g/m²
   c) Under 2 mm but not less than 1.2 mm thickness: 340 g/m²
(ii) Castings Grey Iron, malleable iron: 610 g/m²
(iii) Threaded works other than tubes & tube fittings
   a) Under 10 mm dia: 300 g/m²
   b) 10 mm dia & above: 270 g/m²

4.4 Rating and Functional Characteristics

(i) Nominal system voltage: 11kV
(ii) Highest system voltage: 12kV
(iii) System earthing: effectively earthed system
(iv) Frequency (Hz): 50
(v) Lightning Impulse withstand Voltage (kVP): 75
(vi) Power frequency withstand Voltage (kV rms): 28
(vii) Arrestor duty
    - Connection to system: Phase to earth
    - Type of equipment to be protected: Transformers & Switchgear
5. **Performance Guarantee**

The equipment along with all accessories shall be capable of performing intended duties under specified conditions. The Contractor shall guarantee the reliability and performance of the individual equipment as well as of the complete system as specified in the bid documents.

6. **Design and Construction**

6.1 **Standards**

The design, manufacture and performance of Lighting Arrestors shall comply with IS: 3070 part-3 and other specific requirements stipulated in the specification. Unless otherwise specified, the equipment, material and processes shall conform to the latest applicable Indian as listed hereunder:

- **IS: 2071-1974 (Part-2)**: Test Procedures
  - IS: 6209-1982: Methods of Partial discharge measurement.
  - IS: 6745: Method for determination of mass of zinc coating on zinc coated iron and steel articles.

6.2 The equipment complying with any other internationally accepted standards shall also be considered if it ensures performance equivalent to or superior to the Indian Standards.

7. **General Requirement**

7.1 The metal oxide gap less Lighting Arrester without any series or shunt gap shall be suitable for protection for 11KV side of Distribution Transformers, associated equipment from voltage lightings resulting from natural disturbance like lightning as well as system disturbances.

7.2 The lighting arrester shall draw negligible current as operating voltage and at the same time offer least resistance during the flow or lighting current.

7.3 The lighting arrester shall consist of non-linear resistor elements placed in series and housed in electrical grade porcelain housing / silicon polymeric of specified creep age distance.

7.4 The assembly shall be hermetically sealed with suitable rubber gaskets with effective sealing system arrangement to prevent ingress of moisture.

7.4 The lighting arrester shall be provided with line and earth terminal of suitable size. The ground side
terminal of lighting arrestor shall be connected with 25x6 mm galvanized strip.

7.5 The lighting arrestor shall not operate under power frequency and temporary over voltage conditions but under lighting conditions, the lighting arrestor shall change over to the conducting mode.

7.6 The lighting arrestor shall be suitable for circuit breaker performing 0-0.3 min-Co-3-min-CO_duty over to the conducting mode.

7.7 Lighting arrestors shall have a suitable pressure relief system to avoid damage to the porcelain / silicon polymeric housing and providing path for flow of rated fault currents in the event of arrestor failure.

7.8 The reference current of the arrestor shall be high enough to eliminate the influence of grading and stray capacitance on the measured reference voltage.

7.9 The Lighting Arrestor shall be thermally stable and the supplier shall furnish a copy of thermal stability test along with the bid.

7.10 The arrestor shall be capable of handling terminal energy for high lightings, external pollution and transient over voltage and have low losses at operating voltages.

7.11 The lighting arrestor shall be provided with line and earth terminals of suitable size. The line side terminal shall be suitable for AAA conductor equivalent to ACSR weasel / rabbit conductor. Lighting counter, leakage detector (including insulating base) are not required for the lighting arrestors.

8. **Arrestor Housing**

8.1 The arrestor housing shall be made up of porcelain / silicon polymeric housing and shall be homogenous, free from laminations, cavities and other flaws of imperfections that might affect the mechanical and dielectric quality. The housing shall be of uniform brown colour, free from blisters, burrs and other similar defects. Arrestors shall be complete with insulating bases fasteners for stacking units.

8.2 The housing shall be so coordinated that external flashover shall not occur due to application of any impulse of switching lighting voltage up to the maximum design value for arrestor. The arrestors shall not fail due to contamination. The 11kV arrestors housing shall be designed for pressure relief class as given in Technical Parameters of the specification.

8.3 Sealed housings shall exhibit no measurable leakage.

9. **Arrestor Mounting**

The arrestors shall be suitable for mounting on 4 pole/2 pole structure used for pole/ plinth mounted transformer and for incoming and outgoing lines.

10.0 **Fittings & Accessories**

10.1 The lighting arrestor shall be complete with insulating bases, fasteners for stacking units along with clamp & terminal connectors and inbuilt dis-connector.

10.2 The terminals shall be non-magnetic, corrosion proof, robust and of adequate size and shall be so
located that incoming and outgoing connections are made with minimum possible bends. The top metal cap and base of lighting arrestor shall be galvanized. The line terminal shall have a built in clamping device, which can be adjusted for both horizontal and vertical take off.

11.0 **Drawings, Documents and Design Calculations**

Bidder to submit followings along with the bid:

i) Sectional drawings

ii) Mounting arrangement

12.0 **Tests**

12.1 **Test on Lighting Arrestors**

The lighting Arrestors offered shall be type tested from NABL accredited laboratory. Copies of test certificates shall be furnished by the bidder for scrutiny.

Routine and Acceptance tests shall be carried out in accordance with IS: 3070 (Part-3)-1993. The purchaser representative will witness the acceptance test at the works of manufacturer. The suitability of the Lighting Arrestors shall also be established from the following:

- Residual voltage test
- Reference voltage test
- P.D. test
- Sealing test
- Thermal stability

Metal oxide block shall be tested for guaranteed specific energy capability in addition to routine / acceptance test as per IEC / IS.

12.3 The maximum residual voltages corresponding to nominal discharge current of 5 kA for steep current, impulse residual voltage test, lightning impulse protection level and switching impulse level shall generally conform to relevant ISS.

12.4 The suppliers shall furnish the copies of the type tests and the characteristics curves between the residual voltage and nominal discharge current of the offered lighting arrestor and power frequency voltage v/s time characteristic of the lighting arrestor subsequent to impulse energy consumption as per clause 6.6 of IS ; 3070 (Para-3) offered along with the bid.

12.5 The lighting arrestor housing shall also be type tested and shall be subjected to routine and acceptance tests in accordance with IS : 2071.

12.6 **Galvanization Test**

12.6.1 **Test on Lighting Arrestor Dis-connectors**

The test shall be performed on lighting arrestors which are fitted with arrestor dis-connector or on the dis-connector assembly alone if its design is such as to be un-affected by the heating of adjacent parts of the arrestor in its normally installed portion in accordance with IS : 3070 (part-3).

13.0 **Name Plate**
The nameplate attached to the arrestor shall carry the following information:
- Rated Voltage
- Continuous Operation Voltage
- Normal discharge current
- Pressure relief rated current Manufacturer Trade Mark
- Name of Sub-station Year of Manufacture
- Name of Scheme
- Name of Client
Purchase Order Number along with date

### 11 KV Distribution Class Lighting Arrestors
#### Guaranteed Technical Particulars

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Description</th>
<th>Guaranteed value to be furnished by the bidder</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Name of manufacturer</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Manufacturer's type</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Standards to which the equipment conforms</td>
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</tr>
<tr>
<td>4</td>
<td>Arrestor class</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>a) Type of construction</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) No. of columns</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Rated arrestor voltage</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Frequency (Hz.)</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Max. continuous operating voltage MCOV (KV) rms</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Leakage current at MCOV (micro Amp)</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Reference voltage of arrestor at specified ambient temperature</td>
<td></td>
</tr>
<tr>
<td>10.1</td>
<td>Temperature power freq. over voltage withstand</td>
<td></td>
</tr>
<tr>
<td></td>
<td>a) for 0.2 sec.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) for 1 sec.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) for 100 sec.</td>
<td></td>
</tr>
<tr>
<td>10.2</td>
<td>Whether graph to indicate TOV withstand capability are enclosed</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Nominal discharge current (8/20micro sec. Wave)</td>
<td></td>
</tr>
<tr>
<td>11.1</td>
<td>Rated power freq. over voltage withstand capability immediately after discharging energy</td>
<td></td>
</tr>
<tr>
<td>11.2</td>
<td>Equivalent to the max. capability of the arrestor.</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>a) Max. residual voltages at (KV peak)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>i) Lightening impulse current of 5 K. Amp.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ii) Lightening impulse current of 10 K. Amp.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>iii) Lightening impulse current of 20 K. Amp.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Switching impulse current as per IEC of</td>
<td></td>
</tr>
<tr>
<td></td>
<td>i) 1000 Amps</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ii) 250 Amps.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) Steep fronted impulse current of 5 KA (peak)</td>
<td></td>
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<tr>
<td>13.1</td>
<td>Long duration discharge class</td>
<td></td>
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<tr>
<td>13.2</td>
<td>Max. energy dissipation capability (KJ/KV)</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Voltage time characteristics of the arrestor(whether grapf enclosed or not)</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>High current pressure relief test (rms)</td>
<td></td>
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<tr>
<td>16</td>
<td>Method of sealing the complete arrestor unit</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Minimum creepage distance (mm)</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Method used for testing sealing arrangement</td>
<td></td>
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<tr>
<td>19</td>
<td>Class of pressure relief devices</td>
<td></td>
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<td>19.1</td>
<td>Prospective symmetrical fault current during Pressure relief test</td>
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<td>19.2</td>
<td>Duration of flow of fault current during pressure</td>
<td></td>
</tr>
<tr>
<td></td>
<td>a) High current</td>
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</tr>
<tr>
<td></td>
<td>b) Low current</td>
<td></td>
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<tr>
<td>20</td>
<td>No. of units to cover the arrestor</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Partial discharge at 1.05 times MCOB (%)</td>
<td></td>
</tr>
<tr>
<td>21.1</td>
<td>Min. recommended spacing of the arrestor from the earth objected</td>
<td></td>
</tr>
<tr>
<td>21.2</td>
<td>Min. recommended spacing of the arrestor from center to center</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Whether type test reports submitted?</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Outline dimensions for installation (Dwg. No.)</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Details of earthing arrangement provided (Dwg.</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>Mounting flange dimensional details Dwg. No.)</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Thickness of zinc coating on ferrous parts</td>
<td></td>
</tr>
<tr>
<td>27.1</td>
<td>Details of Zinc Oxide Disc</td>
<td></td>
</tr>
<tr>
<td></td>
<td>a) Make</td>
<td></td>
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<tr>
<td>b) Diameter (mm)</td>
<td></td>
<td></td>
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<tr>
<td>c) Height (mm)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d) Weight (kg)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>e) Rating (KV rms)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>f) MCOV (KV rms)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>27.2</td>
<td>Whether imported or indigenous</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Surge counter/monitor’s min. counting current at 28 8/20 micro sec. Wave shape</td>
<td></td>
</tr>
<tr>
<td>29.1</td>
<td>Watt loss per KV at MCOV</td>
<td></td>
</tr>
<tr>
<td>29.2</td>
<td>Watt loss per KV at arrestor rated voltage</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>Degree of protection for discharge counter 30 (corresponding to BIS 2147)</td>
<td></td>
</tr>
<tr>
<td>31.1</td>
<td>Impulse withstand voltage (1.2/50 micro sec wave in KV peak)</td>
<td></td>
</tr>
<tr>
<td>31.2</td>
<td>Power freq. withstand voltage (KV rms)</td>
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</tr>
<tr>
<td>a)</td>
<td>One minute dry</td>
<td></td>
</tr>
<tr>
<td>b)</td>
<td>One minute wet</td>
<td></td>
</tr>
<tr>
<td>31.3</td>
<td>Total creepage distance (mm)</td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>Max. cantilever strength of complete arrestor</td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>Total height of arrestor (mm)</td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>Height of insulating base of arrestor (mm)</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>Weight of complete arrestor (Kg)</td>
<td></td>
</tr>
</tbody>
</table>
1. MILD STEEL CHANNEL & ANGLE

TECHNICAL SPECIFICATIONS OF MILD STEEL CHANNEL & ANGLE

1.1 SCOPE
This specification covers design, manufacture, testing and dispatch to Purchaser's stores of M.S. Channel & Angle for use in structures in distribution system.

1.2 APPLICABLE STANDARD
Materials shall conform to the latest applicable Indian standards. In case bidders offer steel section and supports conforming to any other international specifications which shall be equivalent or better than IS, the same is also acceptable.

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Standard No.</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>IS: 2062 Grade ‘A’</td>
<td>Quality Specification for M.S.Angles, M.S.Channel</td>
</tr>
<tr>
<td>2</td>
<td>IS: 2062</td>
<td>Chemical and Physical composition of material</td>
</tr>
<tr>
<td>3</td>
<td>IS: 1852</td>
<td>Rolling and Cutting Tolerances for Hot Rolled Steel products</td>
</tr>
</tbody>
</table>

2.0 GENERAL REQUIREMENTS

2.1 Raw material
The Steel Sections shall be re-rolled from the BILLET/INGOTS of tested quality as per latest version of IS:2830 or to any equivalent International Standard and shall be arranged by the bidder from their own sources.
The Chemical composition and Physical properties of the finished material shall be as per the equivalent standards.
Chemical Composition and Physical Properties of M.S. Angles, M.S. Channels, and M.S.Flat conforming to IS:2062/84

2.2 Chemical Composition
Chemical composition For Fe 410 WA Grade
1 C - 0.23% MAX
2 Mn - 1.5% MAX
3 S - 0.050% MAX
4 P - 0.050% MAX
5 SI - 0.40% MAX6 CE
2.3 **Mechanical Properties**

1. Tensile strength Kgf/mm² - 410
2. Yield stress Min. for thickness/diameter
   - < 20 mm - 26 Kgf/mm² OR 250 N/ mm²
   - 20-40 mm - 24 Kgf/mm² OR 240 N/ mm²
   - > 40 mm - 23 Kgf/mm² OR 230 N/ mm²
3. Elongation % - 23%
4. Bend Test (Internal Dia) - Min-3\(t\)
   (\(t\)–is the thickness of the material).

2.4 **Tolerance**

Variation in ordered quantity for any destination and overall ordered quantity be only to the extent of ±2%.

Rolling and weight tolerances shall be as per version of IS: 1852 or to any equivalent International Standard.

2.5 **TEST**

Steel Section shall be tested in IS approved Laboratory or Standard Laboratory the Bidder country having all facilities available for conducting all the test prescribed in relevant IS or IEC or to any equivalent International Standard or any recognized and reputable International Laboratory or Institutions.

The bidders are required to specifically indicate that;

They hold valid IS (or equivalent IEC) License.

Steel Section offered are bearing requisite IS certification or equivalent marks.

The bidders are required to submit a copy of the valid IS (or equivalent IEC) License clearly indicating size and range of product against respective ISS or any equivalent International Standards along with their offer.

2.6 **MARKING**

It is desirable that the bidder should put his identification marks on the finished material. The mark shall be in “legible English letter” given with marking dies of minimum 18 mm size.

2.7 **INSPECTION AND TEST CERTIFICATES**

The material to be supplied will be subject to inspection and approval by the purchaser’s representative before dispatch and/or on arrival at the destination. Inspection before dispatch shall not however, relieve the bidder of his responsibility to supply the Steel
Sections strictly in accordance with the specification.
The purchaser’s representative shall be entitled at all reasonable time during
manufacture to inspect, examine and test at the bidder’s premises the materials and
workmanship of the steel section to be supplied.
As soon as the steel section are ready for testing, the bidder shall intimate the purchaser
well in advance, so that action may be taken for getting the material inspected. The
material shall not be dispatched unless waiver of inspection is obtained or inspected by
the purchaser’s authorized representative.
Test certificates shall be in accordance with latest version of the relevant Indian
Standards or any equivalent International Standard.
The acceptance of any batch/lot shall in no way relieve the bidder of any of his
responsibilities for meeting all the requirements of the specification and shall not prevent
subsequent rejection of any item if the same is later found defective.

GTP :-

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Sl No</th>
<th>Width of web in mm</th>
<th>Width of Flange in mm</th>
<th>Thickness of web in mm</th>
<th>Thickness of Flange in mm</th>
<th>Weight per meter in kg</th>
<th>Sectional Length to be supplied in meter</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ISMC 100X50</td>
<td>98.1</td>
<td>49.7</td>
<td>5.55</td>
<td>6.4</td>
<td>9.180</td>
<td>5-6 meter</td>
</tr>
<tr>
<td>2</td>
<td>ISMC 75X40</td>
<td>74.44</td>
<td>39.71</td>
<td>4.8</td>
<td>7.5</td>
<td>7.140</td>
<td>5-6 mtr</td>
</tr>
<tr>
<td>3</td>
<td>ISA 50X50X6</td>
<td>50</td>
<td>50</td>
<td>6.0</td>
<td>6.0</td>
<td>4.500</td>
<td>5-6 mtr</td>
</tr>
<tr>
<td>4</td>
<td>RS JOIST 150X150</td>
<td>150</td>
<td>150</td>
<td>11.8</td>
<td>9.0</td>
<td>34.600</td>
<td>11/12/13 M +5%</td>
</tr>
<tr>
<td>5</td>
<td>RS JOIST 100X116</td>
<td>100</td>
<td>116</td>
<td>-</td>
<td>-</td>
<td>23.000</td>
<td>11 M +5%</td>
</tr>
</tbody>
</table>
1. Post insulator shall conform in general to IS 2544, IEC 168 and IEC 815.

Technical Parameters

<table>
<thead>
<tr>
<th>SI No.</th>
<th>Parameters</th>
<th>33kV</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Type</td>
<td>Confirming to IEC 273 (solid core)</td>
</tr>
<tr>
<td>2</td>
<td>Voltage class (kV)</td>
<td>36</td>
</tr>
<tr>
<td>3</td>
<td>Dry and wet one minute withstand voltage (kV rms)</td>
<td>70</td>
</tr>
<tr>
<td>4</td>
<td>Dry lightning impulse withstand voltage (kV p)</td>
<td>170</td>
</tr>
<tr>
<td>5</td>
<td>Wet switching surge withstand voltage (kV p)</td>
<td>NA</td>
</tr>
<tr>
<td>6</td>
<td>Max. RIV at corona extinction voltage (micro volts)</td>
<td>NA</td>
</tr>
<tr>
<td>7</td>
<td>Corona extinction voltage (kV rms)</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Total minimum cantilever strength (kg)</td>
<td>Not &lt; 300</td>
</tr>
<tr>
<td>10</td>
<td>Minimum torsion moment</td>
<td>As per IEC 273</td>
</tr>
<tr>
<td>11</td>
<td>Total height of insulator (mm)</td>
<td>325</td>
</tr>
<tr>
<td>12</td>
<td>Minimum PCD (mm) top/bottom</td>
<td>127/ 254</td>
</tr>
<tr>
<td>13</td>
<td>No. of bolts top/bottom</td>
<td>4/ 8</td>
</tr>
<tr>
<td>14</td>
<td>Diameter of bolt holes (mm) top/bottom</td>
<td>M16/ 18</td>
</tr>
<tr>
<td>15</td>
<td>Pollution level as per IEC 815</td>
<td>Heavy</td>
</tr>
<tr>
<td>16</td>
<td>Minimum total creepage distance (mm)</td>
<td>900</td>
</tr>
</tbody>
</table>

2. Constructional features

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

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

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

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

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

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

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

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

3. TEST DETAILS

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

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

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

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

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

3.3 Routine Tests
- Visual examination
- Power frequency voltage dry test
- Tests to prove mechanical strength.
1.0 TECHNICAL SPECIFICATION FOR HARDWARE FITTINGS

1.1 SCOPE
This Specification covers design manufacture, testing at manufacturer's Works, supply and delivery of power conductor accessories, insulator and hardware fittings for string insulators suitable for use in 33 KV Over-head transmission lines and sub-stations of NESCO/WESCO/SOUTHCO. The hard wares to be supplied shall be as per approved drawings of NESCO/WESCO/SOUTHCO. Any change there of shall be with due permission of CSO (NESCO/WESCO/SOUTHCO). The firm shall submit his drawings for approval of NESCO/WESCO/SOUTHCO and only after which the manufacturing shall be started.

The materials/equipment offered, shall be complete with all components, which are necessary or usual for the efficient performance and satisfactory maintenance. Such part shall be deemed to be within the scope of contract.

1.2 STANDARDS
The materials covered under this Specification shall comply with the requirement of the latest version of the following standards as amended upto date, except where specified otherwise.

i) IS:2486 Part-II & III Insulator fitting for overhead power lines with a nominal voltage greater than 1,000 volts.

ii) IS:2121 Part I & II Conductor & earth wire accessories for overhead power lines.

iii) IS:9708 Stock Bridge Vibration Dampers on overhead power lines.

iv) IS:2633 Method of testing of uniformity of coating on zinc coated articles


vi) BS:916 Specification for Hexagonal bolts and nuts.

1.3 MATERIALS AND DESIGN
Aluminum and aluminum alloys, malleable iron and forget steel, having required mechanical strength, corrosion resistance and mach inability depending on the types of application for which accessories / fittings are needed, shall be employed.

In manufacturer of the accessories / fittings, the composition of the aluminium alloys used shall be made available to Employer if required for verification.

The materials offered shall be of first class quality, workmanship, well finished and approved design. All castings shall be free from blow-holes, flaws, cracks of other defects and shall be smooth, close grained and true forms and dimensions. All machined surfaces should be free, smooth and well finished.
Metal fittings of specified material for conductor and earth wire accessories and string insulator fittings are required to have excellent mechanical properties such as strength, toughness and high resistance against corrosion. All current carrying parts shall be so designed and manufactured that contact resistance is reduced to the minimum.

All bolts, nuts, bolt-heads shall be the white worth's standard thread. Bolt heads and nuts shall be hexagonal. Nuts shall be locked in an approved manner. The treads in nuts and tapped holes shall be cut after galvanizing an shall be well fabricated and greased. All other treads shall be cut before galvanizing. The bolt treads shall be undercut to take care of increase in diameter due to galvanizing.

All nuts shall be made of materials to Clause 4.8 of IS:1367 (latest edition) with regard to its mechanical properties.

The general design conductor and earth wire accessories and insulator fittings shall be such as to ensure uniformity, high strength, free from corona formation and high resistance against corrosion even in case of high level of atmosphere pollution.

All hooks, eyes, pins, bolts, suspension clamps and other fittings for attaching to the tower or to the line conductor or to the earth wire shall be so designed that the effects of vibration, both on the conductor and the fittings itself, are minimized.

Special attention must be given to ensure smooth finished surface throughout. Adequate bearing area between fittings shall be provided and point or line contacts shall be avoided.

All accessories and hardwares shall be free from cracks, shrinks, slender air holes, burrs or rough edges.

The design of the accessories and hardwares shall be such as to avoid local corona formation or discharge likely to cause interference to tele-transmission signals of any kind.

1.4 GALVANISING:

All ferrous parts of conductor and ground wire accessories and insulator hardwares shall be galvanized in accordance with IS:2629-Recommended Practice for hot dip galvanizing of iron and steel or any other equivalent authoritative standards. The weight of zinc coating shall be determined as per method stipulated in IS:2633 for testing weights, thickness and uniformity of coating of hot dip galvanized articles or as per any other equivalent authoritative standards. The zinc used or galvanization shall conform to grade zn 98 of IS:209. The galvanized parts shall withstand four (4) dips of 1 minute each time while testing uniformity of zinc coating as per IS:2633. Spring washers shall be electro galvanized.

1.5 INSULATOR HARDWARES

The insulator disc hardwares and string assemblies to be offered by the tenderer shall be suitable to meet the requirement given in the specific technical particulars as detailed hereinafter.

Hardwares for suspension and tension insulator shall be suitable for insulator with normal pin shank diameter of 20 mm. in case of tension string unit and 16mm. for suspension string unit.
Each insulator string shall generally include the following hardware components.

**Single Suspension Set.**

a) Ball Hook.
b) tower side arcing horn
c) Socket Eye with R-Type security clip.
d) Line side arcing horn.
e) Suspension clamps

**Double Suspension Set.**

i) Ball Hook.
i) Socket clevis with R-Type security clip- 3 Nos.
(ii) Yoke Plate-2 Nos.
(iii) Tower side arcing horns-2Nos.
(iv) Ball clevis – 2 Nos.
(v) Line side arcing horns-2 Nos.
(vi) Clevis Eye.
(vii) Suspension Clamp.

**Single Tension Set :**

a) Anchor Shackle.
b) Ball Eye.
c) Tower side arcing horn.
d) Socket Clevis with R-Type security clip.
e) Line side arcing horn
f) Bolted type dead end clamp.

**Double Tension Set :**

a) Anchor Shackle.
b) Chain Link.
c) Yoke Plate – 2 Nos.
d) Tower side arcing horn.
e) Ball Clevis – 2 Nos.
f) Socket Clevis with R-Type security clip – 2 Nos.
g) Line side arcing horns.
h) Bolted type dead end clamps.

### 1.6 SUSPENSION CLAMPS

This clamp will be envelope type made out of aluminum alloy suitable for accommodating preformed armored rod.

### 1.7 TENSION CLAMPS

The Tension Clamps shall be made out of aluminium alloy and of 4 pair bolted (M-16) type suitable for 232 mm² AAA C-up conductor (In case of lines it will be suitable for 80mm²100 mm²) The tension clamps shall not permit slipping or damage to failure of the complete conductor or any part thereof at a load less than 90% of the ultimate strength of conductor. The mechanical efficiency of tension / clamps shall not be affected by method of erection involving come / along or similar clamps or tension stringing operation during or after assembly and erection of tension clamp itself. The tension clamp shall be of a design that will ensure unrestricted flow of current without use of parallel groove clamps.

The clamps shall be as light as possible.

### 1.8 ARCING HORNS
Each hardware assembly shall have provision for attaching arcing horns of both adjustable and non/adjustable type across the suspension and tension strings or tower side. However each hardware assembly shall be provided with arching horn of fixed type on line side only.

2.0 TESTS, TEST CERTIFICATE AND PERFORMANCE REPORTS

The fittings and accessories for the power conductor, insulator and hardwares shall be tested in accordance with IS:2121, IS:2486, BS:916 for hexagonal bolts and nuts or any other authoritative equivalent standards. Six sets of type and routine test certificates and performance reports are to be submitted by the bidder.

The Employer however, reserves the right to get all the tests performed in accordance with the relevant I.S. Specification as Acceptance Test in presence of Employer’s representatives.

The tenderer shall clearly state the testing facilities available in the laboratory at his Works and his ability to carry out the tests in accordance with this Specification. All the specified tests shall be carried out without any extra cost.

Acceptance Test for power conductor accessories.

a) Visual examination
b) Dimensional verification
c) Failing load test
d) Slip strength test (for clamps)
e) Electrical resistance test
f) Fatigue test (for vibration dampers)
g) Mass pull off test (for vibration dampers)
h) Galvanizing test.

2.1 ACCEPTANCE TEST FOR HARDWARES

i) Dimensional verification.
ii) Ultimate tensile test.
i) Slip strength test.
ii) Electrical resistance test.
iii) Heating cycle test
iv) Breaking strength of full string assembly.
v) Galvanizing test.

3. BONDING PIECES:

a) material : flexible copper bond (37/7/0.417 mm.
tinned copper flexible stranded cable).
b) Length : Not less than 750 mm.
c) Bolt size : 16mm x 40 mm.
d) Copper area. : 34 sq.mm.
e) Thickness of long : 6 mm.
f) Material for connecting socket : Tinned Brass
4. **FASTENERS: Bolts, Nuts & Washers**

1. All bolts and nuts shall conform to IS-6639 – 1972. All bolts and nuts shall be galvanized. All bolts and nuts shall have hexagonal heads, the heads being truly concentric, and square with the shank, which must be perfectly straight.

2. Bolts up to M16 and having length up to ten times the diameter of the bolt should be manufactured by cold forging and thread rolling process to obtain good and reliable mechanical properties and effective dimensional control. The shear strength of bolt for 5.6 grade should be 310 Mpa minimum as per IS-12427. Bolts should be provided with washer face in accordance with IS-1363 Part-I to ensure proper bearing.

3. Fully threaded bolts shall not be used. The length of the bolt shall be such that the threaded portion shall not extend into the place of contact of the component parts.

4. All bolts shall be threaded to take the full depth of the nuts and threaded enough to permit the firm gripping of the component parts but not further. It shall be ensured that the threaded portion of the bolt protrudes not less than 3 mm and not more than 8 mm when fully tightened. All nuts shall fit and be tight to the point where shank of the bolt connects to the head.

5. Flat washers and spring washers shall be provided wherever necessary and shall be of positive lock type. Spring washers shall be electro-galvanized. The thickness of washers shall conform to IS-2016-1967.

6. The bidder shall furnish bolt schedules giving thickness of components connected, the nut and the washer and the length of shank and the threaded portion of the bolts and size of holes and any other special details of this nature.

7. To obviate bending stress in bolt, it shall not connect aggregate thickness more than three times its diameter.

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

9. Fasteners of grade higher than 8.8 are not to be used and minimum grade for bolts shall be 5.6.

5. **GENERAL:**

1. All ferrous parts including fasteners shall be hot dip galvanized, after all machining has been completed. Nuts may however be tapped (threaded) after galvanizing and the threads oiled. Spring washers shall be electro-galvanized. The bolt threads shall be undercut to take care of the increase in diameter due to galvanizing. Galvanizing shall be done in accordance with IS-2629-1985 and shall satisfy the tests mentioned in IS: 2633-1986. Fasteners shall withstand four dips while spring washers shall withstand three dips of one-minute duration in the standard Preece test. Other galvanized materials shall be guaranteed to withstand at least six successive dips each lasting one minute under the Standard Preece test for galvanizing.

2. The zinc coating shall be perfectly adherent of uniform thickness, smooth, reasonably bright, continuous and free from imperfections such as flux, ash, rust stains, bulky white deposits and blisters. The zinc used for galvanizing shall be of grade Zn 99.95 as per IS 209-1979.
3. Pin balls shall be checked with the applicable “G” gauges in at least two directions, one of which shall be across the line of die flashing and the other 90 deg. to this line. ‘NO GO’ gauges shall not pass in any direction.

4. Socket ends, before galvanizing shall be of uniform contour. The bearing surface of socket ends shall be uniform about the entire circumference without depressions or high spots. The internal contours of socket ends shall be concentric with the axis of the fittings as per IS 2486/IEC-120. The axis of the bearing surfaces of socket ends shall be coaxial with the axis of the fittings. There shall be no noticeable tilting of the bearing surfaces with the axis of the fittings.

5. All current carrying parts shall be so designed and manufactured that contact resistance is reduced to minimum.

6. Welding of aluminum shall be by inert gas shielded tungsten arc or inert gas, shielded metal arc process. Welds shall be clean, sound, smooth, and uniform without overlaps, properly fused and completely sealed. There shall be no cracks, voids incomplete penetration, incomplete fusion, under-cutting or inclusions Porosity shall be minimized so that mechanical properties of the aluminum alloys are not affected. All welds shall be properly finished as per good engineering practices.

6.0 Electrical Design:

The normal duty and heavy duty suspension, light duty, normal duty and heavy duty tension insulator sets shall all comply with the technical requirements and satisfy the test requirements

7.0 Mechanical design:

The mechanical strength of the insulators and corresponding insulator fittings must match. The design shall be such that stresses due to expansion and contraction in any part of the insulator shall not lead to the development of defects.

Insulating material shall not engage directly with hard metal. All fixing materials shall be of approved quality, shall be applied in an approved manner and shall not enter into chemical action with the metal parts or cause fracture by expansion in service. Where cement is used as a fixing medium, cement thickness shall be as small and even as possible and proper care shall be taken to correctly centre and locate the individual parts during cementing.


8.1 Type tests:

The following type tests shall be conducted on hardware fittings.

A. On suspension hardware fittings only.
   (i) Magnetic power loss test.
   (ii) Clamp slip strength Vs torque
   (iv) Mechanical strength test.
   (v) On one test on elastomer.
B. On Tension hardware fittings only.
   (i) Electrical resistance test for dead end assembly. IS 2486 (Part-I) 1971
   (ii) Heating cycle test for dead end assembly.
   (iii) Slip strength test for dead end assembly. IS 2486 (Part-I)
   (iv) Mechanical strength test.

C. On both suspension and tension hardware fittings.
   (i) Visual examination. IS-2486 (Part-I) 1971
   (ii) Verification of dimension. -do-
   (iii) Galvanizing / electroplating test. -do-
   (iv) Mechanical strength test of each component (including corona control ring/grading ring and arcing horn)
   (vi) Mechanical strength test of welded joint.
   (vi) Mechanical strength test for corona control ring/ grading ring and arcing horn. BS-3288 (Part-I)
   (vii) Test on locking device for ball and socket coupling. IEC – 3721984
   (viii) Chemical analysis, hardness tests, grain size, Inclusion rating and magnetic particle inspection for forging/casting.

D. On suspension hardware fittings only.
   (i) Clamp slip strength ver as torque test for suspension clamp.
   (ii) Shore hardness test of elastomer cushion for AG suspension clamp.
   (iii) Bend test for armour rod set. IS-2121 (Part-I)
   (iv) Resilience test for armour rod set. -do-
   (v) Conductivity test for armour rod set. -do-

All the acceptance tests stated at clause shall also be carried out on composite insulator unit, except the eccentricity test at clause. In addition to these, all the acceptance tests indicated in IEC 1109 shall also be carried out without any extra cost to the employer.

E. For hardware fittings.
   (a) Visual examination. IS-2121 (Part-I)
   (b) Proof & test.

F. Tests on conductor accessories.

G. Type tests.

H. Mid span compression joint for conductor and earth wire.
   (a) Chemical analysis of materials.
   (b) Electrical resistance tests. IS-2121 (Part-II) 1981 clause 6.5 & 6.6
   (c) Heating cycle test. -do-
   (d) Slip strength test. -do-
1.0 TECHNICAL SPECIFICATION FOR EQUIPMENT CLAMPS & CONNECTORS

1.1 SCOPE

This specification covers design, manufacture, assembly, testing at manufacturer’s works, supply and delivery at site of all terminal connectors of 33KV equipments (mainly breaker, isolator, CT, PT, CVT, BPI and LA) and all other clamps and dropper connectors required for the switch yard as per approved lay out and system design.

1.2 STANDARDS

The terminal connectors under this specification shall conform strictly to the requirements of the latest version of the following standards as amended up-to-date, except where specified otherwise.

i) IS: 556 Power Connectors.
ii) IS: 617 Aluminium & Aluminium Alloy
iii) IS: 2629 Recommended Practice for hot dip galvanizing of iron and steel.
iv) IS: 2633 Method of testing uniformity of coating of zinc coated articles.

The materials conforming to any other authoritative standards which ensure equal or better performance shall also be acceptable. The salient point of these specifications and points of difference between these and the above specifications shall be clearly brought out in the bid.

1.3 MATERIAL & WORKMANSHIP

The terminal connectors shall be manufactured from Aluminium Silicon Alloy and conform to designation A6 of IS: 617 (latest edition)

The connectors shall be of best quality and workmanship, well finished and of approved design. Specific materials for clamps and connectors should have high current carrying capacity, high corrosion resistance and be free from corona formation.

All connectors or its components to be connected with conductor shall be of bolted type having aluminium purity not less than 99.5%.

All bus bar clamps shall be made preferably from forged aluminium of purity not less than 99.5%. The thickness and contact surface should be maintained in such a way that the clamp should conform to IS:5561/1970 or any latest revision thereof.

1.4 RATING

The connector rating shall match with the rating of the respective equipments for the terminal connectors and the connectors for bus bar and dropper should be of the following rating. Minimum thickness at any part of connector shall be 10(ten) mm. Indicative ratings are given below:
<table>
<thead>
<tr>
<th>Sl No.</th>
<th>Rating</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Main bus bar connectors high level and low level (Amps)</td>
<td>1250</td>
</tr>
<tr>
<td>2</td>
<td>High level bus sectionalisation Isolator (Amps)</td>
<td>1250</td>
</tr>
<tr>
<td>3</td>
<td>-do- for CT</td>
<td>As per CT rating</td>
</tr>
<tr>
<td>4</td>
<td>-do- for PI</td>
<td>As per PI rating</td>
</tr>
<tr>
<td>5</td>
<td>-do- for LA</td>
<td>As per LA rating</td>
</tr>
<tr>
<td>6</td>
<td>-do- for PT</td>
<td>As per PT rating</td>
</tr>
</tbody>
</table>

1.5 EQUIPMENT CONNECTORS

Bimetallic connectors shall be used to connect conductors of dissimilar metal. The following bimetallic arrangement shall be preferred.

i) Copper cladding of minimum 4 mm. thickness on the aluminium portion of connector coming in contact with the copper palm or stud of the equipment.

ii) Alternatively, to provide cold rolled aluminium copper strip between the aluminium portion of the connection, the sheet thickness shall not be less than 2 mm.

Sufficient contact pressure should be maintained at the joint by the provision of the required number of bolts or other fixing arrangements, but the contact pressure should not be so great as to cause relaxation of the joint by cold flow, the joint should be such that the pressure is maintained within this range under all conditions of service, to avoid excessive local pressure, the contact pressure should be evenly distributed by use of pressure plates, washers or suitable saddles of adequate area of thickness should be less than that of an equal length of conductor where measured individually test results showing the milli drop test and resistance should be enclosed with the bid.

All connectors shall be so designed and manufactured as to offer ease of installation as these are to be used in overhead installations, design shall be such that full tightening of nuts and bolts should be possible with the use of double wrench.

The connectors shall be such as to avoid local corona, sound or visible discharge.

1.6 TEMPERATURE RISE

The temperature rise of connectors when carrying rated current shall not exceed 45˚ C above reference design temperature of 50˚ C.

i) Acceptance Tests
   (a) Tensile Test
   (b) Temperature rise test
   (c) Temperature rise test

ii) Routine Test
   (a) Visual Inspection
(b) Dimensional Check

Type test reports from a recognized laboratory shall have to be submitted.

1.7 WEIGHTS

Weights of different materials uses in manufacture, such as aluminium, silicon, copper etc. should be clearly indicated in the bid.

1.8 INTERCHANGE ABILITY

Corresponding parts of similar clamps and connectors shall be made to gauge or jig and shall be interchangeable in every respect.

(O) TECHNICAL SPECIFICATION FOR ACSR / AAAC BUS-BAR

1.0 SCOPE

The specification covers design, engineering, manufacture, testing at manufacturer’s works, supply and delivery of heavy duty AAAC bus-bar for use in 33 kV sub-station.

1.2 MATERIALS

The 232 sq. mm AAAC bus bar shall be drawn.

The strung bus-bar shall be of heavy duty type and design to operate within set temperature limits and to withstand thermal and electromechanical forces developed due to short circuits.

1.3 MECHANICAL CHARACTERISTICS

The mechanical strength of the strung bus-bar shall be limited to be maximum allowable tension for specific size of conductor as per ISS.

1.4 DIMENSIONAL TOLERANCE

Dimensional tolerances shall be as per relevant ISS.
1.0 **SCOPE**

1.1 This Specification provides for the design, manufacture, inspection and testing before dispatch, packing and delivery F.O.R. (destination) of metal oxide (gapless) Surge Arresters with discharge counters, insulating base, terminal connectors and other accessories as specified here in.

Following is the list of documents constituting this Specification. :

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th>Annexure</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i)</td>
<td>Technical Specification (TS)</td>
<td></td>
</tr>
<tr>
<td>(ii)</td>
<td>Check-List.</td>
<td>Annexure-B</td>
</tr>
<tr>
<td>(iii)</td>
<td>Calibration Status of testing equipments and meters/ Instruments.</td>
<td>Annexure-C</td>
</tr>
<tr>
<td>(iv)</td>
<td>Check-list towards Type Test Reports.</td>
<td>Annexure-D</td>
</tr>
</tbody>
</table>

Note : Annexure-B, C, & D are to be filled up by the Bidder.

All the above along with amendments thereof shall be read and interpreted together. However, in case of a contradiction between the Technical Specification and any other volume, the provisions of this volume will prevail.

1.2 The Surge Arrester shall conform in all respects to high standards of engineering, design, workmanship and latest revisions of relevant standards at the time of offer and purchaser shall have the power to reject any work or materials, which in his judgement is not in full accordance therewith.

1.3 **STANDARDS:**

Except to the extent modified in the Specification, the Surge Arrester shall conform to the latest editions and amendments of the standards listed hereunder.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Standard Ref. No.</th>
<th>Title.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>IS:2147</td>
<td>Degree of protection, provided by enclosures for low voltage switchgear and control.</td>
</tr>
<tr>
<td>3</td>
<td>IS:2629</td>
<td>Recommended practice for hot dip galvanization of iron and steel.</td>
</tr>
<tr>
<td>4</td>
<td>IS:2633</td>
<td>Method for testing uniformity of coating on zinc coated articles.</td>
</tr>
<tr>
<td>5</td>
<td>IS:3070</td>
<td>Specification for surge arresters for alternating current system.</td>
</tr>
<tr>
<td>7</td>
<td>IEC-60-1</td>
<td>High-Voltage Test technique.</td>
</tr>
<tr>
<td>8</td>
<td>IEC-270</td>
<td>Partial discharge measurements.</td>
</tr>
<tr>
<td>9</td>
<td>IEC-99-1</td>
<td>Non-linear resistor type gapped arresters for a.c. systems.</td>
</tr>
<tr>
<td>10</td>
<td>Indian Electricity Rules, 1956.</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>IEC-60815</td>
<td>Shed profile of hollow porcelain Insulator.</td>
</tr>
</tbody>
</table>
Surge Arresters with the requirement of other authoritative standards, which ensure equal or better quality than the standards, mentioned above shall also be acceptable. Where the equipment offered by the supplier conforms to other standards, salient points of difference between the standards adopted and the specified standards shall be clearly brought out in the offer. 4 (Four) copies of the reference standards in English language shall be furnished along with the offer.

1.5 GENERAL TECHNICAL REQUIREMENTS:

1.5.1 The Surge Arrester shall confirm the technical requirements

1.5.2 The energy handling capability of each rating of Arrester offered, supported by calculations, shall be furnished with the offer.

1.5.3 The Surge Arresters shall be fitted with pressure relief devices and arc diverting paths and shall be tested as per the requirements of IEC for minimum prospective symmetrical fault current as specified in Appendix-I.

1.5.4 A grading ring shall be provided if required, (for attaining all the relevant technical parameters) on each complete Surge Arrester.

1.6 PROTECTIVE LEVELS:

Surge Arresters shall be capable of providing protection to sub-station equipments, designed for the withstand levels, given in the following table.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Equipment to be protected</th>
<th>Insulation Level of 36KV System</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>L.I. Level (KVP)</td>
</tr>
<tr>
<td>1</td>
<td>Power Transformers.</td>
<td>☐ 170</td>
</tr>
<tr>
<td>2</td>
<td>Instrument Transformers.</td>
<td>☐ 170</td>
</tr>
<tr>
<td>3</td>
<td>Reactors</td>
<td>☐ 170</td>
</tr>
<tr>
<td>4 (i)</td>
<td>Circuit Breakers/Isolators.</td>
<td>☐ 170</td>
</tr>
<tr>
<td></td>
<td>Phase to ground.</td>
<td>☐ 170</td>
</tr>
</tbody>
</table>

Surge arrester shall be suitable for the following duty cycles of circuit breaker at the following system voltages:

| 36 KV Circuit Breaker | 0-0.3 sec-co-3 min-co |

1.7 DUTY REQUIREMENT:

1.7.1 Surge Arresters shall be of heavy-duty station class and gapless type without any series or shunt gaps.

   i. Surge Arresters shall be capable of discharging over voltages occurring during switching of un-loaded transformers, lines, capacitors and reactors.

   ii. The Surge Arresters shall be capable of discharging lightning and switching surges and temporary power frequency over-voltages.

   iii. The Surge Arresters shall be capable of discharging the energy equivalent to class 3 of IEC-99-4.
1.7.2 The reference current of the arrester shall be high enough to eliminate the influence of grading and stray capacitance on the measured reference voltage. The supplier shall submit values and the supporting evidence along with calculations on above.

1.7.3 Surge Arresters shall be fully stabilized thermally to give a life expectancy as per standard under site conditions.

Surge Arresters shall be able to withstand maximum wind load of 260 Kg./sq.m.

1.7.5 Surge Arresters shall be capable of withstanding effects of direct solar radiation

1.7.6 Surge arresters shall be capable of spark over on severe switching Surges and multiple strokes.

1.7.7 The Surge Arrester should be adequately designed to operate satisfactorily under temporary power frequency over-voltage as given in specific technical requirements, after discharging two shots of respective long duration surges.

1.7.8 Unless otherwise brought out separately by the Bidder in the schedule of deviations, the Surge Arresters, offered shall conform to the specification scrupulously. All deviations from the specification shall be brought out in the schedule of deviations. The discrepancies between the specification and the catalogues or literature, submitted as part of the offer shall not be considered as valid deviations unless specifically brought out in the schedule of deviations.

1.8 CONSTRUCTION :

1.8.1 Non linear blocks shall be sintered metal oxide material. These shall be provided in such a way as to obtain robust construction with excellent electrical and mechanical properties even after repeated operations.

1.8.2 All the units of arresters of same rating shall be inter-changeable without adversely affecting the performance.

1.8.3 The Surge Arresters shall be suitable for pedestal type mounting.

1.8.4 All the necessary flanges, bolts, nuts, clamps etc. required for assembly of complete arrester with accessories and mounting on support structure to be supplied by the purchaser, shall be included in supplier’s scope of supply.

1.8.5 The drilling details for mounting the Arrester on Purchaser’s support shall be supplied by the supplier.

1.8.6 The minimum permissible separation between the Surge Arrester and any earthed object shall be indicated by the Bidder in his offer.
1.8.7 Surge Arresters shall be designed to incorporate pressure relief devices and arc diverting paths to prevent shattering of the blocks or the porcelain housing, following prolonged current flow or internal flash over and providing path for flow of rated fault currents in the event of arrester failure.

1.8.8 Surge Arresters shall incorporate anti-contamination feature to prevent arrester failure, caused by uneven voltage gradient across the stack, resulting from contamination of the arrester porcelain.

1.8.9 Seals shall be provided in such a way that these are always effectively maintained even when discharging rated lightning current.

1.8.10 The heat treatment cycle details along with necessary quality checks used for individual blocks along with insulation layer, formed across each block are to be furnished. Metalised coating thickness for reduced resistance between adjacent discs is to be furnished along with the procedure for checking the same. Details of thermal stability test for current distribution of current on individual disc is to be furnished.

1.8.11 Each individual unit of Surge Arresters shall be hermetically sealed and fully protected against ingress of moisture. The hermetic seal shall be effective for the entire lifetime of the arrester and under the service conditions as specified. The supplier shall furnish sectional view of the arrester showing details of sealing employed.

1.8.12 The Surge Arresters shall be suitable for hot line washing.

1.9 PORCELAIN HOUSING:

1.9.1 All porcelain Housings shall be free from lamination cavities or other flaws, affecting the maximum level of mechanical and electrical strengths.

1.9.2 The porcelain shall be well vitrified and non-porous.

1.9.3 The minimum creep age distance of the arrester housing shall be as per Cl 7.21 of the TS.

1.9.4 The porcelain petticoat shall be preferably of self-cleaning type (Aerofoil design). The details of the porcelain housing such as height, angle of inclination, shape of petticoats, gap between the petticoats, diameter (ID and OD) etc. shall be indicated by the Bidder in his offer in the form of detailed drawing.

1.9.5 Porcelain housings shall be so co-coordinated that external flash over will not occur due to application of impulse or switching Surge voltages up to the maximum design value for arrester.
1.10 **GALVANISATION, NICKEL PLATING ETC:**

1.10.1 All ferrous parts exposed to atmosphere shall be hot dip galvanized as per IS: 2629, as amended from time to time. Tinned copper/brass lugs shall be used for internal wiring of discharge counter. Screws used for electrical connections shall be either made of brass or shall be nickel-plated.

1.10.2 Ground terminal pads and nameplate brackets shall be hot dip galvanized.

1.10.3 The material shall be galvanized only after completing all shop operations

1.11 **ACCESSORIES AND FITTINGS:**

1.11.1 **Surge Counters**

1.11.2 A self-contained Surge counter, suitably enclosed for outdoor use and requiring no auxiliary of battery supply for operation shall be provided for each unit. The surge counter shall be operated by the discharge current, passed by the surge arrester and shall be suitable for mounting on the support structure of the Arrester.

1.11.3 Surge counters shall be of the Electro-mechanical type and designed for continuous service.

1.11.4 The cyclometer counter shall be visible through an inspection window from ground level. The counter terminals shall be robust and adequate size and shall be so located that the incoming and outgoing connections are made with minimum possible bends.

1.11.5 Internal parts shall be unaffected by atmospheric conditions at site. Alternatively, a weather proof housing to IP 55 shall be provided and this shall be designed to allow the recording device to be read from ground level without exposing the internal parts to the atmosphere.

1.11.6 The Surge Counter shall be connected in the main earth lead from the arrester in such a manner that the direction of the earth lead is not changed or its surge impedance materially altered. A bolted link shall be provided so that the surge counter may be short circuited and removed without taking the arrester out of service.

1.11.7 All necessary accessories and earthing connection leads between the bottom of the Arrester and discharge counter shall be in the supplier’s scope of supply.

1.12 **LEAKAGE CURRENT METERS:** (In case of 33 Kv surge arrester only)

1.12.1 Leakage current meters (suitable milli-ammeter) shall be connected in the earthing path of the surge arresters to measure the resistor grading leakage current. Meters shall be designed for continuous service.

1.12.2 The ammeter shall be suitable for mounting on the support structure of the arrester. The push buttons shall be mounted such that it can be operated from the ground level.

1.12.3 The internal parts shall be fully weather-proof to IP 55 or better with a transparent cover to provide an unobstructed view of the ammeter.
1.12.4 Arresters shall be complete with insulating base having provision for bolting to flat surface of the structure.

1.12.5 The grounding terminals shall be suitable for accommodating purchaser’s grounding connection to steel earth mat.

1.12.6 The Bidder has to quote unit rates of the insulting base and the surge counter separately. The purchaser reserves its option to procure insulting base and surge counter.

1.12.7 Clamp type terminal connector, suitable for 33KV-AAA Panther-up Conductor shall be provided having both horizontal and vertical take-off.

1.12.8 Two clamp type ground terminal connectors, suitable for G. I. Strip (50 x 6) or (50 x 8) should be provided.

1.12.9 All interconnecting hard wares such as nuts, bolts, spring washers etc. with 5% spares shall be supplied for different units.

1.12.10 Pollution Shunt (Copper braid) shall be supplied along with each surge Arrester for by-passing the surface current.

Other standard accessories, which are specifically not mentioned, but are usually provided with Surge Arrester of such type and rating for efficient and trouble free operation should be supplied.

1.13 NAME PLATE:

Each single pole Arrester shall be provided with non-corrosive legible name plate, at the base bearing thereon, voltage rating of the complete pole and the number of demountable sections with the following data, indelibly marked

i) NESCO / WESCO / SOUTHCO

ii) Purchase order No. & Date.

iii) Name of device.

iv) Manufacturer’s name and trademark and identification no. of the arrester being supplied.

v) Year of manufacture

vi) Rated voltage

vii) Rated Frequency

viii) Maximum continuous operating voltage.

ix) Type

x) Nominal discharge current.

xi) Long duration discharge class.

xii) Pressure relief current in KA(rms)

xiii) Energy discharge capability (KJ / KV rating).
1.14 TEST:

1.14.1 Type Tests:

The surge Arrester offered should have been subjected to the following type tests in an independent
Government approved test laboratory. The bidder shall furnish four sets of type test reports along with
the offer. These tests must not have been conducted earlier than five years from the date of opening of
technical bid. For any change in the design, type already type tested and the design type offered
against this specification, the purchaser reserves the right to demand repetition of some or all type tests
without any extra cost to NESCO/WESCO/SOUTHCO, in the presence of Purchaser’s representative at
the cost of the supplier.

1 Insulation withstands tests:
(a) Lightning Impulse Voltage Test.
2 Residual voltage tests.
3 Long duration current impulse withstand tests.
4 Operating duty tests.
5 Pressure relief tests.
   (a) High current test.
   (b) Low current test.
6 Power frequency voltage vs. time curve.
   (Temporary over voltage test)
7 Contamination test. (artificial pollution test).
8 Seismic withstand test.
9 IP-55 test on surge counter.
10 Minimum current operation tests of the surge counter.
11 Maximum current withstand test of the surge counter.
12 Mechanical terminal load test on bushing.
13 Partial discharge test.

N.B.: Even if the condition i.e. the dry arcing distance or the sum of the partial dry arcing distances is larger
than the test voltage divided by 500 KV/m’, the lightning impulse voltage test must have been
conducted or is to be conducted without any financial liability to NESCO / WESCO / SOUTHCO.

Even if the type test reports are found to be valid as per this specification, the purchaser reserves the
right to demand the repetition of some or all the type tests in the presence of purchaser’s
representative. For this purpose, the bidder shall quote unit rates for carrying out each type test. These
prices, if necessary, will be taken into consideration for bid evaluation.

1.14.2 ROUTINE TESTS:

The following routine tests shall be conducted at the supplier’s cost on each surge arrester and shall be
submitted along with or before offering for inspection for purchaser’s approval.

(a) Measurement of reference voltage.
(b) Residual voltage tests.
(c) Measurement for partial discharge and contact noise.
(d) Sealing test for units with sealed housings.
1.14.3 ACCEPTANCE TESTS:

The following tests, considered as acceptance tests, shall be conducted in the presence of purchasers representative for which no charges will be payable by NESCO/WESCO/SOUTHCO. The acceptance tests, whenever possible shall be conducted on the complete arrester unit. The number of samples to be subjected to acceptance test shall be decided by the purchaser at the time of actual testing.

I Temperature Cycle Test on Housing.

II Measurement of Power Frequency Voltage at the reference current.

III Measurement of leakage current and capacitive current at M.C.O.V.

IV Lightning Impulse Residual Voltage Test at N.D.C., 50% of N.D.C. & 200% of N.D.C.

V Partial Discharge Tests on complete arresters/units at 1.05 times M.C.O.V.

VI Special Thermal stability test.

VII Porosity test on porcelain components.

VIII Galvanization test on metal parts.

IX The functional (operational) test on the Surge Counter by way of checking its operation at following nominal discharge currents:
   a) 100 Amps with 8/20 micro second wave shape.
   b) 10 KA with 8/20 micro second wave shape.

X Check of calibration of leakage current meters.

1.15 INSPECTION:

I The purchaser shall have access at all time to the works and all other places of manufacture, where the Surge Arresters are being manufactured and the supplier shall provide all facilities for unrestricted inspection of the supplier's works, raw materials, manufacture of all the accessories and for conducting the necessary tests.

II The supplier shall keep the purchaser informed in advance of the time of starting and the progress of manufacture of equipment in its various stages so that arrangements could be made for inspection.

III No material shall be despatched from its point of manufacture unless the material has been satisfactorily inspected, tested and despatch schedule attached to this specification.

IV The acceptance of any quantity of equipment shall in no way relieve the supplier of his responsibility for meeting all the requirements of this specification and shall not prevent subsequent rejection, if such equipments are later found to be defective.

1.16 QUALITY ASSURANCE PLAN:

1.16.1 The Bidder shall invariably furnish following information along with his offer, failing which the offer shall be liable for rejection.
(i) Statement giving list of important raw materials, names of sub-suppliers for the raw materials, list of standards according to which the raw materials are tested, list of tests, normally carried out on raw materials in presence of Bidder’s representative, copies of test certificates.

(ii) Information and copies of test certificates as in (i) above in respect of bought-out items.

(iii) List of manufacturing facilities available.

(iv) Level of automation, achieved and list of areas where manual processing exists.

(v) List of areas in manufacturing process where stage inspections are normally carried out for quality control and details of such tests and inspections.

(vi) Special features provided in the equipment to make it maintenance free.

(vii) List of testing equipments, meters available with Bidder for final testing of equipment, specified and test plant limitation, if any, vis-à-vis the type, acceptance and routine tests, specified in the relevant standards and this specification. These limitations shall be very clearly brought out in the offer.

(viii) All the testing equipments, meters etc. should have been calibrated in a Government approved laboratory. The Bidder must submit the list of testing equipments and meters test-wise as per Annexure-C of this Technical Specification.

1.16.2 The suppliers, within 30 days of placement of order submit the following information to the purchaser.

(i) List of raw materials as well as bought out accessories and the names of the materials as well as bought-out accessories and the names of sub-suppliers, selected from those, furnished along with the offer.

(ii) Type test certificates of the raw material and bought out accessories.

(iii) Quality Assurance Plan (QAP) with hold points for the purchaser’s inspection. The QAP and hold points shall be discussed between the purchaser and the supplier before the QAP is finalised.

1.16.3 The supplier shall submit the routine test certificates of bought out item and raw material at the time of acceptance testing of the fully assembled equipment.

1.17 DOCUMENTATION:

1.17.1 All drawings shall conform to relevant Indian Standard as per relevant IS. All drawings shall be in ink and suitable for microfilming. All dimensions and data shall be in S.I. Units.

1.17.2 The supplier shall furnish four sets of following drawings / documents along with his offer.

(i) General outline drawings of the complete Arrester with technical parameters.

(ii) Drawings showing clearance from grounded and other line objects and between adjacent poles of Surge Arresters, required at various heights of Surge Arresters.
(iii) Drawings showing details of pressure relief devices.
(iv) Detailed drawing of discharge counters along with the wiring and schematic drawing of discharge counter and meter.
(v) Outline drawing of insulating base.
(vi) Details of grading rings, if used.
(vii) Mounting details of Surge Arresters.
(viii) Details of line terminal and ground terminals.
(ix) Volt-time characteristics of Surge Arresters.
(x) Details of galvanization being provided on different ferrous parts.
(xi) The detailed dimensional drawing of porcelain Housing such as ID, OD, thickness and insulator details such as height, profile of petticoats, angle of inclination and gap between successive petticoats, total creepage distance etc.
(xii) Cross-sectional view of the Surge Arrester Units showing all components.

1.18 TEST REPORTS:
(i) Four copies of type test reports shall be furnished to the purchaser with the tender specification. Copies of acceptance test reports and routine test reports shall be furnished to the purchaser. One copy will be returned duly certified by the purchaser and only thereafter shall the materials be despatched.
(ii) All records of routine test reports shall be maintained by the supplier at his works for periodic inspection by the purchaser.
(iii) All test reports of tests, conducted during manufacture shall be maintained by the supplier. These shall be produced for verification as and when requested for by the purchaser.

1.19 PACKING AND FORWARDING:
1.19.1 The equipment shall be packed in suitable crates so as to withstand handling during transport and outdoor storage during transit. The supplier shall be responsible for any damage to the equipment during transit, due to improper and inadequate packing. The easily damageable material shall be carefully packed and marked with the appropriate caution symbols. Wherever necessary, proper arrangement of lifting such as lifting hooks etc. shall be provided. Any material found short inside the packing cases shall be supplied by the supplier without any extra cost.
1.19.2 Each consignment shall be accompanied by a detailed packing list containing the following informations:
(a) Name of the consignee:
(b) Details of consignment:
(c) Destination:
(d) Total weight of consignment:
(e) Sign showing upper/lower side of the crate:
(f) Handling and unpacking instructions:
(g) Bill of materials indicating contents of each package:

The supplier shall ensure that the bill of materials is approved by the purchaser before despatch.

1.20 QUANTITY AND DELIVERY REQUIREMENT:

The scope of supply shall include a supply of 2.5% extra quantity of bolts, nuts, washers, split pins, cotter pins and such other small loose items free of cost.

TECHNICAL REQUIREMENTS FOR METAL OXIDE (GAPLESS)

1.21 SURGE ARRESTERS

1.21.1 The Surge Arrester under this Specification shall conform to the parameters given below:

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Particulars.</th>
<th>Technical Parameters for Surge Arrestors</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>30 KV</td>
</tr>
<tr>
<td>1</td>
<td>Nominal system voltage (phase to phase) (KV rms).</td>
<td>33</td>
</tr>
<tr>
<td>2</td>
<td>Highest system voltage (phase to phase) (KV rms).</td>
<td>36</td>
</tr>
<tr>
<td>3</td>
<td>System Frequency (HZ).</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>System Neutral earthing.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Installation.</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Class.</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Type of construction for 10 KA rated arrester.</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>No. of phases.</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Maximum duration of earth fault (Sec.)</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Maximum prospective symmetrical fault current at arrester location (KA rms.)</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>Description</td>
<td>Value 1</td>
</tr>
<tr>
<td>---</td>
<td>-----------------------------------------------------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>11</td>
<td>Rated arrester voltage (KV rms)</td>
<td>30</td>
</tr>
<tr>
<td>12</td>
<td>Nominal discharge current (KAP) Discharge current at which insulation co-ordination will be done</td>
<td>10 KA of 8/20 µsec Wave.</td>
</tr>
<tr>
<td>13</td>
<td>Minimum energy discharge capability (KJ/KV)</td>
<td>As per relevant ISS/IEC</td>
</tr>
<tr>
<td>14</td>
<td>Maximum continuous operating voltage at 50º C (KV rms)</td>
<td>25</td>
</tr>
<tr>
<td>15</td>
<td>Maximum switching surge residual voltage (KVP)</td>
<td>72 at 500A</td>
</tr>
<tr>
<td>16</td>
<td>Maximum residual voltage at 8/20 micro second(KVP)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(i) 5 KA.</td>
<td>85</td>
</tr>
<tr>
<td></td>
<td>(ii) 10 KA Nominal discharge current.</td>
<td>90</td>
</tr>
<tr>
<td></td>
<td>(iii) 20 KA.</td>
<td>100</td>
</tr>
<tr>
<td>17</td>
<td>Long duration discharge class</td>
<td>2</td>
</tr>
<tr>
<td>18</td>
<td>High current short duration test value (KAP) (4/10 Micro-second wave).</td>
<td>100</td>
</tr>
<tr>
<td>19</td>
<td>Current for pressure relief test (KA-rms)</td>
<td>40</td>
</tr>
<tr>
<td>20</td>
<td>Minimum total creepage distance (mm).</td>
<td>900</td>
</tr>
<tr>
<td>21</td>
<td>One minute dry and wet power frequency withstand voltage of Arrester housing (KV-rms).</td>
<td>70</td>
</tr>
<tr>
<td>22</td>
<td>Impulse withstand voltage of arrester housing with 1.2/ 50 micro-second wave (KVP). Switching Impulse Voltage (Wet) (KVP)</td>
<td>110.5</td>
</tr>
<tr>
<td></td>
<td>(a)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(b)</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Pressure relief class.</td>
<td>A</td>
</tr>
<tr>
<td>24</td>
<td>Corona extinction voltage (KV-rms).</td>
<td>-</td>
</tr>
<tr>
<td>25</td>
<td>RIV at 92 KV rms.</td>
<td>Less than 500 micro volts</td>
</tr>
<tr>
<td>26</td>
<td>Partial discharge at 1.05 times continuous over-voltage.</td>
<td>Nor more than 50 PC</td>
</tr>
<tr>
<td>27</td>
<td>Seismic acceleration.</td>
<td>0.3g horizontal 0.15g vertical</td>
</tr>
<tr>
<td>----</td>
<td>----------------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>28</td>
<td>Reference ambient temperature.</td>
<td>50ºC</td>
</tr>
<tr>
<td>29</td>
<td>(a) IR at MCOV.</td>
<td>Less than 400 micro amperes</td>
</tr>
<tr>
<td></td>
<td>(b) IC at MCOV.</td>
<td>Less than 1200 micro amperes</td>
</tr>
<tr>
<td>30</td>
<td>a) Reference Current (mA)</td>
<td>1 to 5 mA</td>
</tr>
<tr>
<td></td>
<td>b) Reference voltage at reference current.</td>
<td>Greater than rated voltage.</td>
</tr>
<tr>
<td>31</td>
<td>Maximum steep current Impulse RDV (KVP). at KAP</td>
<td>100</td>
</tr>
<tr>
<td>32</td>
<td>Maximum cantilever strength of the arresters (KGM).</td>
<td>325</td>
</tr>
<tr>
<td>33</td>
<td>TOV(KVP).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(i) 0.1 sec.</td>
<td>53</td>
</tr>
<tr>
<td></td>
<td>(ii) 1.0 sec.</td>
<td>51</td>
</tr>
<tr>
<td></td>
<td>(iii) 10.0 sec.</td>
<td>49</td>
</tr>
<tr>
<td></td>
<td>(iv) 100.0 sec.</td>
<td>47</td>
</tr>
</tbody>
</table>

**ANNEXURE – B**

**CHECK – LIST**

1. Whether calculation towards energy handling capability of the Surge Arrester furnished?
2. Whether the heat treatment cycle details along with necessary quality checks used for individual blocks furnished?
3. Whether sectional view of arrester furnished showing details of sealing provided?
4. Whether porcelain petticoat is of Aero foil design? Whether drawing of porcelain Housing as per Clause No.7.9 of TS furnished?
5. Whether drawings and documents as per TS furnished?
6. Whether special measures in the manufacture of Surge Arrester for operating at ambient temperature of 50ºC (against 40 ºC as per IEC-99-4, Clause No.4.4.1) are to be taken? ....................... State the special measures in details ..................
1.0 **SCOPE:-**
This specification covers manufacturing testing and supply of 3 Pole, 400 AMP, 50 Hz, Single break, 33 KV & 11 KV class Air Break switches for outdoor installations to be used at 33/11 KV Sub-stations and for incoming & outgoing Lines suitable for operation under off load conditions.

1.1 **DESCRIPTION OF THE MATERIALS:-**

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

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Description</th>
<th>Parameters of AB Switch</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>33 KV</td>
</tr>
<tr>
<td>i)</td>
<td>Number of poles</td>
<td>3</td>
</tr>
<tr>
<td>ii)</td>
<td>Number of Post insulator per pole</td>
<td>4 nos. 22/24 KV class</td>
</tr>
<tr>
<td>iii)</td>
<td>Nominal system voltage (KV)</td>
<td>33</td>
</tr>
<tr>
<td>iv)</td>
<td>Highest System Voltage (KV)</td>
<td>36</td>
</tr>
<tr>
<td>v)</td>
<td>Rated frequency</td>
<td>50HZ</td>
</tr>
<tr>
<td>vi)</td>
<td>System earthing</td>
<td>effectively earthed.</td>
</tr>
<tr>
<td>vii)</td>
<td>Rated nominal current Amp.</td>
<td>400</td>
</tr>
<tr>
<td>viii)</td>
<td>Altitude of installation</td>
<td>Not exceeding 1000 M</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Description</th>
<th>Parameters P.I. of AB Switches for</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>33 KV</td>
</tr>
<tr>
<td>i)</td>
<td>Power frequency withstand voltage (dry) KV (RMS)</td>
<td>95</td>
</tr>
<tr>
<td>ii)</td>
<td>Power frequency withstand voltage (wet) KV (RMS)</td>
<td>75</td>
</tr>
<tr>
<td>iii)</td>
<td>Impulse withstand voltage (dry) KV (Peak)</td>
<td>170</td>
</tr>
<tr>
<td>iv)</td>
<td>Power frequency puncture withstand</td>
<td>1.3 times the actual dry flashover voltage of the</td>
</tr>
</tbody>
</table>
1.2 **STANDARDS:** The AB Switch Set shall conform to the following standards:

i) IS-9920 (Part-I to V.)
ii) IS-2544/1973 (for porcelain post insulators)
iii) Is-2633 (for galvanization of ferrous parts.) or its latest amendments if any.

1.3 **INSULATORS:**
12 KV class (for 11 KV AB Switches) and 22 KV / 24 KV class (for 33 KV AB Switches) Post Insulators complete with pedestal 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.

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

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

1. Maximum ambient air temperature. 45 °C
2. Maximum daily average air temperature 35 °C
3. Maximum yearly average ambient air temperature 30 °C
4. Maximum temperature attainable by a body exposed to the sun. 50 °C
5. Minimum ambient air temperature 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./ mm²

1.5 **TECHNICAL DETAILS:**

1.5.1 The 33 KV A.B. Switch Set shall be gang operated (with double tandem pipe) single air break outdoor type horizontal mounting having 4 nos. 22/24 KV post insulator per phase and the 11 KV A.B. Switch Set shall be gang operated single (with double tandem pipe) air break outdoor type horizontal mounting having 2 nos. 12 KV 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 affect any of its parts. The required base M.S. Channel, 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 gauge of 32mm diameter nominal bore G.I. pipe single piece 6 meters. The phase coupling rod for gang operation shall medium gauge 25mm dia nominal bore G.I. Pipe. Rotating post insulators shall be provided with suitable bearing mounted on a base channel with 6 mm thick thrust collar 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 through stainless steel bolts with double nuts. The post insulators should be fixed with the base channel using Galvanized Nuts and Bolts.

All the bearings shall be provided with grease nipple. All ferrous parts shall be galvanized and polished. The pipes shall be galvanized in accordance with IS-4736/1968.

1.5.2 Mounting:-

The A.B. Switches shall be suitable for horizontal mounting in all type of sub-station structures.

1.5.3 Switching Blades:-

It shall be made out of electrolytic copper with silver plated. The approximate size shall be 250mm x 50 x 8mm for 11 KV. 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

1.5.4 Fixed Contracts:-

The fixed jaw type female contracts (50x8x95 )mm for 11 KV shall be made of electrolytic copper (minimum 95 % copper composition) duly electroplated controlled by Phosphor bronze high pressure spring housed in robust G.I. Cover.

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.

1.5.5 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.

1.5.5 Terminal Connectors:-
Terminal connectors shall be robust in design. The size of fixed connector shall be (80 x 50 x 8 mm) and size of movable connector shall be (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. bimetallic solderless sockets suitable up to ACSR Panther or AAAC 232 mm² conductor.

1.5.6 Spacing:
The minimum clearance between phase to the switch shall be 1200 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 560 mm. In the open position of the A.B. Switches the moving blade shall rotate through an angle of 90°. This shall be exhibited in the drawing.

1.5.7 Drawing & Literatures:
Drawings of each item i.e. 11 KV, 630 amp and 33 KV 400 amp, 3 Pole, single break A.B. Switch shall be furnished along with the tender.

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

1.6 TESTS & TEST CERTIFICATE

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

i. Impulse voltage dry test

ii. Power frequency voltage dry test

iii. Power frequency voltage wet test

iv. Temperature of resistance.

v. Measurement of resistance.

vi. Test to prove the capability of carrying the rated peak short circuit current and the rated short time current.

vii. Mainly active load breaking capacity test.

viii. Transformer off-load breaking test.

ix. Line charging breaking capacity test.

x. Operation tests.

xi. Mechanical endurance test.


Besides, mechanical endurance test will have to be conduct on one set in the presence of our authorized person who shall be deputed to carryout acceptance tests before delivery of the materials.

1.6.2 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. Galvanization test.

1.7 GUARANTEED TECHNICAL PARTICULARS:-

The tenderer shall furnish the guaranteed technical particulars duly filled in the format at Appendix-I along with the tender.

1.8 COMPLETENESS OF EQUIPMENT:-

Any fittings, accessories for 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.

1.9 INSPECTION:-

Routine and acceptance tests 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 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.
<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Particulars</th>
<th>Desired values</th>
<th>Bidder's offer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Maker’s name and country of origin</td>
<td>To be specified by the tenderer</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Type of Switch</td>
<td>Rotating type only</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Suitable for mounting</td>
<td>Horizontal only</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Post Insulator.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a)</td>
<td>Maker’s name and country of origin</td>
<td>To be specified by the tenderer</td>
<td></td>
</tr>
<tr>
<td>b)</td>
<td>Type of cementing</td>
<td>To be quoted for original cemented only &amp; as per IS-2544-1973 &amp; relevant IEC.</td>
<td></td>
</tr>
<tr>
<td>c)</td>
<td>One minute power frequency withstand voltage Dry</td>
<td>95 KV RMS.</td>
<td></td>
</tr>
<tr>
<td>d)</td>
<td>One minute power frequency withstand voltage Wet</td>
<td>75 KV RMS.</td>
<td></td>
</tr>
<tr>
<td>e)</td>
<td>Visible discharge voltage</td>
<td>27 KV RMS.</td>
<td></td>
</tr>
<tr>
<td>f)</td>
<td>Dry Flashover Voltage</td>
<td>To be specified by the tenderer</td>
<td></td>
</tr>
<tr>
<td>g)</td>
<td>Power frequency puncture with stand voltage</td>
<td>1.3 times of actual dry flash over voltage</td>
<td></td>
</tr>
<tr>
<td>h)</td>
<td>Impulse withstand voltage (switch in position)</td>
<td>170 KV (peak)</td>
<td></td>
</tr>
<tr>
<td>i)</td>
<td>Creepage distance (mm)</td>
<td>380 mm minimum. (actual creepage distance for which type test have been conducted is to be specified by the tenderer.)</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Impulse withstand voltage for positive and negative polarity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a)</td>
<td>Across the isolating distance</td>
<td>195 KV (peak)</td>
<td></td>
</tr>
<tr>
<td>b)</td>
<td>To earth &amp; between poles</td>
<td>170 KV (peak)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Description</td>
<td>Value</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>------------------------------------------------------------------------------</td>
<td>---------------------</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>One minute power frequency withstand voltage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a)</td>
<td>Across the isolating distance</td>
<td>80 KV (RMS)</td>
<td></td>
</tr>
<tr>
<td>b)</td>
<td>To earth &amp; between poles</td>
<td>70 KV (RMS)</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Rated normal current and rated frequency</td>
<td>400 amps. 50 Hz</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Rated short time current.</td>
<td>16 KA (RMS)</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Rated short circuit making capacity</td>
<td>25 KA (RMS)</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Rated peak withstand current</td>
<td>40 KA (Peak)</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Rated cable charging breaking capacity</td>
<td>40 KA (RMS)</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Rated Transformer off load breaking capacity</td>
<td>16 Amp (RMS)</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Rated line charging breaking capacity</td>
<td>5.3 Amps (RMS)</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Minimum clearance between adjacent phases</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a)</td>
<td>Switch Closed (centre to centre)</td>
<td>1200 mm</td>
<td></td>
</tr>
<tr>
<td>b)</td>
<td>Switch Opened (centre to edge of blade)</td>
<td>640 mm</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Temperature rise</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a)</td>
<td>Temperature rise shall not exceed the maximum limit as specified below at an ambient temperature not exceeding in 40 °C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b)</td>
<td>Copper contacts in air</td>
<td>65 °C</td>
<td></td>
</tr>
<tr>
<td>c)</td>
<td>Terminal of switch intended to be connected to external conductor by bolts</td>
<td>50 °C</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Vertical Clearance from top of insulator cap to mounting channel</td>
<td>508 mm (minimum)</td>
<td></td>
</tr>
</tbody>
</table>
18. Type of Contact: -

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a)</td>
<td>Self aligned, high pressure jaw type fixed contacts of electrolytic copper of size 80 mm x 50 mm x 8 mm duly silver plated. Each contact should be revetted 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 assemblies are to be bolted through stainless steel bolts and nuts with stainless steel flat and spring washer.</td>
<td></td>
</tr>
<tr>
<td>b)</td>
<td>Solid rectangular blade type moving contact of electrolytic copper size 250 mm x 50 mm x 8 mm duly silver plated ensuring a minimum deposit of 10 micron of silver on copper contacts or as may be prescribed under relevant ISS / IEC.</td>
<td></td>
</tr>
<tr>
<td>c)</td>
<td>Pressure spring to be used in jaw contacts shall be Stainless Steel 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)</td>
<td></td>
</tr>
</tbody>
</table>

19. Connectors:-

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Terminal connectors for both movable and fixed should be of copper flats of same size similar to that of moving contact blades (minimum 95% copper composition). The fixed connector shall of size 80 mm 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. of 3/8” stainless steel bolts, nuts, plain washers &amp; spring washers should be provided along with 2 nos solder less bimetallic sockets for each connector suitable sockets for each connector suitable up to 232 mm² AAA conductor.</td>
<td></td>
</tr>
</tbody>
</table>

20. Moving Contacts:-

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>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 no stainless steel bolts and nuts with suitable stainless steel flat and spring washers.</td>
<td></td>
</tr>
</tbody>
</table>

21. Galvanization

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a)</td>
<td>Iron parts shall be dip galvanized as per IS-2633/1972.</td>
<td></td>
</tr>
<tr>
<td>b)</td>
<td>The pipe shall be galvanized as per IS-4736/1968.</td>
<td></td>
</tr>
</tbody>
</table>

22. Details of Phase

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a)</td>
<td>Coupling Rod</td>
<td>25 mm nominal bore G.I. pipe medium gauge.</td>
</tr>
<tr>
<td>b)</td>
<td>Operating Rod</td>
<td>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) as mentioned below :-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Nominal base (mm)</th>
<th>Outside diameter (mm)</th>
<th>Diameter thickness (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Max</td>
<td>Min</td>
</tr>
<tr>
<td>---</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td>153</td>
<td>34.2</td>
<td>33.3</td>
</tr>
<tr>
<td>3.25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>42.9</td>
<td>42</td>
</tr>
<tr>
<td>3.25</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

c) **Arcing Horns**  
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 tapes:**  
450 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 lubricated bearing to be provided with grease nipple including 4th bearing being a thrust bearing.

h) **Locking arrangement**  
Pad Lock & Key arrangement at both 'ON' & 'OFF' position.

i) **Earth Terminal:**  
To be provided at base channels.

23. **Supporting Channels**  
100 mm x 50 mm M.S. Channel hot dip galvanized.

24. **Weight of each pole complete**  
To be specified by the tender
GUARANTEED TECHNICAL PARTICULARS FOR 11 KV, 630A, 3 POLE, 50 HZ, SINGLE BREAK A.B. SWITCHES

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Particulars</th>
<th>Desired values</th>
<th>Bidder’s offer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Maker’s name and country of origin</td>
<td>To be specified by the tenderer</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Type of Switch</td>
<td>Rotating type only</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Suitable for mounting</td>
<td>Horizontal only</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Post Insulator.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a)</td>
<td>Maker’s name and country of origin</td>
<td>To be specified by the tenderer</td>
<td></td>
</tr>
<tr>
<td>b)</td>
<td>Type of cementing</td>
<td>To be quoted original cemented only &amp; as per IS-2544-1973 &amp; relevant IEC.</td>
<td></td>
</tr>
<tr>
<td>c)</td>
<td>One minute power frequency withstand voltage Dry</td>
<td>35 KV RMS.</td>
<td></td>
</tr>
<tr>
<td>d)</td>
<td>One minute power frequency withstand voltage Wet</td>
<td>35 KV RMS.</td>
<td></td>
</tr>
<tr>
<td>e)</td>
<td>Visible discharge voltage</td>
<td>9 KV RMS.</td>
<td></td>
</tr>
<tr>
<td>f)</td>
<td>Dry Flashover Voltage</td>
<td>To be specified by the tenderer</td>
<td></td>
</tr>
<tr>
<td>g)</td>
<td>Power frequency puncture with stand voltage</td>
<td>1.3 times of actual dry flash over voltage</td>
<td></td>
</tr>
<tr>
<td>h)</td>
<td>Impulse withstand voltage (switch in position)</td>
<td>75 KV (peak)</td>
<td></td>
</tr>
<tr>
<td>i)</td>
<td>Creepage distance (mm)</td>
<td>320 mm minimum. (Confirming to ISS-2544 / 1973 &amp; relevant IEC)</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Impulse withstand voltage for positive and negative polarity 1.2 / 50 micro-second wave</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a)</td>
<td>Across the isolating distance</td>
<td>85 KV (peak)</td>
<td></td>
</tr>
<tr>
<td>b)</td>
<td>To earth &amp; between poles</td>
<td>75 KV (peak)</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>One minute power frequency withstand voltage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a)</td>
<td>Across the isolating distance</td>
<td>32 KV (RMS)</td>
<td></td>
</tr>
<tr>
<td>b)</td>
<td>To earth &amp; between poles</td>
<td>28 KV (RMS)</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>Rated normal current and rated frequency</td>
<td>630 Amps. 50 Hz</td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>Rated short circuit making capacity.</td>
<td>25 KA ( RMS )</td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>Rated short time current.</td>
<td>16 KA ( RMS )</td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>Rated peak withstand current</td>
<td>40 KA ( Peak )</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Description</td>
<td>Value</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>-----------------------------------------------------------------------------</td>
<td>----------------</td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>Rated mainly active load breaking capacity</td>
<td>630 Amp (RMS)</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Rated Transformer off load breaking capacity</td>
<td>6.3 Amp (RMS)</td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td>Rated line charging breaking capacity</td>
<td>2.5 Amps (RMS)</td>
<td></td>
</tr>
<tr>
<td>15.</td>
<td>Minimum clearance between adjacent phases</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>a) Switch Closed (centre to centre)</td>
<td>760 mm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Switch Opened (centre to edge of blade)</td>
<td>380 mm</td>
<td></td>
</tr>
<tr>
<td>16.</td>
<td>Temperature rise</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>a) Temperature rise shall not exceed the maximum limit as specified below at an ambient temperature not exceeding in 40ºC</td>
<td>40º C</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Copper contacts silver plated</td>
<td>65º C</td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) Terminal of switch intended to be connected to external conductor by bolts</td>
<td>50º C</td>
<td></td>
</tr>
<tr>
<td>17.</td>
<td>Vertical Clearance from top of insulator cap to mounting channel</td>
<td>254 mm (minimum)</td>
<td></td>
</tr>
<tr>
<td>18.</td>
<td>Type of Contact: -</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>a) Self aligned, high pressure jaw type fixed contacts of electrolytic copper of size 80 mm x 50 mm x 8 mm duly silver plated. Each contact should be revetted 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. This total thickness of copper foils per jaw should be 6 mm. Jaw assemblies are to be bolted through stainless steel bolts and nuts with stainless steel flat and spring washer.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Solid rectangular blade type moving contact of electrolytic copper size 220 mm x 50 mm x 8 mm duly silver plated ensuring a minimum deposit of 10 micron of silver on copper contacts or as may be prescribed under relevant ISS / IEC.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) Pressure spring to be used in jaw contacts shall be Stainless Steel 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)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
19. Connectors:-
Terminal connectors for both movable and fixed should be of copper flats of same size similar to that of moving contact blades (minimum 95% copper composition). The fixed connector shall of size 80 mm x 50 mm 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. of 3/8” stainless steel bolts, nuts, plain washers & spring washers should be provided along with 2 nos solder less bimetallic sockets for each connector suitable sockets for each connector suitable up to 80 Sq.mm conductor.

20. Moving Contacts:-
Movable contact is to be supported by galvanised angle of 50 x 50 x 5 mm in each phase and the moving contact are to be bolted through 2 no stainless steel bolts and nuts with suitable stainless steel flat and spring washers.

21. Galvanization
a) Iron parts shall be hot dip galvanised as per IS-2633/1972.

b) The pipe shall be galvanised as per IS-4736/1968.

22. 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) as mentioned below :-

<table>
<thead>
<tr>
<th>Nominal base (mm)</th>
<th>Outside diameter (mm)</th>
<th>Diameter thickness (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Max</td>
<td>Min</td>
</tr>
<tr>
<td>25</td>
<td>34.2</td>
<td>33.3</td>
</tr>
<tr>
<td>32</td>
<td>42.9</td>
<td>42</td>
</tr>
</tbody>
</table>

c) Arcing Horns
10 mm dia G.I. rod with spring assisted operation.

d) Force of Fixed contact spring
To be specified by the tenderer.
<table>
<thead>
<tr>
<th></th>
<th><strong>Copper braided flexible tapes:</strong></th>
<th>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.</th>
</tr>
</thead>
<tbody>
<tr>
<td>f)</td>
<td><strong>Quick break device</strong></td>
<td>Lever mechanism.</td>
</tr>
<tr>
<td>g)</td>
<td><strong>Bearings</strong></td>
<td>4 nos. self lubricated bearing to be provided with grease nipple including 4th bearing being a thrust bearing.</td>
</tr>
<tr>
<td>h)</td>
<td><strong>Locking arrangement</strong></td>
<td>Pad Locker &amp; Key arrangement at both ‘ON’ &amp; ‘OFF’ position.</td>
</tr>
<tr>
<td>i)</td>
<td><strong>Earth Terminal:</strong></td>
<td>To be provided at base channels.</td>
</tr>
<tr>
<td>23.</td>
<td><strong>Supporting Channels</strong></td>
<td>75 mm x 40 mm M.S. Channel hot dip galvanized.</td>
</tr>
<tr>
<td>24.</td>
<td><strong>Weight of each pole complete</strong></td>
<td>To be specified by the tender</td>
</tr>
</tbody>
</table>
1.0 **SCOPE**

This specification covers the design manufacture, shop testing, loading, transportation and delivery at sub-station site of 33KV, 400Amp, 3Pole & 11KV, 400Amp, 3Pole H.G. Fuse Sets for out door installations to be used at 33/11KV Sub-stations suitable for operation under off load conditions.

1.1 **DESCRIPTION OF THE MATERIALS:-**

1.1.1 **The 33KV, 400Amps, 3 Pole H.G Fuse** Sets shall confirm to the following parameters:-

i) Number of Poles:- 3

ii) No. of insulator per pole:- 4nos. 22/24KV Post Insulator/ Phase

iii) Nominal system voltage 33 KV

iv) Highest system voltage:- 36KV

v) Rated frequency:- 50 Hz

vi) System earthing:- Effectively earthed

vii) Rated normal current 400 Amps

viii) Altitude of installation Not exceeding 1000 M.

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

i) Power frequency withstand voltage (dry) 95KV (RMS)

ii) Power frequency withstand voltage ( wet) 75 KV (RMS)

iii) Impulse withstand voltage (dry) 170 KV (Peak)

iv) Power frequency puncture withstand voltage 1.3 times the actual dry flashover voltage of the unit.

1.1.2 **The 11KV, 400Amps, 3 Pole H.G Fuse** Sets shall confirm to the following parameters:-

i) Number of Poles:- 3

ii) No. of insulator per pole:- 2nos. 12KV Post Insulator/ Phase

iii) Nominal system voltage 11KV

iv) Highest system voltage:- 12KV

v) Rated frequency:- 50 Hz

vi) System earthing:- Effectively earthed

vii) Rated normal current 400 Amps

viii) Altitude of installation Not exceeding 1000 M.
The post insulator used in the H.G. Fuse set shall have the following ratings:

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

2.0 STANDARDS:- The H.G. Fuse Set shall conform to the following standards:

i) IS- 5792- 1973 (For high voltage expulsion fuses & similar fuses)
ii) IS-2544-1973 (for porcelain post insulators)
iii) IS-9385-1979 or its latest amendments if any.
iv) IS-2633-1979 (For Galvanization of ferrous parts)

3.0 INSULATORS:-

The 12KV & 22KV/ 24KV post insulators complete with pedestal cap duly cemented to be used in the H.G. Fuse sets confirming to IS-2544/1973.

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

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

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

i) Maximum ambient air temperature 49°C
ii) Maximum daily average air temperature 35°C
iii) Maximum yearly average ambient air temperature 30°C
iv) Maximum temperature attainable by a body Exposed to the sun. 50°C
v) Minimum ambient air temperature 10°C
vi) Maximum relative humidity. 100%
vii) Minimum number of rainy days per annum 70
viii) Average number of rainy days per annum 120
ix) Average annual rain fall. 150 cm.
x) Number of months of tropical monsoon conditions 4
xi) Maximum wind pressure. 260 Kg./ mm²
5.0 TECHNICAL DETAILS:-

The H.G. Fuses shall have adjustable arcing horns made of solid copper rod having 8.23 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 x 50 mm x 8 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 crimp able conductor up to 232 Sq.mm. size (ACSR/ AAAC) 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 1200 mm and the centre to centre (distance between two post insulators of the same phase) shall be 760 mm. All metal (ferrous) parts shall be galvanized and polished. Only post insulator (original cemented and not pin insulators shall be used for the H.G. Fuse Set.

6.0 DRAWING & LITERATURES:-

Three copies of drawings of each item of 33KV & 11KV, 400Amp, 3 Pole H.G. Fuse shall be furnished along with the tender for reference. The details of construction and materials of different parts of the H.G. Fuse shall clearly be indicated in the tender and illustrative pamphlet/literature for the same shall be submitted along with the tender.

7.0 TESTS & TEST CERTIFICATE:-

7.1 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 H.G. Fuse in a Govt. Approved Testing Laboratory preferably at CPRI Bangalore shall be submitted along with the tender.

i) Impulse voltage dry test

ii) Power frequency voltage dry test

iii) Power frequency voltage wet test

iv) Temperate of resistance.

v) Test to prove the capability of carrying the rated peak short circuit current and the rated short time current.

vi) Mainly active load braking capacity test.

vii) Transformer off-load breaking test.

viii) Line charging breaking capacity test.

ix) Operation tests.

x) Mechanical endurance test.

xi) Mechanical strength test for the post insulator as per IS:2544/1973, 5350 (Pt-II)/1970 & relevant IEC.

xii) Test for galvanization of metal (ferrous) parts as per IS-2633/1973.
Besides above, mechanical endurance test will have to be conducted on one set in the presence of our authorized person who shall be deputed to carryout acceptance test before delivery of the materials.

7.2 **Routine Tests:-**

The following routine tests shall have to be conducted on each sets and results are to be furnished for consideration for acceptance of deputing inspecting Officer for inspection & conducting testing of the materials.

i) Power frequency voltage dry test.

ii) Tests to prove satisfactory operation.

iii) Dimension check.

iv) Galvanisation test.

8.0 **GUARANTEED TECHNICAL PARTICULARS:-**

The tenderers are required to furnish the guaranteed technical particulars at Schedules attached to this specification duly filled in along with the tender.

9.0 **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.

10.0 **INSPECTION AND TESTING:-**

The Purchaser shall have free entry at all times, while work on the contract is being performed, to all parts of the manufacturer's works which concern the processing of the equipment ordered. The manufacturer shall afford the Purchaser without charge, all reasonable facilities to assure that the equipment being furnished is in accordance with this specification.

The equipment shall successfully pass all the type tests and routine tests referred to and those listed in the most recent edition of the standards given in this specification.

The Purchaser reserves the right to reject an item of equipment if the test results do not comply with the values specified or with the data given in the technical data schedule.
Type tests shall have been / shall be carried out at CPRI / National Govt. approved Laboratory and be witnessed by a representative of such laboratory or some other representative acceptable to the Purchaser. Routine tests shall be carried out by the Supplier at no extra charge at their works.

Adequate facility with calibrated testing equipment must be provided by the manufacturer free of cost to carry out the tests. Type test certificates must be furnished along with the tender for reference of the Purchaser.

All costs in connection with the testing, including any necessary re-testing, shall be borne by the Supplier who shall provide the Purchaser with all the test facilities which the latter may require, free of charge. The Purchaser shall have the right to select the samples for test and shall also have the right to assure that the testing apparatus is duly calibrated and correct. Measuring apparatus for routine tests shall be calibrated at the expense of the Supplier at an approved laboratory and shall be approved by the Purchaser.

The Supplier shall be responsible for the proper testing of the plant or materials supplied by sub-suppliers to the same extent as if the work, plant or materials were completed or supplied by the Supplier.

Any cost, incurred by the Purchaser in connection with inspection and re-testing as a result of failure of the equipment under test or damage during transport or offloading shall be to the account of the Supplier.

The supplier shall submit to the Purchaser five signed copies of the test certificates, giving the results of the tests as required. No materials shall be despatched until the test certificates have been received by the Purchaser and the Supplier has been informed that they are acceptable.

The test certificates must show the actual values obtained from the tests, in the units used in this specification, and not merely confirm that the requirements have been met.

In the case of components for which specific type tests or routine tests are not given in this specification, The Supplier shall include a list of the tests normally required for these components. All materials used in the Contract shall withstand and shall be certified to have satisfactorily passed such tests.

The Purchaser at his discretion may re-confirm the Test Results in his own laboratory or laboratory of his choice.

No inspection or lack of inspection or passing by the Purchaser’s Representative of equipment or materials whether supplied by the Supplier or sub-supplier, shall relieve the Supplier from his liability to complete the contract works in accordance with the contract or exonerate him from any of his guarantees.
## SCHEDULES

**GURANTEED TECHNICAL PARTICULARS FOR 400 AMP, 3 POLE, H.G. FUSES.**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Particulars</th>
<th>Desired Values for</th>
<th>Bidder’s offer</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>33 KV</td>
<td>11 KV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>33 KV</td>
<td>11 KV</td>
</tr>
<tr>
<td>1</td>
<td>Maker's name and country or origin</td>
<td>To be specified by the tenderder.</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>Suitable for mounting</td>
<td>Horizontal only.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Number of supporting post insulator per phase</td>
<td>4 nos. 22KV/24KV Post Insulator per phase as per ISS - 2544/ 1973</td>
<td>2 nos. 12KV Post Insulator per phase as per ISS -2544/ 1973</td>
</tr>
<tr>
<td>4</td>
<td>Post Insulator</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a)</td>
<td>Maker's name and country or origin</td>
<td>To be specified by the tenderder.</td>
<td></td>
</tr>
<tr>
<td>(b)</td>
<td>Type of cementing</td>
<td>To be quoted original cemented only.</td>
<td></td>
</tr>
<tr>
<td>(c)</td>
<td>One minute power frequency withstand voltage dry</td>
<td>95KV RMS</td>
<td>35KV RMS</td>
</tr>
<tr>
<td>(d)</td>
<td>One minute power frequency withstand voltage wet.</td>
<td>75 KV RMS</td>
<td>35KV RMS</td>
</tr>
<tr>
<td>(e)</td>
<td>Visible discharge voltage</td>
<td>27KV RMS</td>
<td>9KV RMS</td>
</tr>
<tr>
<td>(f)</td>
<td>Dry Flashover Voltage</td>
<td>To be specified by the tenderder.</td>
<td></td>
</tr>
<tr>
<td>(g)</td>
<td>Power puncture frequency withstand voltage</td>
<td>1.3 times of actual dry flash over voltage.</td>
<td></td>
</tr>
<tr>
<td>(h)</td>
<td>Impulse withstand voltage (switch in position)</td>
<td>170KV (peak)</td>
<td>75KV (peak)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>1</td>
<td>Creepage distance</td>
<td>380mm minimum. (actual creepage distance for which type test have been conducted is to be specified by the tenderer)</td>
<td>230mm minimum. (actual creepage distance for which type test have been conducted is to be specified by the tenderer)</td>
</tr>
<tr>
<td>5</td>
<td>Impulse withstand voltage for positive and negative polarity (1.2/50 micro second wave)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(a) Across the isolating distance</td>
<td>195 KV (peak)</td>
<td>85KV (peak)</td>
</tr>
<tr>
<td></td>
<td>(b) To earth &amp; between poles</td>
<td>170 KV (peak)</td>
<td>75 KV (peak)</td>
</tr>
<tr>
<td>6</td>
<td>One minute power frequency withstand voltage</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(a) Across the isolating distance</td>
<td>100 KV (RMS)</td>
<td>32 KV (RMS)</td>
</tr>
<tr>
<td></td>
<td>(b) To earth &amp; between poles</td>
<td>75 KV (RMS)</td>
<td>28 KV (RMS)</td>
</tr>
<tr>
<td>7</td>
<td>Rated normal current and rated frequency.</td>
<td></td>
<td>400 amps, 50 Hz, 3 Pole</td>
</tr>
<tr>
<td>8</td>
<td>Operating Voltage</td>
<td></td>
<td>11 KV</td>
</tr>
<tr>
<td>9</td>
<td>Vertical clearance from top of insulator cap to mounting Channel</td>
<td>508 mm (minimum)</td>
<td>254 mm (minimum)</td>
</tr>
<tr>
<td>10</td>
<td>Height of the riser for carrying the horns.</td>
<td>250mm from the cap (top) of insulator.</td>
<td>150mm from the cap (top) of insulator.</td>
</tr>
<tr>
<td>11</td>
<td>Details of Arcing Horns</td>
<td>Copper rod having 8.32 mm dia Silver-plated provided with screwing arrangement for fixing use wire made of copper casting. (Total length 995mm). All the bolts, nuts and washers should be made out of brass.</td>
<td>Copper rod having 7.62 mm dia Silver-plated provided with screwing arrangement for fixing use wire made of copper casting. (Total length 635mm). All the bolts, nuts and washers should be made out of brass.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Riser Unit (250mm total height)</td>
<td>(a) The shape of connectors may be made of straight copper Flat of size adequate enough to carry a current density not less than 1.5 Amp/mm². 2 Nos of 3/8” G.I. Bolts, double nuts, plain and spring washers and 2 nos. solder less bimetallic shockets per each connector suitable up to 232 mm² AAA conductor. (a) The shape of connectors may be made of straight copper Flat of size adequate enough to carry a current density not less than 1.5 Amp/mm². 2 Nos of 3/8” G.I. Bolts, double nuts, plain and spring washers and 2 nos. solder less bimetallic shockets per each connector suitable up to 100 mm² AAA conductor.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(b) 170mm height G.I. Riser made of 25mm nominal bore medium gauge G.I. Pipe welded with 2 nos. G.I. Flat of 35 x 5 mm at both ends fixed with 10mm dia stainless steel, bolts and nuts with flat stainless steel spring washers. (b) 100mm height G.I. Riser made of 19mm nominal bore medium gauge G.I. Pipe welded with 2 nos. G.I. Flat of 30 x 5 mm at both ends fixed with 10mm dia stainless steel, bolts and nuts with flat stainless steel spring washers.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Supporting Channels</td>
<td>100 x 50 x 6 mm M.S. Channel (galvanized) 75 x 40 x 6 mm M.S. Channel (galvanized)</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Galvanisation</td>
<td>All ferrous parts should be galvanized as per IS-2633/1972 &amp; all non-ferrous part should be duly electroplated with silver.</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Weight of each pole (complete)</td>
<td>To be specified by the tenderder.</td>
<td></td>
</tr>
</tbody>
</table>
### 11 KV 200 Amp 3 Pole HG Fuse

**GUARANTEED TECHNICAL PARTICULARS**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Particulars</th>
<th>(Desired Value)</th>
<th>Values offered by the Bidder</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Name of the manufacturer and country of origin</td>
<td>To be specified by the bidder</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Operating voltage</td>
<td>11 KV</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>No. of Insulators per Phase</td>
<td>2 no.s 12 KV Post Insulators per Phase</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Rated normal current and normal frequency</td>
<td>200 Amps. 50 Hz</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Vertical clearance from top of insulator cap to mounting channel</td>
<td>254 mm (minimum)</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Height of the riser for carrying the horns</td>
<td>150 mm from the cap (top) of insulator</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Post Insulator</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a)</td>
<td>Name of the manufacturer and country of origin</td>
<td>To be specified by the bidder</td>
<td></td>
</tr>
<tr>
<td>(b)</td>
<td>Type of cementing</td>
<td>To be quoted original cemented only</td>
<td></td>
</tr>
<tr>
<td>(c)</td>
<td>One minute power frequency withstand voltage - Dry</td>
<td>35 KV RMS</td>
<td></td>
</tr>
<tr>
<td>(d)</td>
<td>One minute power frequency withstand voltage – Wet</td>
<td>35 KV RMS</td>
<td></td>
</tr>
<tr>
<td>(e)</td>
<td>Visible discharge voltage</td>
<td>9 KV RMS</td>
<td></td>
</tr>
<tr>
<td>(f)</td>
<td>Dry Flashover voltage</td>
<td>To be specified by the bidder</td>
<td></td>
</tr>
<tr>
<td>(g)</td>
<td>Power frequency puncture withstand voltage</td>
<td>1.3 times of actual dry flash over voltage</td>
<td></td>
</tr>
<tr>
<td>(h)</td>
<td>Creepage distance</td>
<td>300 mm minimum (actual creepage distance for which type test has been conducted is to be specified by the bidder).</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Impulse withstand voltage (1.2/50 micro second wave positive &amp; negative polarity)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a)</td>
<td>Across the isolating distance</td>
<td>85 KV (peak)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>(b)</td>
<td>To earth &amp; between poles</td>
<td>75 KV (peak)</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>One minute power frequency withstand voltage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a)</td>
<td>Across the isolating distance</td>
<td>32 KV (RMS)</td>
<td></td>
</tr>
<tr>
<td>(b)</td>
<td>To earth &amp; between poles</td>
<td>28 KV (RMS)</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Details of Arching Horns</td>
<td>10 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 63.5 mm). All the bolts, nuts and washers should be made out of brass</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Riser Unit (150 mm total height)</td>
<td>Riser cum connector made out of copper casting with minimum 95% copper composition) having riser size 50 mm height x 30 mm width x 8 mm thickness and connector size 80x50x6 mm duly silver plated and machine finishing provided with 2 no.s 12 mm dia brass bolts &amp; brass double nuts with flat brass washer and 2 no.s solderless bimetallic shockets per each connector suitable upto 80 mm² conductor</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Supporting Channels</td>
<td>12 75 x 40 x 6 mm MS Channel (Galvanized)</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Galvanization</td>
<td>All ferrous parts should be galvanized as per IS-2633/1972 &amp; all non-ferrous parts should be duly electroplated with silver.</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Weight of each pole (complete)</td>
<td>To be specified by the bidder</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Sockets (Lugs)</td>
<td>Shall be tinned copper shoulder less crimping type confirming to IS : 8309 &amp; 8394 suitable for aluminium conductor.</td>
<td></td>
</tr>
</tbody>
</table>
The cable lugs shall suit the type of terminals provided. The cable lug shall be of Dowel make.

|   | Detailed drawing submitted? | Yes |
1.0 SCOPE

This specification provides for design, manufacturer, testing at manufacturer’s Works and delivery, supervision of erection, commissioning (if required) of outdoor station type 33KV & 11 KV, 3 phase triple pole double break gang operated centre rotating type (Single Isolator with/without earth switches, with electrical inter lock, insulators and complete in all respect with bimetallic connectors arcing horns operating mechanism, auxiliary switches, indicating devices, fixing detail etc. as described hereinafter. The 25 mm dia. double tandem pipes and 40 mm dia. down operating pipe should be provided.

Main features

<table>
<thead>
<tr>
<th>Type:</th>
<th>33 KV &amp; 11 KV</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Main switch</td>
<td>Double end break centre post rotating, gang operated</td>
</tr>
<tr>
<td>2. Service</td>
<td>---------------- Outdoor ----------------</td>
</tr>
<tr>
<td>4. Pole:</td>
<td>3 pole gang operator ----------------</td>
</tr>
<tr>
<td>5. Rated voltage nominal / maximum</td>
<td>33/36 11/12</td>
</tr>
<tr>
<td>6. Rated Frequency</td>
<td>---------------- 50 HZ ± 5%-------------------</td>
</tr>
<tr>
<td>7. System earthing</td>
<td>---------------- effectively earthed ------</td>
</tr>
<tr>
<td>8. Temperature rise</td>
<td>As per relevant IS/IEC publication</td>
</tr>
<tr>
<td>9. Insulation level impulse with stand voltage:</td>
<td></td>
</tr>
<tr>
<td>a) Across Isolating distance (kV peak)</td>
<td>195 85</td>
</tr>
<tr>
<td>b) To earthed &amp; between poles (kV Peak)</td>
<td>170 75</td>
</tr>
<tr>
<td>10. 1 minute power frequency with stand voltage</td>
<td></td>
</tr>
<tr>
<td>a) Across Isolating distance (kV Peak)</td>
<td>80 32</td>
</tr>
<tr>
<td>b) To earthed &amp; between poles (kV Peak)</td>
<td>70 28</td>
</tr>
<tr>
<td>11. Rated current</td>
<td>800 800</td>
</tr>
<tr>
<td>12. Short time current for 3 sec.</td>
<td>25KA 25KA</td>
</tr>
<tr>
<td>14. Auxiliary voltage</td>
<td>33 KV 11 KV</td>
</tr>
<tr>
<td>a) Control &amp; Inter lock</td>
<td>------ 24V DC 80% to 110% ------</td>
</tr>
<tr>
<td>15. Safe duration of overload</td>
<td></td>
</tr>
<tr>
<td>a) 150% of rated current</td>
<td>------ 5 minute ------</td>
</tr>
<tr>
<td>b) 120% of rated current</td>
<td>------ 30 minute ------</td>
</tr>
</tbody>
</table>
16. Minimum creepage distance of support and Rotating insulator

<table>
<thead>
<tr>
<th>i. Mounting structure</th>
<th>900mm</th>
<th>500mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>ii. Terminal connector type</td>
<td>Bimetallic clamp size as per Requirement</td>
<td></td>
</tr>
<tr>
<td>iii. Control</td>
<td>Local</td>
<td></td>
</tr>
</tbody>
</table>

REMARKS:
The operating mechanism for earth switch of 33 KV & 11 KV shall be manual operated.

2.0 STANDARDS

Disconnecting switches covered by this specification shall conform to latest edition IEC-129/IEC 62271-102 I.S.1813 and IS: 9921,IS-325, and unless specifically stated otherwise in this specification.

23.1 TYPE

The 33 KV & 11 KV Isolators shall be outdoor type with three phase double break centre rotating type [Single (SI) / Double (DI)] Isolators suitable for manual operation and local operation. They shall have crank and reduction gear mechanism.

All Isolators offered shall be suitable for horizontal upright mounting on steel structures. Each pole unit of the multiple Isolators shall be of identical construction and mechanically linked for gang operation.

Each pole of the Isolator shall be provided with two sets of contacts to be operated in series and the moving contact blades shall rotate in horizontal plane.

The design shall be such that the operating mechanism with the linkages shall be suitable for mounting on any of the outer pole ends without much difficulty and with minimum shifting of parts.

Moving contacts of all isolators shall rotate through 90 deg from their “fully closed position” to “fully open position” so that the break is distinct and clearly visible from ground level.

The 33KV & 11 KV Isolators offered by the Bidder shall be designed for Normal rating current for 800 amp It should suitable for continuous service at the system voltages specified herein.

The Isolators shall be suitable to carry the rated current continuously and full short circuit current of 25 KA for 33 KV & 11 KV respectively for 3 second at site condition without any appreciable rise in temperature. These shall also be suitable for operation at 110% rated (normal) voltage. The Isolators shall be suitable for Isolating low capacitive / inductive currents of 0.7amp at 0.15 power factor. The isolators shall be so constructed that they don’t open under the influence of short circuit conditions.

The Isolators and earthing switches are required to be used on electrically exposed installation and this should be taken into account while fixing the clearance between phases and between phase and earth.

MAIN CONTACTS & MOVING ARM

All Isolators shall have heavy duty, self aligning and high pressure line type contacts made of high conductivity, corrosion resistant, hard-drawn electrolytic copper strips of proper thickness and contact area. Fixed contact should consist of loops of above copper strips suitable for 800 Amps ratings for 33
KV & 11 KV Isolators. The hard dawn electrolytic copper strips should be silver plated 10 micron thickness or more as per the requirement and fixed contacts should be backed by powerful phosphor bronze/stainless steel springs of suitable numbers. However, the thickness and contact area of the contact should conform to the drawing approved during type test. These fixed and moving contacts shall be able to carry the rated current continuously and the maximum fault current of 25 KA for 33KV & 11 KV for 3 seconds without any appreciable rise in temperature. The Isolator blades shall retain their form and straightness under all conditions of operation including all mechanical stress arising out of operation as well as under rated short circuit condition.

Fixed guides shall be provided so that even when the blades are out of alignment by one inch (maximum), closing of the switches, proper seating of the blades in between contacts and adequate pressure to give enough contact surface is ensured. Wherever possible, the blades shall be counter balanced by weights and springs. The contact shall be self cleaning by the wiping action created by the movements of the blades. The surface of the contacts shall be tendered smooth and silver plated. The Isolator shall be self cleaning type so that when isolators remain closed for long periods in a heavily polluted atmosphere, binding does not occur. No undue wear or scuffing shall be evident during the mechanical endurance tests, contacts and springs shall be designed so that adjustment of contact pressure shall not be necessary throughout the life of the isolator. Each contact or part of contacts shall be independently sprung so that full pressure is maintained on all contact at all times.

**ARCING HORN AND GRADING HORN**

Suitable arcing horn made of tinned electrolytic copper which are required for guiding contacts shall be provided on the fixed and moving contacts of all Isolators. The contacts shall be of “make before and break after” type.

**ELECTRICAL INTERLOCK / MECHANICAL INTERLOCK**

The disconnecting switches whenever required shall be with an approved type electrical interlock for interlocking with the associated circuit breakers and earth switch. Electrical interlock assembly should be more right in construction and properly mounted to ensure reliable operation. The design should be such that the electrical circuit for the interlocking mechanism will only remain energised during operation of the switches.

2.5 **AUXILIARY SWITCHES**

All isolators and earthing switches shall be provided with 24VDC auxiliary switches for their remote position indication on the control board and for electrical interlocking with other equipment. The auxiliary switch shall be provided with a minimum of auxiliary contacts normally 4 open and normally 4 closed contacts with 10 amp. Current carrying capacity.

2.6 **EARTH SWITCH**

Line earth switch shall consist of three earthing blades for Isolator which normally rest against the frame when the connected Isolator is in closed position. The earthing blades for three phase shall be
mechanically linked to a coupling shaft which shall be capable of being fitted on either side of the Isolator. The earthing blades shall match and be similar to the main switch blades and shall be provided at the hinge; with suitable flexible conductors with terminal lugs for connecting to the station ground bus. The earthing blades shall be operated by a separate mechanism but shall be mechanically interlocked with the main switch so that the earthing blades can be closed only when the main switches are in open position and vice-versa. The earthing blades shall be gang operated and all the three blades will operate simultaneously.

23.7 OPERATING MACHANISM

The operating mechanism shall be simple and shall ensure quick and effective 1000 operation. The design shall be such as to enable one man to operate it with nominal effort. The operating mechanism box shall be made out of Aluminum extruded (Aluminum Alloy) sections of minimum 3mm thickness. The Isolator blades shall be in positive continuous control throughout the entire cycles of operation. The operating rods and pipes shall be rigid enough to maintain positive control under most adverse conditions and to withstand all torsional and bending stresses arising from operation. Operation of the switches at any speed should not result in improper functioning, in displacement of parts / machines after final adjustment has been made. All holes in cranks, linkages etc. having moving pins shall be drilled and fitted accurately so as to prevent slackness and lost motion.

Provision shall be made for padlocking the operating mechanism of disconnecting and earth switches in both open and closed positions.

Bearings shall be ball and roller type shall be protected from weather and dust by means of cover and grease retainers. Bearings pressures shall be kept low to ensure long life and care of operation.

Each operated isolator shall be driven as well as manually operated and shall be complete with local selector switch and open / close push buttons. The function of all control facilitates operating isolators.

2.8 DESIGN, MATERIALS AND WORKMANSHIP

The live parts shall be designed to eliminate sharp points, edges and similar corona producing surfaces, where this is impracticable, adequate shields to be provided. All ferrous metal parts shall be hot dip galvanized, as per IS 2629. All metal parts shall be of such materials or treated in such a way so as to avoid rust, corrosion and deterioration due to continued exposure to atmosphere and rain. All current carrying parts shall be made from high conductivity electrolytic copper / aluminium.

Bolts, screws and pins shall be provided with standard locking device viz. Locknuts, spring washers, keys etc. and when used with current carrying parts, they shall be made of copper silicon or other high conductivity and wear resistant alloys.

The switches should not need lubrication of any parts except at very long interval of five year minimum.

2.9 PROTECTIVE COATINGS
All ferrous parts including bolts, nuts and washers of the switches assembly shall be galvanised to withstand at least six one minute dips in copper sulphate solution of requisite strength (Pierce tests) except the threaded portions which should withstand four dips.

3.0 INSULATORS

Support insulators for all type of isolators shall be of solid core type. The insulator shall be made of homogeneous and vitreous porcelain of high mechanical and dielectric strength. It shall have sufficient mechanical strength to sustain electrical and mechanical loading on account of wind load, short circuit forces etc. Glazing of the porcelains shall be of uniform dark brown colour with a smooth surface arranged to shed away raise water. The porcelain shall be free from laminations and other flaws or imperfections that might affect the mechanical or dielectric quality. It shall be thoroughly vitrified, tough and impervious to moisture. The porcelain and metal ports shall be assembled in such a manner and with such material that any thermal differential expansion between the metal and porcelain parts throughout the range of temperature specified in this specification shall not loosen the parts or create under internal stresses which may affect the mechanical or electrical strength or rigidity. The assembly shall not have excessive concentration of electrical stresses in any section or across leakage surfaces. The cement used shall not give rise to chemical reaction with metal fittings. The insulator shall be suitable for water washing by rain or artificial means in service condition. Profile of the insulator shall also conform to IEC-815. Insulator shall have minimum cantilever strength of 800 kgs. Caps to be provided on top of the insulator shall be of high grade cast iron or malleable steel casting. It shall be machine faced and hot dip galvanized. The cap shall have four numbers of tapped holes spaced on a pitch circle diameter of 127mm. The holes shall be suitable for bolts with threads having anti corrosive protection. The effective depth of threads shall not be less than the nominal diameter of the bolt. The cap shall be so designed that it shall be free from visible corona and shall have radio interference level within 500 micro volts. Casing shall be free from blow holes cracks and such other defects.

4.0 CONTROL CABINET:

The control cabinet of the operating mechanism shall be made out of aluminium sheet of minimum 3mm thickness. Hinged door shall be provided with pad locking arrangement. Sloping rain hood shall be provided to cover all sides. 15 mm thick neoprene or better type of gaskets shall be provided to ensure degree of protections of at least IP 55 as per IS 2147/IS-3947. The cabinet shall be suitable for mounting on support structure/or on a separate plinth foundation with adjustment for vertical, horizontal and longitudinal alignment. Details of these arrangements shall be furnished along with the offer.

4.1 Gear:

The dis connector / isolator may be required to operate occasionally, with considerably long idle intervals. Special care shall be taken for selection of material for gear and lubrication of gears to meet
this requirement. The gear shall be made out of aluminum bronze or any other better material lubricated for life with graphite or better quality non-drawing and non-hardening type grease. Wherever necessary automatic relieving mechanism shall be provided suitable relay, Device shall be provided to prevent over loading of the motor. Single phase preventer (for 3 phase meter) shall be provided to operate on open circuiting of any phase and shall trip off the motor. Complete details of the devices shall be furnished in the offer.

4.2 Terminal block and Wirings –

Each operating mechanism shall be provided with 1100V grade stud type terminal block. All auxiliary switches, interlocks and other terminals shall be wired upto terminal block. The terminal block shall have at least 20% extra terminals. All wiring shall be carried out with 1.1KV grade insulated 2.5 sq mm copper wires.

1 Position indicator :

A position indicator to show the isolator is in ON or OFF position to be provided.

2 Name plate :

Isolator, earthing switches and their operating devices shall be provided with name plate. The name plate shall be weather proof and corrosion proof. It shall be mounted in such a position that it shall be visible in the position of normal service and installation. It shall carry the following information’s duly engraved or punched on it.

A. Isolator Base

Name : NESCO / WESCO / SOUTHCO
Name of manufacturer –
Order No. –
Type Designation –
Manufacturers serial No. –
Rated voltage –
Rated normal current –
Rated short time current (rms) and duration –
Rated short time peak current (KAP)
Weight

B. Earthing Switch

Name : NESCO / WESCO / SOUTHCO
Name of manufacturer –
Order No. –
Type Designation –
Manufacturers serial No. –
Rated voltage –
Rated normal current –
Rated short time current (rms) and duration
Rated short time peak current (KAP)
Weight

C. Operating Device
Name – NESCO / WESCO / SOUTHCO
Name of manufacturer –
Order No.
Type Designation –
Reduction gear ratio –
AC motor
1) Rated auxiliary voltage
2) Starting current
3) Designation of AC motor as per I.S 4722/325
4) Starting torque at 80% of supply voltage
5) Over travel in degrees after cutting off supply

Total operating time in seconds
6) Close operation – Electrical
7) Open operation – Electrical
8) Open operation – Manual

All components shall be given adequate treatment of climate proofing as per IS:3202 so as to withstand corrosive and severe service conditions.
All metal parts not suitable for painting such as structural steel, pipes, rods, levers, linkages, nuts and bolts used in other than current path etc. shall be hot dip galvanized as per IS -2629.
Complete details of painting, galvanizing and climate proofing of the equipment shall be furnished in the offer.

5.0 TESTS

5.1 Type Tests
Isolators offered, shall be fully type tested as per the relevant standards. The Bidder shall furnish three sets of the following valid type test reports for their different type of offered Isolators along with the offer. The Purchaser reserves the right to demand repetition of some or all the type tests in the presence of purchaser’s representative. For this purpose the Bidder may quote unit rates for carrying out each type test and this will be taken during bid price evaluation, if required.

a) short time withstand & peak withstand current test for Isolator & Earth Switch.
b) power frequency (Dry & Wet),Lightening Impulse dry withstand Test
c) Mechanical endurance Test
d) IP-55 test
During type tests the isolator shall be mounted on its own support structure or equivalent support
structure and installed with its own operating mechanism to make the type tests representative.
Drawing of equivalent support structure and mounting arrangements shall be furnished for Purchaser's
approval before conducting the type tests.
The type tests shall be conducted on the isolator along with approved insulators and terminal
connectors.
Mechanical endurance test shall be conducted on the main switch as well as earth switch of one
isolator of each type

5.2 Acceptance and Routine Test :
All acceptance and routine test as stipulated in the relevant standards shall be carried out by the
supplier in presence of Purchaser's representative.
Mechanical operation test (routine test) shall be conducted on isolator (main switch and earth switch) at
the supplier's works as well as purchaser's substation site.
Immediately after finalization of the programme of type / acceptance, routine testing the supplier shall
give sufficient advance intimation (clear 20 days advance intimation), along with shop routine test
certificates, valid calibration reports from Govt. approved test house for the equipments, instruments to
be used during testing for scrutiny by the purchaser to enable him to depute his representative for
witnessing the tests. If there will be any discrepancies in the shop routine test certificates and
calibration reports furnished by the firm then after settlement of the discrepancies only, purchaser's
representative will be deputed for witnessing the tests.
Special tests proposed to be conducted (if decided to conduct) as type test on isolators, are given at
Annexure- II. These special type test charges shall be quoted along with all other type tests as per
relevant IEC standard and these charges shall be included in the total bid price.
Test certificates of various items including but not limited to the following shall be furnished at the time
of routine tests.
   i. Chemical analysis of copper along with a copy of excise certificate indicating genuine source of
procurement of electrolytic grade copper.
   ii  Bearings
   iii Fasteners
   iv Universal / swivel joint coupling
   v  Insulators
   vi Gears
   vii Auxiliary switch
   viii Overload / single phase preventer relay
   ix  Interlocking devices
  x  Terminal block
 xi Any other item
6.0 INSPECTION

i) The Purchaser shall have access at all times to the works and all other places of manufacture, where the dis-connectors, earth switches and associated equipment are being manufactured and the supplier shall provide all facilities for unrestricted inspection of the works raw materials manufacture of all the accessories and for conducting necessary tests as detailed herein.

ii) The supplier shall keep the purchaser informed in advance of the time of starting of the progress of manufacture of equipment in its various stages so that arrangements could be made for inspection.

iii) No material shall be dispatched from its point of manufacture unless the material has been satisfactorily inspected and tested.

iv) The acceptance of any quantity of the equipment shall in no way relieve the supplier of his responsibility for meeting all the requirements of this specification and shall not prevent subsequent rejection if such equipment are later found to be defective.

7.0 QUALITY ASSURANCE PLAN

The Bidder shall invariably furnish following information along with his offer, failing which his offer shall be liable for rejection.

(i) Names of sub suppliers for raw materials, list of standards according to which the raw materials are tested, list of tests normally carried out on raw materials in presence of Supplier’s representative, copies of test certificate

(ii) Information and copies of test certificates as in (i) and (ii) above in respect of bought out accessories.

(iii) List of manufacturing facilities available

(iv) Level of automation achieved and list of areas where manual processing still exists.

(v) List of areas in manufacturing process, where stage inspections are normally carried out for quality control and details of such tests and inspections.

(vi) List of testing equipments with calibration certificates from Govt. approved test house available with supplier for final testing equipment and test plant limitation if any, vis-à-vis the type, special acceptance and routine test specified in the relevant standards. These limitations shall be very clearly brought out in the specified test requirements.

   i) List of raw material as well as bought out accessories and the names of sub-suppliers selected from the lists furnished along with offer.

   ii) Type test certificates of the raw material and both bought out accessories.

   iii) Quality Assurance Plan (QAP) with hold points for purchaser’s inspection.
The supplier shall submit the routine test certificates of bought out accessories and raw material viz. Copper, aluminum conductors, lubricating material, gear material etc. at the time of routine testing of the fully assembled isolator.

8.0 DOCUMENTATION

All drawings shall conform to relevant international standards organization (ISO). All drawings shall be in ink and suitable for micro filming. All dimensions and data shall be in S.I. Units.

List of Drawings and Documents

The Bidder shall furnish four sets of following drawings / documents along with his offer.

a) General outline and assembly drawings of the dis-connector operating mechanism, structure, insulator and terminal connector.

b) Sectional views and descriptive details of items such as moving blades, contacts, arms contact pressure, contact support bearing housing of bearings, balancing of heights, phase coupling pipes, base plate, operating shaft, guides, swivel joint operating mechanism and its components etc.

c) Loading diagram

d) Drawings with structure for the purpose of type tests.

e) Name plate.

f) Schematic drawing.

g) Type test reports.

h) Test reports, literature, pamphlets of the bought out items and raw material.

The supplier shall within 2 weeks of placement of order submit four sets of final versions of all the above said drawings for Purchaser’s approval. The purchaser shall communicate his comments / approval on the drawings to the supplier. The supplier shall, if necessary, modify the drawings and resubmit four copies of the modified drawings for Purchaser’s approval within two weeks from the date of comments. After receipt of approval the supplier shall within three weeks submit 15 prints and two good qualities re-producible of the approved drawings for purchaser’s use.

Six sets of the type test reports, duly approved by the Purchaser shall be submitted by the supplier for distribution, before commencement of supply Adequate copies of acceptance and routine test certificates, duly approved by the Purchaser shall accompany the despatched consignment.

The manufacturing of the equipment shall be strictly in accordance with the approved drawings and no deviation shall be permitted without the written approval of the purchaser. All manufacturing and fabrication work in connection with the equipment prior to the approval of the drawing shall be at the supplier risk.

9.0 INSTRUCTION MANUALS:

Fifteen copies of the erection, operation and maintenance manuals in English be supplied for each type of disconnector one month prior to dispatch of the equipment. The manual shall be bound volumes and shall contain all drawings and information required for erection, operation and maintenance of the disconnector including but not limited to the following particulars.
(a) Marked erection prints identifying the component parts of the disconnect or as shipped with assembly drawings.
(b) Detailed dimensions and description of all auxiliaries.
(c) Detailed views of the insulator stacks, metallic, operating mechanism, structure, interlocks, spare parts etc.

10.0 PACKING AND FORWARDING.

The equipment shall be packed in crates suitable for vertical / horizontal transport, as the case may be and suitable to withstand handling during transport and outdoor storage during transit. The supplier shall be responsible for any damage to the equipment during transit, due to improper and inadequate packing. The easily damageable material shall be carefully packed and marked with the appropriate caution symbols. Wherever necessary, proper arrangement for lifting, such as lifting hooks etc. shall be provided. Any material found short inside the packing cases shall be supplied by supplier without any extra cost.

Each consignment shall be accompanied by a detailed packing list containing the following information:
(a) Name of the consignee.
(b) Details of consignment.
(c) Destination.
(d) Total weight of consignment.
(e) Handling and unpacking instructions.
(f) Bill of material indicating contents of each package.

The supplier shall ensure that the bill of material is approved by the purchaser before dispatch.
1.0 TECHNICAL SPECIFICATION FOR 24 V, 100 AH, MAINTENANCE BATTERY TYPE VRLA

1.1 SCOPE:

1.2 STANDARDS:
The equipments shall comply in all respects with the latest edition of relevant Indian Standard Specifications except for the modifications specified herein. The equipments manufactured according to any other authoritative national / international standard which ensure an equal or better quality than the provisions of these specifications shall also be acceptable. Where the equipment offered conform to any other standard, salient points of differences between the proposed standard and the provisions of these specifications shall be clearly brought out in the tender. A Xerox copy of such standards [in English shall be enclosed with the offer].

1.3 INSTALLATIONS:
Equipments covered under these specifications shall be suitable for indoor installation.

1.4 DETAILS OF SPECIFICATIONS OF VRLA Type (24 V)
Battery:
The batteries shall be made of closed type lead acid cells with VRLA Type (24 V) plates manufactured to conform to IS: 1652-1991.

Capacity:
The capacity of the batteries shall be as follows:

[i] Voltage. - 24 V
[ii] Output at 27°C - 100AH at 10 hrs. discharge rate.

The batteries shall normally remain under ‘floating’ condition with the ‘trickle’ charger supplying the continuous load. However, the batteries shall be capable of supplying the following loads under emergency conditions without any assistance from the chargers and without their terminal voltage falling below 21 V [90% of rated voltage]
Stage emergency - 15A for 3 hours for lighting.

The number of cells for 24V batteries shall be so chosen that for the nominal floating voltage of the cells, the battery voltage shall be 25.93V and for the minimum [discharged condition] voltage of the cells, the voltage of the battery shall not be less than 21.6 V, while the assigned rating of the battery bank can not lowered below its rated voltage of 24 V volts.
1.5 DESIGN AND CONSTRUCTIONAL DETAILS:

1.5.1 Containers: The Container for VRLA Type battery shall be robust and shall be as per the latest standard prescribed by Indian Bureau Standard.

1.5.2 Plates: The Plates for VRLA Type battery (300 AH Capacity) shall be as per the latest standard prescribed by Indian Bureau Standard.

1.5.3 Separators: The separators shall be of synthetic material conforming to the latest edition of IS-6071-1986. These shall permit free flow of electrolyte and would not be affected by the chemical reaction inside the cell and shall last for indefinite time. The internal resistance factor of the separators shall assure high discharge characteristics under all operating conditions. Proper arrangement to keep end plates in position shall be furnished by the bidder along with his offer.

1.5.4 Electrolyte: The electrolyte shall be prepared from the battery grade sulphuric acid conforming to IS-266-1993 and shall have a specific gravity of 1.2 at 27°C. The sulphuric acid of battery grade shall be colorless liquid. The concentrated sulphuric acid on dilution with an equal volume of distilled water shall be free from suspended matter and other visible impurities. The sulphuric acid shall meet the requirements of columns – 4 and 5 Table –1 of IS-266-1993. The requisite quantity shall be dispatched in non-returnable containers suitably packed and marked as per the requirements of the above Indian Standards. The container materials and packing shall be subject to approval of the purchaser.

Sufficient quantity of distilled water conforming to IS-1069-1993 shall be supplied in non-returnable containers to correct the level of electrolyte during initial testing and commissioning. The material of containers and packing shall be subject to the approval of the purchaser.

1.5.5 Plate group bar with terminals:

The plate group bar with terminals shall conform to IS-1652-1991. The positive and negative terminals shall be clearly marked for easy identification. The legs of the plates of like polarity shall be connected to the load, turned to a horizontal group bar having an upstanding terminal post adopted for connection to the external circuit. The group bars shall be sufficiently strong to hold the plates in position.

1.5.6 Buffers/spring: Suitable buffers / springs shall be provided in the cells to keep the end plates in position. These shall have adequate length and strength.

1.5.7 Cell lids: Lids used with sealed or closed type cells shall be of glass, plastic or ebonite and shall be provided with vent plugs. Terminal post shall be suitably sealed at the lid to prevent escape of acid spray, by means of rubber grommets, sealing compound or other suitable device. The positive and negative terminal posts shall be clearly and indelibly marked for easy identification.
1.5.8 **Water**: Water used for preparation of electrolyte and also to bring the level of electrolyte to approximately correct height during operation / testing shall conform to relevant standards.

1.5.9 **Venting device**: The venting device shall be anti splash type and shall allow gases to escape freely but shall effectively prevent acid particles or spray from coming out. There shall be two vent holes, one serving as a guide for acid level indicator for checking the electrolyte level and other to permit drawing of electrolyte samples, servicing, checking of specific gravity etc.

1.5.10 **Marking**: Acid level line shall be permanently and indelibly marked around on all the containers. The following information shall be indelibly marked on the outside surface of each cell:

- [i] Manufacturer’s name, type and trade mark.
- [ii] Nominal voltage.
- [iii] AH capacity at 10 hours rate with specified end cell voltage.
- [iv] Cell number.
- [v] Upper and lower electrolyte level in case of transparent containers.
- [vi] Type of positive plate.
- [vii] Type of container.
- [viii] Date of manufacture [month and year] or [week and year].

2.0 **CONNECTORS:**
Bars tinned copper lead connectors shall be employed for Inter-cell and inter-row, inter-tier connections. However, the tee-off connection from the battery unit shall be made with acid resisting cables of suitable size. A suitable terminal box along with acid-resisting cable shall be provided by the tenderer for this purpose. The connectors shall preferably be of bolted type and the bolts and nuts shall be of similar material as that of connectors and shall be provided with corrosion resisting lead coating.

The connectors shall be of sufficient cross-section to withstand all the working conditions including one minute discharge rate as well as short circuit conditions.

[a] Lead coated connection hardware such as bolts, nuts etc. 5% extra. Or any other connector suitable for VRLA type Battery.


[c] Any other accessories, not specified but required for installation, satisfactory operation and maintenance of batteries for a period of 5 [five] years.

3.0 **MAXIMUM SHORT CIRCUIT CURRENT:**
The Bidder shall state the maximum short circuit current of each battery along with the safe duration in seconds which it can withstand. Methods, proposed to be adopted for protecting batteries from the short circuit conditions should also be stated to avoid damage to the battery and loss to the associated equipment.
4.0 **CHARGING:**
The bidders shall state whether an equalizing charge is recommended for the battery. If so, the equalizing charge voltage, current, duration and the interval between the equalizing charging shall be specified in the Data sheet. Bidder shall also indicate the requirements for boost charging.

5.0 **LIFE:**
The bidder shall quote in his offer the Guaranteed life of the battery when operating under the conditions specified.

6.0 **INSTRUCTION MANUALS:**
Eight sets of instruction manuals for installation, commissioning, charging and maintenance instruction shall have to be furnished.

7.0 **TRANSPORT:**
The batteries, accessories and racks etc. shall be suitably packed and transported to site.

8.0 **TESTS:**

8.1 **TYPE TESTS:**
The bidder shall submit the test reports along with his offer for the following type tests, conducted on the offered samples as per relevant National Standard[s] within five years from the date of opening of the bid and test witnessed by any Government Department / Government undertaking, failing which the offer is liable for rejection.

[a] Verification of constructional requirements.
[b] Verification of dimensions.
[c] Test for capacity.
[d] Test for retention of charge.
[e] Endurance Test.
[g] Test for voltage during discharge.

If the type test report [s] does/do not meet the requirements as per this specification, CESU at its discretion may ask the supplier to conduct the above type tests [s] at the supplier’s cost in the presence of CESU’s representative without any financial liability to CESU.

8.2 **ACCEPTANCE TESTS:**
Following shall constitute the acceptance tests which shall be test witnessed by the purchaser’s representative at the works of the manufacturer at the cost of supplier.

[i] Verification of marking.
[ii] Verification of dimensions.
[iii] Test for capacity for 10 hours discharge rate along with the Test for voltage during discharge.
8.2.1
The Purchaser may at his discretion undertake test for capacity and voltage during discharge after installation of the battery at site without any extra cost.

8.2.2
The supplier shall arrange for all necessary equipments including the variable resistor, tools, tackles and instruments. If a battery fails to meet the guaranteed requirement, NESCO/WESCO/SOUTHCO shall have the option of asking the supplier to replace the same within 15 [fifteen] days from the date of declaring the same to be insufficient/failed / not as per the specification [s].

9.0 DRAWINGS / DOCUMENTS :
The tenderer shall submit the following drawings / documents along with his offer failing which the offer is liable for rejection.

[a] General battery arrangement, proposed size of individual and over all dimensions along with sectional views showing all connections etc.
[b] Pamphlets and technical literature giving detailed information of the batteries offered.

The manufacturer shall submit the following drawings / documents in 7 [seven] copies within 15[fifteen] days from the date of issue of the purchase order for purchaser's approval. :-

[a] Lay out details of the batteries.
[b] OGA and cross-sectional details for battery cells.
[c] Instruction manuals for initial charging and subsequent charging.
[d] Technical data, curves etc.

10.0 GUARANTEED TECHNICAL PARTICULARS :
The Guaranteed technical particulars, as called for in the 'Annexure – I & II shall be furnished along with the tender. Any tender lacking complete information in this respect is likely to be rejected.

All deviations from the specification shall be separately listed, in the absence of which it will be presumed that the provisions of these specifications are complied with by the tenderer.
PART – B

CHARGER FOR BATTERIES

(15 Amp single phase Charger (Float Cum Boost Charger) suitable for 24V, 100 AH, Maintenance Battery Type VRLA)

11.0 BRIEF DESCRIPTION

Charging equipment comprising of a float charger and a Float cum boost & 15 Amp (Float Cum Boost Charger) suitable for 24 V, 100 AH, Maintenance Battery Type VRLA) charger, is required to meet the D.C. power requirements of the sub-station under normal conditions, i.e., when AC auxiliary power supply is available and also to keep all the cells in the state of full charge. The float charger shall supply the continuous DC load at the bus bars in addition to keeping, batteries floated in a healthy condition. In case of failure of A.C. mains or sudden requirement of additional DC power, the battery shall meet the demand as the battery shall be connected in parallel with the charger. After the battery has discharged to a considerable extent, it shall be fully recharged by the ‘boost’ charger unit in a short period so as to prepare it for the next emergency. Even during the ‘boost’ charging of the battery, the continuous DC load at the bus shall be met by the trickle-charging unit. The ‘boost’ charging unit shall however be provided with suitable control arrangement to function as a stand-by for float charging unit in case of necessity.

12.0 ARRANGEMENTS :

12.1 Trickle (Float) Charger :

(a) The trickle charger shall have arrangement for regulation of D.C. output voltage by:-

(c) automatic voltage regulation system.

(d) Shall be of thyristor control type with both ‘auto/manual’ control arrangement.

12.2 Quick (Boost) Charger :

The quick charger shall be similar type as trickle charging equipment, but shall have the following features.

(i) Shall be provided with control arrangement for ‘auto/manual’ current regulation features, necessary for quick charging

(ii) Shall also have ‘auto/manual’ voltage control arrangement for use when the charger will be utilised as a trickle charger.

12.3 The ‘Trickle’ and ‘Quick’ charger shall be self supporting cubicle type with front panels hinged and suitable for mounting instruments, incoming A.C., circuit breaker with thermal and instantaneous releases relays, contactors and control switches etc. The panels shall have access from the backside
also. These cubicles shall also house transformers, rectifiers and other equipment's, accessories, as stipulated in this specification.

13.0 DESIGN AND CONSTRUCTION DETAILS:

13.1 The ‘trickle’ charger and ‘quick’ charger shall be complete with silicon controlled rectifier units, dry type air-cooled transformers, control electronics, smoothing filters etc. suitable for operation from 230 V ± 10%, 50 HZ ± 5%, 1 phase A.C. supply. The charger output shall be stabilized to ± 1% of set value for ± 10% input voltage variations and 0-100% load variation.

13.2 The battery charger shall have full-wave, Half-controlled thyristor controlled bridge rectifier circuit. The charger output voltage shall suit the battery offered. The float voltage shall be adjustable from 80% to 115% of nominal voltage. The boost voltage shall be adjustable from 80% to 135% of nominal voltage. Ripple voltage shall be less than 3% RMS voltage.

13.3 Each float charger shall be capable of floating each cell of the battery bank at the specified voltage and supplying specified float current continuously under normal system operation.

13.4 Under normal operation, the float charger shall be supplying the DC load current and at the same time trickle charge the station battery. When the battery voltage goes down considerably, automatic transfer arrangement shall be provided such that the battery is disconnected from the float charger and gets connected to the boost charger. However, when battery is on boost charge, DC load shall be fed from the float charger. In addition, means shall be provided to ensure interruption free availability of control power from the battery whenever there is a power failure irrespective of whether the battery is on boost charge or float charge.

13.5 The selection of electronic components shall be used on ambient temperature of 50 degree C. and shall be of worst-case design to ensure continuous and trouble free service. The control electronics shall be built on plug in type glass epoxy printed circuit boards of modular design.

13.6 The maximum temperature, attained by any part of trickle charger and quick charger, when in service at site under continuous full load conditions shall not exceed the permissible limits as fixed by relevant standards and as corrected to site condition.

14.0 Charger Panel:

14.1 Charger panels shall be rigid, self supporting structures, completely assembled and totally enclosed cubicle type construction, made out of structural steel members with sheet steel-coverings.
14.2 The enclosure of the charger shall be made of CRCA sheet steel of thickness not less than 2 mm for load bearing members, 1.6 mm for door and non-load bearing members and 3 mm for gland plates. Panels shall be offered with base frame of 3.0 mm thick CRCA sheet, painted black all around, suitable for bolting/welding/grouting on to the foundation. Gaskets on doors and inter panel gaskets shall be of neoprene rubber.

14.3 The panel shall have hinged front and back doors with concealed type hinged locks and latches.

14.4 The panel shall have adequate cross-ventilation arrangement to avoid any undue rise in temperature.

14.5 All equipment’s and wiring used in the panel shall be tropicalised dust proof and vermin-proof.

14.6 Power wiring for the chargers shall be done with 1.1KV grade, heavy duty, single core, stranded copper conductor PVC insulated cables or suitable sized PVC sleeved copper bus bars. Control wiring for the charger shall be done with 1.1 KV grade PVC insulated copper wires of cross section 2.5 sq. mm for all control connection. Wire of 2.5 sq. mm cross section shall be used for control bus. All control wiring shall be ferruled.

14.7 Necessary terminals for grounding the panel with two separate earthing shall be arranged for bottom entry and suitable cable glands shall be provided for the cables.

14.8 Each charger panel shall incorporate all the necessary controls, Indications, interlocks, protective devices and timing features to ensure any operation.

Provision shall be made with necessary contact / relays for annunciation in the event of alternating current power failures to the charger and automatic shut down of the charger by over-voltage / current devices. Annunciation shall however be prevented when the charger is manually shutdown or when A.C. power supply is momentarily interrupted for adjustable period of 1 to 5 seconds.

14.9 The float and equaliser charging rates shall both be adjustable from the front of the charger control panel. Each charger shall be protected against any damage from over voltage/load currents and shall be so designed that it can continuously deliver at least rated current output without operation of the protective over-load device for abnormal conditions of low battery voltage down to 19.2 V (80%) of the rated voltage). But the chargers shall be disconnected from A.C. input supply through an over-voltage relay, if the input voltage exceeds 10% of the rated voltage of the equipment. Necessary selector switches for ‘Trickle Charging’ and ‘Quick charging’ shall be provided. There shall be ‘make before break’ type blocking Diodes and other equipments to be shown in the drawing or otherwise found necessary for charging or otherwise found necessary for charging the battery without increasing the voltage beyond safe value across the load shall also be supplied by the tenderer.

14.10 The rectifier units of the chargers shall be capable of supplying an impulse load of 6/7 times its rated capacity. The trickle charger in conjunction with automatic voltage regulators shall have drooping characteristics, So as to transfer the load beyond its capacity to the battery.
14.11 The incoming and outgoing circuits shall be provided with MCCBs with static releases for overload, short circuit and earth fault protections. The incoming power supply to the chargers will be from two sources with a facility of changeover switch. The change over facility shall be provided in the charger itself.

14.12 The battery circuit shall be provided with HRC fuse protection over a suitably rated load break isolator switch and reverse protection circuits.

14.13 Input volt meter and ammeter shall be of moving iron type and shall be 96 x 96 mm. Square. These meters shall be of accuracy class not less than 1.0 and shall be of flush mounting type with required PTs and CTs and selector switches. Output voltmeter and ammeter shall be moving iron type and shall be 96 x 96 mm square. These meters shall be of accuracy class not less than 1.0 and shall be flush mounting type. The ammeter shall be centre zero type for measurement of charging and discharging current from the battery.

14.14 Cluster LED lamps for indicating ‘Input on’ condition and ‘Output on’ condition, float status on / off, boost status on / off etc. shall be provided. Annunciation with audiovisual alarms shall be provided for the following.

1) Input mains failure.
2) Input phase failure.
3) Input fuse failure.
4) Rectifier fuse failure.
5) Filter fuse failure
6) DC over voltage
7) DC under voltage
8) Output fuse failure
9) Charger over-load
10) Earth leakage
11) Alarm supply fuse failure
12) Charger trip
13) Output MCCB tripped
14) AC under voltage
15) Battery low condition

ACCEPT, TEST AND RESET push buttons shall be provided. 20% spare annunciation windows shall be provided.

14.15 Any other item(s), not stipulated in this specification, but required for installation, operation and maintenance of the battery charger is / are included in the scope of supply without any extra charge on NESCO/WESCO/SOUTHCO.
15.0 **TRANSPORT** : The chargers along with its accessories shall be suitably packed and transported to site in ready to use condition.

16.0 **TESTS**

16.1 **Type Tests** : The bidder shall submit the test reports along with his offer for the following type tests conducted on the offered samples (both float charger and boost charger) as per relevant National Standard (s) within five years from the date of opening of the bid and test-witnessed by any Government Department / Government undertaking, failing which the offer is liable for rejection.

1) Measurement of voltage regulation / AVR regulation
2) Efficiency and power factor measurement test
3) Temperature rises test so as to determine the temperature rise of SCR, Transformer primary, Secondary and core, Diode, capacitor, choke and cabinet etc.
4) Measurement of insulation resistance.
   (i) AC input to earth.
   (ii) AC input to DC output.
   (iii) DC output to earth
   (iv) Test for rectifier transformer.
   (v) DC voltage current characteristic
   (vi) High Voltage Tests.
   (vii) Determination of regulation
   (viii) Measurement of ripple
   (ix) Reverse leakage test.

16.2 **Acceptance Tests** :

Followings shall constitute the acceptance tests which shall be tested by the purchaser’s representative at the works of the manufacturer at the cost of the supplier (both for FC & FCBC) for each charger. No sampling is allowed.

1. Measurement of voltage regulation / AVR Regulation
2. Efficiency and power factor measurement
3. Temperature rise test so as to determine the temperature rise of SCR, Transformer primary, secondary and core, diode, capacitor, choke and cabinet etc.
   • AC input to earth
   • AC input to DC output
   • DC output to earth
5. Test for rectifier transformer (all relevant tests as per corresponding ISS)
6. DC voltage current characteristic
7. High voltage tests.
9. Measurement of ripple
10. Tests for indications and alarms as per this specification
11. Tests for indicating instruments.
12. Determination of system set points.
13. Soft start test

**N.B.** : The supplier shall provide arrangements for monitoring the temperature across the elements, as stipulated above, continuously during the temperature rise test without disconnection of any of the temperature measuring devices across the hottest spot of each of the above elements.

All other tests, as may be necessary to ensure that all equipment's are satisfactory shall also be carried out. In addition to the above tests, manufacturer’s test certificates, vendor’s test certificates for different equipment's, accessories, instruments etc. shall be submitted, whenever required by the purchaser.

### 17.0 DRAWINGS / DOCUMENTS

The tenderer shall submit the following drawings / documents along with his offer failing which the offer is liable for rejection.

- **A.** OGA of the battery chargers
- **B.** General layout with overall dimensions
- **C.** Electrical schematic diagram showing connections and controls.
- **D.** Leaflets and technical literature giving detailed information of the panels offered.

The manufacturer shall submit the following drawings / documents in 7 (seven) copies within 15 (fifteen) days from the date of issue of the purchase order for purchaser's approval.

- i) OGA of the battery chargers
- ii) General layout with overall dimensions marked alongwith sectional views showing cable entry position etc.
- iii) Rating calculations for transformer, rectifiers, diode, capacitor, inductor etc.
- iv) Detailed schematic and connection and control wiring diagram for all the equipments.
- v) Complete bill of materials
- vi) Technical excerpts on operation.
- vii) The circuit diagram of charger including circuit diagrams of all cards to facilitate the maintenance of chargers

### 18.0 GUARANTEED TECHNICAL PARTICULARS

The guaranteed technical particulars of this specification shall be furnished along with the tender. Any tender, lacking complete information in this respect is likely to be rejected.
### 19.0 DEVIATION FROM SPECIFICATION

All deviations from the specification shall be separately listed in the technical deviation sheet, in the absence of which it will be presumed that the provisions of these specifications are complied with by the tenderer.

### 20.0 GENERAL TECHNICAL REQUIREMENTS FOR BATTERY CHARGER SUITABLE FOR 24 V VRLA TYPE BATTERY

<table>
<thead>
<tr>
<th></th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td><strong>Type</strong></td>
</tr>
<tr>
<td>2.</td>
<td><strong>RATINGS</strong></td>
</tr>
<tr>
<td>3.</td>
<td><strong>AC INPUT</strong>  &lt;br&gt;(a) Voltage  &lt;br&gt;(b) Frequency  &lt;br&gt;(c) Phase</td>
</tr>
<tr>
<td>4.</td>
<td><strong>D.C. OUTPUT</strong>  &lt;br&gt;VOLTAGE SETTINGS  &lt;br&gt;Nominal  &lt;br&gt;Float</td>
</tr>
<tr>
<td>5.</td>
<td><strong>OUTPUT CURRENT LIMIT</strong></td>
</tr>
<tr>
<td>6.</td>
<td><strong>POWER CONVERSION</strong></td>
</tr>
<tr>
<td>7.</td>
<td><strong>VOLTAGE REGULATION AT BRIDGE OUTPUT.</strong></td>
</tr>
<tr>
<td>8.</td>
<td><strong>RIPPLE_VOLTAGE</strong></td>
</tr>
<tr>
<td>9.</td>
<td><strong>EFFICIENCY</strong></td>
</tr>
<tr>
<td>10.</td>
<td><strong>PROTECTIONS</strong></td>
</tr>
<tr>
<td></td>
<td>(a) Input side</td>
</tr>
<tr>
<td></td>
<td>(b) Output side</td>
</tr>
<tr>
<td></td>
<td>(c) Protection</td>
</tr>
<tr>
<td></td>
<td>(d) Control Circuit</td>
</tr>
<tr>
<td></td>
<td>(e) Capacitor circuit</td>
</tr>
<tr>
<td></td>
<td>(f)</td>
</tr>
<tr>
<td></td>
<td>(g)</td>
</tr>
<tr>
<td></td>
<td>(h)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th><strong>Float &amp; Float cum boost charger &amp; Float Cum Boost Charger for VRLA Type, full wave, full controlled type.</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>20.</td>
<td><strong>10 / 15 A Float cum Boost for 24 V, 100 AH VRLA Type Battery</strong></td>
</tr>
<tr>
<td>230VAC ± 10% 50Hz ± 5% 1 - phase</td>
<td></td>
</tr>
<tr>
<td>24V/ 27V (adj. By + 20%, - 5%)</td>
<td></td>
</tr>
<tr>
<td>24V/ 33V (adj. By + 2%, - 5%)</td>
<td></td>
</tr>
<tr>
<td>10A 15A</td>
<td></td>
</tr>
<tr>
<td>AC to DC by means of single phase full wave, Half controlled bridge rectifier consisting of thyristors and diodes.</td>
<td></td>
</tr>
<tr>
<td>± 1% of set value for ± 10% Input Voltage Variations, 0-100% Load variation.</td>
<td></td>
</tr>
<tr>
<td>Less than 3% RMS without battery connected.</td>
<td></td>
</tr>
<tr>
<td>More than 80% at full load</td>
<td></td>
</tr>
<tr>
<td>AC input MCCB &amp; ELBS with input ON/OFF switch and fuses, contactor</td>
<td></td>
</tr>
<tr>
<td>DC output MCCB with output ON/OFF switch and fuses.</td>
<td></td>
</tr>
<tr>
<td>Current limit protection, soft start feature, surge suppressor.  &lt;br&gt;Fast semiconductor fuses for rectifier bridge.</td>
<td></td>
</tr>
<tr>
<td>Fuses</td>
<td></td>
</tr>
<tr>
<td>Rectifier HRC fuses.</td>
<td></td>
</tr>
<tr>
<td>Over-voltage cut-back</td>
<td></td>
</tr>
<tr>
<td>Charger over load / short circuit</td>
<td></td>
</tr>
<tr>
<td>Blocking diode</td>
<td></td>
</tr>
</tbody>
</table>
| 11. | CONTROLS AND SWITCHES | Followings controls and switches are provided in the system:
1. AC input source MCCBs with interlocking
2. DC output MCCB
4. Float and boost voltage variable potentiometers.
5. Manual voltage adjustment Potentiometer
6. Test push button
7. Reset push button
8. Battery current adjustment potentiometers
9. Heater’s power supply switch
10. Socket power supply switch |
| 12. | FEATURES | The following features are provided in the systems:
1. Soft start on DC side
2. Class-F insulation for all magnetic
3. Automatic voltage regulation.
4. Automatic changeover from float to boost and vice versa based on current, drawn by battery.
5. Filter circuit to eliminate ripple.
6. Charger current limit
7. Separate battery path current limit.
8. Built-in auto phase reversal of operation. |
| 13. | METERS | F.C. B.C.
(i) Input Voltmeter (i) Common
(ii) Input Ammeter (ii) Input Ammeter
(iii) Output Voltmeter (iii) Output Voltmeter
(iv) Output Ammeter (iv) Output Ammeter. |
| 14. | Indications | Phase ‘ON’ lamps
(ii) Output ‘ON’ lamp
(iii) Charger ‘ON’ float LED
(iv) Charger ‘ON’ boost LED. |
| 15. | Annunciation with audiovisual alarms. | (i) AC input mains failure (v) Rectifier fuse failure
(ii) Input phase failure (vi) Output fuse failure
(iii) AC under voltage (vii) Filter fuse failure
(d) Input phase failure (viii) DC under voltage
(e) Rectifier fuse failure (ix) DC over Voltage
(f) Output fuse failure (x) Charger trip
(g) Filter fuse failure (xi) Capacitor fuse fail
(h) DC under voltage (xii) Output MCCB tripped.
(i) DC over voltage |
| 16. | Operating ambient temperature surrounding the panel | 0° to 50°C |
| 17. | Surrounding the panel Relative humidity. | 0-95% non-condensing |
| 18. | PANEL  
   (i) Protective grade  
   (ii) Cooling  
   (iii) Paint | IP – 42  
   Natural air-cooled  
   Smoke Grey of ISS-692 shade |
| 19. | MAGNETICS:  
   a) Average winding temperature rise over ambient temperature  
   (a) Insulation class  
   c) Insulation breakdown voltage. | As per relevant ISS.  
   'F'  
   3 KV for 1 min withstand. |
| 20. | CABLES | 1100 V grade PVC insulated copper. Ferrules shall be provided for identification of connection. |

**N.B.:** -Besides the above general technical requirements, all other stipulations, as enumerated in this technical specification shall be followed. Any deviation should be clearly brought out with clear explanation.

Any extra feature/ equipment / instrument as necessary for operation and performance of the battery charger for the 24V battery set as per this specification shall be provided without any extra cost to NESCO/WESCO/SOUTHCO.
1.0 TECHNICAL SPECIFICATION FOR CONTROL CABLES

1.1 PART 1: SCOPE AND CONDITIONS

This specification covers the testing and performance requirements of control cables for installation on the Distribution System of NESCO/WESCO/SOUTHCO.

The equipment offered shall have been successfully type tested and the design shall have been in satisfactory operation for a period not less than preceding 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 control cables 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 Engg Incharge shall have the power to reject any work or material, which, in his judgement, is not in full accordance therewith.

1.2 STANDARDS

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

<table>
<thead>
<tr>
<th>IEC / ISO</th>
<th>Indian Standard</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>IEC 811</td>
<td>IS-18-10810:1982</td>
<td>Testing cables</td>
</tr>
<tr>
<td>IEC 502</td>
<td>IS-7098:1985 (part 2)</td>
<td>LT and 3.3 - 33kVXLPE cables</td>
</tr>
<tr>
<td>IEC 502</td>
<td>IS - 1554:1988 (part 1)</td>
<td>PVC Cables .65/1.1kV</td>
</tr>
<tr>
<td>IEC 227</td>
<td>IS - 5819 :1970</td>
<td>Short circuit ratings for PVC cables</td>
</tr>
<tr>
<td>IEC 228</td>
<td>15-8130:1984</td>
<td>Conductors for insulated cables</td>
</tr>
<tr>
<td>IEC 502</td>
<td>IS - 6474: 1984</td>
<td>XLPE Cables</td>
</tr>
<tr>
<td>IEC 502</td>
<td></td>
<td>Extruded solid dielectric insulated power cables for rated voltages from 1.1kV to 30kV</td>
</tr>
<tr>
<td>IEC 540 IS - 5831: 1984</td>
<td></td>
<td>Test Methods for insulation and sheaths of electric cables and cords</td>
</tr>
<tr>
<td>IEC 287</td>
<td></td>
<td>Calculation of the continuous current rating of cables.</td>
</tr>
<tr>
<td>IS - 3975 : 1979</td>
<td></td>
<td>Mild steel wires, strips and tapes for armouring of cables</td>
</tr>
</tbody>
</table>
The Bidder may propose alternative standards, provided it is demonstrated that they give a degree of quality and performance equivalent to or better than the referenced standards. Acceptability of any alternative standard is at the discretion of the Project Manager. The Bidder shall furnish a copy of the alternative standard proposed along with his bid. If the alternative standard is in a language other than English, an English translation shall be submitted with the standard. In the case of conflict the order of precedence shall be 1) IEC or ISO Standards, 2) Indian Standards, 3) other alternative standards.

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

1.3 SERVICE CONDITIONS

The service conditions shall be as follows:

- maximum altitude above sea level 1,000m
- maximum ambient air temperature 50°C
- maximum daily average ambient air temperature 35°C
- minimum ambient air temperature 0°C
- maximum temperature attainable by an object exposed to the sun 60°C
- maximum yearly weighted average ambient temperature 32°C
- maximum relative humidity 100%
- average number of thunderstorm days per annum (isokeraunic level) 70
- average number of rainy days per annum 120
- average annual rainfall 150cm
- wind pressures as per IS 802 (Part I/ Sec. I) : 1995

Environmentally, the region where the work will take place includes coastal areas, subject to high relative humidity, which can give rise to condensation. Onshore winds will frequently be salt laden. On occasions, the combination of salt and condensation may create pollution conditions for outdoor insulators.

Therefore, outdoor material and equipment shall be designed and protected for use in exposed, heavily polluted, salty, corrosive and humid coastal atmosphere.

1.4 SYSTEM CONDITIONS

The cables shall be suitable for installation in supply systems of the following characteristics:

- Frequency 50 Hz
• Nominal system voltages
  33 kV
  11 kV
  400 / 230 V

• Maximum system voltages:
  33 kV System 36.3 kV
  11 kV System 12.1 kV
  LV System 476 V

• Minimum LV voltage
  340 V

• Nominal short circuit levels:
  33 kV System 25 kA
  11 kV System 12.5 kA

• Insulation Levels:
  1.2/50 (j.s impulse withstand voltage
  (positive and negative polarity):
    33 kV System 170 kV
    11 kV System 75 kV

• Power frequency one minute withstand
  voltage (wet and dry) rms
    33 kV System 70 kV
    11 kV System 28 kV
    LV System 3 kV

• Neutral earthing arrangements:
  33 kV System solidly earthed
  11 kV System solidly earthed
  LV System solidly earthed

2.0 PART 2 : TECHNICAL

All control cables to be used in the NESCO/WESCO/SOUTHCO distribution system shall be of the cross-linked polyethylene (XLPE) or polyvinyl chloride (PVC) insulated with PVC sheathing types.

2.1 1.1KV POLYVINYL CHLORIDE (PVC) INSULATED CABLES
2.2 RATED VOLTAGE AND TEMPERATURE

Control and Panel Wiring Cables (PVC insulated)

The conductor shall be of round stranded plain copper wires complying with IS - 8130:1984/ IEC 228.

The conductors shall be of Flexibility Class 2 as per IS - 8130 : 1984.

2.3 Conductor screening not required

2.4 Insulation

The insulation shall be of Polyvinyl Chloride (PVC) compound. ‘Heat Resisting’ Type C for the Control and Panel Wiring cables. Both shall conform to the requirements of IS - 5831: 1984.

<table>
<thead>
<tr>
<th>Type of Insulation</th>
<th>Normal Continuous Operation</th>
<th>Short Circuit Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Purpose</td>
<td>70°C</td>
<td>160°C</td>
</tr>
<tr>
<td>Heat Resisting</td>
<td>85°C</td>
<td>160°C</td>
</tr>
</tbody>
</table>

The PVC insulation shall be applied by extrusion and the average thickness of insulation shall not be less than the specified nominal value and the maximum value not more than 0.1 mm plus 0.1 of nominal and as specified in IS – 1554 (part 1): 1988.

The insulation shall be applied so that it fits closely on to the conductor and it shall be possible to remove it without damage to the conductor.

2.5 Insulation Screening not required

2.6 Core Identification and Laying up of Cores

In multi-core cables, the cores shall be laid up together with a suitable lay as recommended in IS - 1554 (Part 1): 1988. The layers shall have successive right and left hand lays with the outermost layer having a right hand lay.

2.7 Inner Sheath

The laid up cables shall be covered with an inner sheath made of thermoplastic material (PVC) applied by extrusion.

The thickness of the sheath shall conform to IEC 502/IS - 1554: 1988. Single core cables shall have no inner sheath.
The outer serving shall incorporate an effective anti-termite barrier and shall be capable of withstanding a 10kV DC test voltage for five minutes after installation and annually thereafter.

Cables shall be installed as a single four core cable or three single phase cables plus neutral in a close trefoil formation.

Current ratings shall be calculated in accordance with IEC 287 "Calculation of the continuous current rating of cables with 100% load factor".

2.8 **Conductor Sizes**

The following shall be used for Control and Panel Wiring:

- 2.5 mm$^2$ single core
- 2.5 and 4.0 mm$^2$ four core
- 1.5 and 2.5 mm$^2$ multicore

2.9 **Cable Drum Length**

The cable shall be supplied in 500metre lengths.

2.10 **CABLE IDENTIFICATION**

The manufacturer's and Employer's name or trade mark, the voltage grade, cable designation and year of manufacture shall be indented or embossed along the whole length of the cable. The indentation or embossing shall only be done on the outer sheath. The alphanumerical character size shall be not less than 20% of the circumference of the cable and be legible.

3.0 **SAMPLING OF CABLES**

3.1 **Lot**

In any consignment the cables of the same size manufactured under essentially similar conditions of production shall be grouped together to constitute a lot.

3.2 **Scale of Sampling**

Samples shall be taken and tested from each lot to ascertain the conformity of the lot to specification.

3.3 **Sampling Rates**

The number of samples to be selected shall be as follows:

<table>
<thead>
<tr>
<th>Number of drums in the Lot</th>
<th>Number of Drums to be taken as samples</th>
<th>Permissible number of defective drums</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 25</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>26 to 50</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>51 to 100</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>101 to 300</td>
<td>13</td>
<td>1</td>
</tr>
<tr>
<td>301 and above</td>
<td>20</td>
<td>1</td>
</tr>
</tbody>
</table>
The samples shall be taken at random. In order to achieve random selection the procedure for selection detailed in IS - 4905: 1968 shall be followed.

4.0 NUMBER OF TESTS AND CRITERION FOR CONFORMITY

Suitable lengths of test samples shall be taken from each of the selected drums. These samples shall be subjected to each of the acceptance tests. A test sample shall be classed as defective if it fails any of the acceptance tests. If the number of defective samples is less than or equal to the corresponding number given in 8.3 the lot shall be declared as conforming to the requirements of acceptance test.

5.0 TESTS ON 1.1 KV PVC INSULATED CABLES

5.1 Type Tests

Certification of type tests already completed by independent test laboratories shall be presented with the bid for each cable type. These tests shall be carried out in accordance with the requirements of IS - 8130: 1984/IEC 502, IS - 5831:1984/IEC 540 and IEC 811 unless otherwise specified.

Type testing of 33kV, 11kV and 1.1 kV cables shall include the following:

<table>
<thead>
<tr>
<th>Test</th>
<th>Requirement Reference</th>
<th>Test Method as a Part of IS-10810/IEC 811</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Tests on conductor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annealing test (copper)</td>
<td>IS-8130: 1984/IEC 502</td>
<td>1</td>
</tr>
<tr>
<td>Tensile test (aluminium)</td>
<td>IS-8130: 1984/IEC 502</td>
<td>2</td>
</tr>
<tr>
<td>Wrapping test (aluminium)</td>
<td>IS-8130: 1984/IEC 502</td>
<td>3</td>
</tr>
<tr>
<td>Resistance test</td>
<td>IS-8130: 1984/IEC 502</td>
<td>5</td>
</tr>
<tr>
<td>(b) Tests for Armour wires/strips</td>
<td>IS - 3975: 1979/IEC 502</td>
<td>36 - 42</td>
</tr>
<tr>
<td>(c) Tests for thickness of insulation and sheath</td>
<td>IS-5831:1984/IEC 540</td>
<td>6</td>
</tr>
<tr>
<td>(d) Physical tests for Insulation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tensile strength and elongation at break</td>
<td>IS-5831:1984/IEC 540</td>
<td>7</td>
</tr>
<tr>
<td>Ageing in air oven</td>
<td>IS-5831:1984/IEC 540</td>
<td>11</td>
</tr>
<tr>
<td>Hot test</td>
<td>IS-5831:1984/IEC 540</td>
<td>30</td>
</tr>
<tr>
<td>Shrinkage test</td>
<td>IS-5831:1984/IEC 540</td>
<td>12</td>
</tr>
</tbody>
</table>
Water absorption (gravimatic) IS-5831:1984/IEC 540

(e) Physical tests for outer sheath

- Tensile strength and elongation at break IS-5831: 1984/IEC 540
- Ageing in air oven IS-5831: 1984/IEC 540
- Shrinkage test IS-5831: 1984/IEC 540
- Hot deformation IS-5831: 1984/IEC 540

<table>
<thead>
<tr>
<th>Test</th>
<th>Requirement Reference</th>
<th>Test Method as a Part of IS-10810/IEC811</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loss of mass in air oven</td>
<td>IS-5831: 1984/IEC540</td>
<td>10</td>
</tr>
<tr>
<td>Heat shock</td>
<td>IS-5831: 1984/IEC540</td>
<td>14</td>
</tr>
<tr>
<td>Partial discharge test</td>
<td>Section 13.2 of this specification</td>
<td>46</td>
</tr>
<tr>
<td>(11 and 33kV only)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bending test (11 and 33kV only)</td>
<td>Section 13.2 of this specification</td>
<td>50</td>
</tr>
<tr>
<td>Dielectric power factor test</td>
<td>Section 13.4 of this specification</td>
<td>48</td>
</tr>
<tr>
<td>(11 and 33kV only)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insulation resistance test</td>
<td>IS-8130: 1984/IEC502</td>
<td>43</td>
</tr>
<tr>
<td>(volume resistivity)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heating cycle test</td>
<td>Section 13.5 of this specification</td>
<td>49</td>
</tr>
<tr>
<td>(11 and 33kV only)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impulse withstand test</td>
<td>Section 13.6 of this specification</td>
<td>47</td>
</tr>
<tr>
<td>(11 and 33kV only)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High voltage test</td>
<td>Section 13.7 of this specification</td>
<td>45</td>
</tr>
<tr>
<td>Flammability test</td>
<td>Section 13.8 of this specification</td>
<td>53</td>
</tr>
</tbody>
</table>

Tests (g), (h), (j), (l) and (m) are only applicable to screened cables.

5.2 Acceptance Tests

The following shall constitute acceptance tests:
• Tensile test (aluminium)
• Annealing test (copper)
• Wrapping test
• Conductor resistance test
• Test for thickness of insulation and sheath
• Hot set test for insulation*
• Tensile strength and elongation at break test for insulation and outer sheath
• Partial discharge test (for screened cables only)**
• High voltage test
• Insulation resistance (volume resistivity) test.
• XLPE insulation only
  ** test to be completed on full drum of cable

5.3 Routine Tests

Routine tests shall be carried out on all of the cable on a particular order. These tests shall be carried out in accordance with the requirements of IS - 8130: 1984/IEC 502 and IS - 5831:1984/IEC 540 unless otherwise specified.

The following shall constitute routine tests.
• Conductor resistance test
• Partial discharge test (for 11 kV and 33kV screened cables only)*
• High voltage test
  * Test to be completed on full drum of cable

5.4 Optional Test

Cold impact test for outer sheath (IS - 5831 - 1984), which shall be completed at the discretion of the Project Manager and at the same time as test at low temperature for PVC as stipulated in the section on special tests.

5.5 Special tests

Special tests shall be carried out at the Project Manager’s discretion on a number of cable samples selected by the Project Manager from the contract consignment. The test shall be carried out on 10% of the production lengths of a production batch of the same cable type, but at least one production length. Special tests shall be carried out in accordance with the requirements of IEC 502 and IEC 540 unless otherwise specified.

The following special tests shall be included:
• Conductor Examination (IEC-228)
• Check of Dimensions
• Test at low temperature for PVC

6.0 DETAILS OF TESTS

6.1 General

Unless otherwise stated, the tests shall be carried out in accordance with the appropriate part of IS - 10810/IEC 502: 1994 and the additional requirements as detailed in this specification.

6.2 Partial Discharge Test

Partial discharge tests shall only be made on cables insulated with XLPE of rated voltages above 1.9/3.3kV.

For multicore cables, the test shall be carried out on all insulated cores, the voltage being applied between each conductor and the metallic screen.

6.3 Bending Test

The diameter of the test cylinder shall be 20 (d +D) ± 5% for single core cables and 15 (d+D) ± 5% for multicores, where D is the overall diameter of the completed cable in millimetres and d is the diameter of the conductor. After completing the bending operations, the test samples shall be subjected to partial discharge measurements in accordance with the requirements of this specification.

6.4 Dielectric Power Factor Test

Tan δ as a Function of Voltage

For cables of rated voltage 1.1 kV and above

The measured value of tan δ at Uo shall not exceed 0.004 and the increment of tan δ between 0.5 Uo and 2 Uo shall not be more than 0.002.

6.5 Heating Cycle Test

The sample which has been subjected to previous tests shall be laid out on the floor of the test room and subjected to heating cycles by passing alternating current through the conductor until the conductor reaches a steady temperature 10°C above the maximum rated temperature of the insulation in normal operation. After the third cycle the sample shall subjected to a dielectric power factor as a function of voltage and partial discharge test.

6.6 High Voltage Test

1. Type/ Acceptance Test

The cable shall withstand, without breakdown, at ambient temperature, an ac voltage equal to 3Uo, when applied to the sample between the conductor and screen/ armour (and between conductors in the
case of unscreened cable). The voltage shall be gradually increased to the specified value and maintained for a period of 4 hours.

If while testing, interruption occurs during the 4 hour period the test shall be prolonged by the same extent. If the interruption period exceeds 30 minutes the test shall be repeated.

6.7 Routine Test

Single core screened cables, shall withstand, without any failure, the test voltages given in this specification for a period of five minutes between the conductor and metallic screen.

Single core unscreened cables shall be immersed in water at room temperature for one hour and the test voltage then applied for 5 minutes between the conductor and water.

Multicore cables with individually screened cores, the test voltage shall be applied for 5 minutes between each conductor and the metallic screen or covering.

Multicore cables without individually screened cores, the test voltage shall be applied for 5 minutes in succession between each insulated conductor and all the other conductors and metallic coverings, if any.

When a DC voltage is used, the applied voltage shall be 2.4 times the power frequency test voltage. In all instances no breakdown of the insulation shall occur.

6.8 Flammability Test

The period for which the cable shall burn after the removal of the flame shall not exceed 60 seconds and the unaffected portion (uncharred) from the lower edge of the top clamp shall be at least 50mm.

7.0 CONTROL / LV WIRING ACCESSORIES

7.1 Terminations

Control wire terminations shall be made with solderless crimping type and tinned copper lugs which firmly grip the conductor. Insulated sleeves shall be provided at all the wire termination. Engraved core identification plastic ferrules marked to correspond with panel wiring diagram shall be fitted at both ends of each wire. Ferrules shall fit tightly on the wire and shall not fall off when the wire is disconnected from terminal blocks. All wires directly connected to trip circuit breaker or device shall be distinguished by the addition of red coloured unlettered ferrule. Numbers 6 and 9 shall not be included for ferrules purposes except where underlined and identified as 6 and 9.

LVAC cable terminals shall be provided with adequate size crimp type lugs. The lugs shall be applied with the correct tool, which shall be regularly checked for correct calibration. Bi-metallic joints between the terminals and lugs shall be provided where necessary.

Terminals shall be marked with the phase colour in a clear and permanent manner.
A removable gland plate shall be provided by the contractor at every cable entry to mechanism boxes, cabinets and kiosks. The Contractor shall be responsible for drilling the cable gland plate to the required size.

PART 3 : GENERAL PARTICULARS AND GUARANTEES

8.0 COMPLIANCE WITH SPECIFICATION

The control cables shall comply in all respects with the requirements of this specification. However, any minor departure from the provisions of the specification shall be disclosed at the time of bidding in the Non Compliance Schedule in this document.

The mass and dimensions of any item of equipment shall not exceed the figures stated in the schedules.

8.1 COMPLIANCE WITH REGULATIONS

All the equipment shall comply in all respects with the Indian Regulations and Acts in force.

The equipment and connections shall be designed and arranged to minimise the risk of fire and any damage which might be caused in the event of fire.

8.2 Non-conforming product

The Project Manager shall retain responsibility for decisions regarding acceptance, modification or rejection of non-conforming items.

8.3 Sub-contractors

The Contractor shall ensure that the Quality Assurance requirements of this specification are followed by any sub-contractors appointed by him under the Contract.

The Contractor shall assess the sub-contractor’s Quality Assurance arrangements prior to his appointment to ensure compliance with the appropriate ISO 9000 standard and the specification.

Auditing of the sub-contractor’s Quality Assurance arrangements shall be carried out by the Contractor and recorded in such a manner that demonstrates to the Project Manager the extent of the audits and their effectiveness.
The authorized representative of NESCO/WESCO/SOUTHCO shall have free entry at all times, while work on the contract is being performed, to all parts of the manufacturer's works which concern the processing of the equipment ordered. The manufacturer shall afford the Project Manager without charge, all reasonable facilities to assure that the equipment being furnished is in accordance with this specification.

The equipment shall successfully pass all the type tests, acceptance tests and routine tests referred to in the section on Tests and those listed in the most recent edition of the standards given in this specification.

The Project Manager reserves the right to reject an item of equipment if the test results do not comply with the values specified or with the data given in the technical data schedule.

Type tests shall be carried out at an independent testing laboratory or be witnessed by a representative of such laboratory or some other representative acceptable to the Project Manager. Routine and acceptance tests shall be carried out by the Contractor at no extra charge at the manufacturer's works.

Type Test certificates shall be submitted with the bid for evaluation. The requirement for additional type tests will be at the discretion of the Project Manager.

The Project Manager may witness routine, acceptance and type tests. In order to facilitate this, the Contractor shall give the Project Manager a minimum of four weeks notice that the material is ready for testing. If the Project Manager does not indicate his intention to participate in the testing, the manufacturer may proceed with the tests and shall furnish the results thereof to the Project Manager.

Full details of the proposed methods of testing, including connection diagrams, shall be submitted to the Project Manager by the Contractor for approval, at least one month before testing.

All costs in connection with the testing, including any necessary re-testing, shall be borne by the Contractor, who shall provide the Project Manager with all the test facilities which the latter may require, free of charge. The Project Manager shall have the right to select the samples for test and shall also have the right to assure that the testing apparatus is correct. Measuring apparatus for routine tests shall be calibrated at the expense of the Contractor at an approved laboratory and shall be approved by the Project Manager.

The Contractor shall be responsible for the proper testing of the materials supplied by sub-contractors to the same extent as if the materials were completed or supplied by the Contractor.
Any cost incurred by the Project Manager in connection with inspection and re-testing as a result of failure of the equipment under test or damage during transport or off-loading shall be to the account of the Contractor.

The Contractor shall submit to the Project Manager five signed copies of the test certificates, giving the results of the tests as required. No materials shall be dispatched until the test certificates have been received by the Project Manager and the Contractor has been informed that they are acceptable.

The test certificates must show the actual values obtained from the tests, in the units used in this specification, and not merely confirm that the requirements have been met.

In the case of components for which specific type tests or routine tests are not given in this specification, the Contractor shall include a list of the tests normally required for these components. All materials used in the Contract shall withstand and shall be certified to have satisfactorily passed such tests.

No inspection or lack of inspection or passing by the Project Manager’s Representative of equipment or materials whether supplied by the Contractor or sub-contractor, shall relieve the Contractor from his liability to complete the contract works in accordance with the contract or exonerate him from any of his guarantees.

9.0 Guarantee

The Contractor shall guarantee the following:

- Quality and strength of materials used;
- Satisfactory operation during the guarantee period of one year from the date of commissioning, or 18 months from the date of acceptance of the equipment by the Project Manager following delivery, whichever is the earlier;
- Performance figures as supplied by the Bidder in the schedule of guaranteed particulars.

10.0 PROGRESS REPORTING

The Contractor shall submit for approval within two weeks of the starting date of the contract, an outline of production, inspection, delivery (and installation) in a chart form. Within a further period of two weeks, the Contractor shall provide a detailed programme of the same information in a form to be agreed by the Project Manager. The design aspect of the progress report shall include a comprehensive statement on drawings, calculations and type test reports submitted for approval.
The position on material procurement shall give the dates and details of orders placed and indicate the delivery dates quoted by the manufacturer. If any delivery date has an adverse effect on the contract programme, the Contractor shall state the remedial action taken to ensure that delays do not occur.

The position on manufacture shall indicate the arrival of raw material and the progress of manufacture. Any events that may adversely affect completion in the manufacturer's works shall also be reported.

All works tests done shall be listed and test results shall be remarked upon. Any test failure shall be highlighted.

The dispatch of each order shall be monitored on the progress report giving the date by which the equipment will be available for transport, the estimated time of arrival on site and the dates actually achieved.

Delays or test failures in any part of the programme which may affect any milestone or final completion dates shall be detailed by the Contractor who shall state the action taken to effect contract completion in accordance with the contract programme.

11.0 SPARE PARTS AND SPECIAL TOOLS

The Contractor shall provide prices for spare conductor, joints and termination equipment.

The Project Manager may order all or any of the spare parts listed at the time of contract award and the spare 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 for the various cables, joints and termination equipment and this shall form part of the drawings and literature to be supplied.

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 equipment 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 installation and maintenance instructions.
12.0 PACKING AND SHIPPING

12.1 Packing

The cable shall be wound on strong drums or reels capable of withstanding all normal transportation and handling.

Each length of cable shall be durably sealed before shipment to prevent ingress of moisture. The drums, reels or coils shall be lagged or covered with suitable material to provide physical protection for the cable during transit and during storage and handling operations.

In the case of steel drums adequate precautions shall be taken to prevent damage being caused by direct contact between the cable sheath and the steel. These precautions shall be subject to the approval of the Project Manager.

If wooden drums are used then the wood shall be treated to prevent deterioration from attack by termites and fungi.

Each drum or reel shall carry or be marked with the following information:

- Individual serial number
- Employer's name
- Destination
- Contract Number
- Manufacturer's Name
- Year of Manufacture
- Cable Size and Type
- Length of Conductor (metres)
- Net and Gross Mass of Conductor (kg)
- All necessary slinging and stacking instructions.
- Destination;
- Contractor's name;
- Name and address of Contractor's agent in Orissa;
- Country of origin;

The direction of rolling as indicated by an arrow shall be marked on a flange.
12.2 Storage

The site selected for the storage of cable drums shall be well drained and preferably have a concrete/firm surface which will prevent the drums sinking into the ground or being subjected to excess water thus causing flange rot.

All drums shall be stood on battens, in the upright position, and in such a manner to allow sufficient space between them for adequate air circulation. During storage the drums shall be rotated 90° every three months. In no instances shall the drums be stored "flat" on their flanges or one on top of each other.

12.3 Shipping

The Contractor shall be responsible for the shipping of all cables, drums and reels supplied from abroad to the ports of entry and for the transport of all goods to the various specified destinations including customs clearance, offloading, warehousing and insurance.

The Contractor shall inform himself fully as to all relevant transport facilities and requirements and loading gauges and ensure that the equipment as packed for transport shall conform to these limitations. The Contractor shall also be responsible for verifying the access facilities specified.

The Contractor shall be responsible for the transportation of all loads associated with the contract works and shall take all reasonable steps to prevent any highways or bridges from being damaged by his traffic and shall select routes, choose and use vehicles and restrict and distribute loads so that the risk of damage shall be avoided. The Contractor shall immediately report to the Project Manager any claims made against the Contractor arising out of alleged damage to a highway or bridge.

All items of equipment shall be securely clamped against movement to ensure safe transit from the manufacturer's facilities to the specified destinations (work sites.)

The Contractor shall advise the storage requirements for any plant and equipment that may be delivered to the Project Manager's stores. The Contractor shall be required to accept responsibility for the advice given in so far as these arrangements may have a bearing on the behaviour of the equipment in subsequent service.

12.4 Hazardous substances

The Contractor shall submit safety data sheets in a form to be agreed for all hazardous substances used with the equipment. The Contractor shall give an assurance that there are no other substances
classified as hazardous in the equipment supplied. The Contractor shall accept responsibility for the
disposal of such hazardous substances, should any be found.

The Contractor shall be responsible for any injuries resulting from hazardous substances due to non
compliance with these requirements.
RETAINING WALL WHERE EARTH FILLING 1 MTR.
DRAIN

RETAINING WALL WHERE EARTH FILLING IS LESS THAN 1 MTR.
ROAD INSIDE SUB STATION

1500 mm to 200 mm thick consolidated W.B. Sub Base Course (in areas where S.B.C is less than 10 MT - 500 mm thick and in other areas it should be 200 mm thick)
FOUNDATION FOR RS JOIST POLE

Exc Depth - 9mtr - 1.5 Mtr
Exc Depth - 10mtr & 11mtr - 2 Mtr

Note: All Dimensions are in mm

NB: 1. Side Concrete Should be 400mm above pedestal
2. Plain Side Clips 2 no. 65x65x6mm x 350mm length
   each clip should have 2no. 16mm x 30mm size bolts with pack and
   spring washer
DESIGN OF SPIKES

40mm Ø 4 Mtr Spike

50mm Ø 100mm Pipe

325 x 325 x 6mm GI Plate

325 x 325 x 6mm GI Plate
TO RS Joist

10mm Dia Hole

325 x 325 x 6mm GI Plate
Welded to 150x150 RS Joist

10mm Dia Hole

50mm Ø 100mm Pipe
Welded to 325 x 325 x 6mm
GI Plate
COMPUND WALL FOUNDATION

PILLAR FOR COMPUND WALL WITH FOUNDATION

(300mm Pillar at every 4mtr Interval)
CONCRETING OF PSC POLE

Exc:- 9mtr - 1.5mtr
Exc:- 10mtr & above- 2mtr

- PCC 1:2:4
- 500 X 500 X 10 mm MS Plate
- 90 X 500 X 500mm Stone

1500/2000 mm

75/200mm PCC (1:4:8)

500 X 500

1000 X 1000
Note: The drawing is for Tender Purpose only. Detail drawing to be submitted by Vendor during detail engineering.
VOLUME- II

(Sample Forms)

Tender Notification: CSO/ 49/ Installation of 33/11 KV Substation & Lines

Date: 03.08.2011
BID PROPOSAL LETTER

Electrical Installation of Works under WESCO

Bidder’s Name and Address:
(in case of JV/Consortium, Name of JV/Consortium)

Bid Proposal Reference:

Person to be contacted:

Designation:

Telephone No.:

E-mail:

Fax No.:

To, Fax No:-

Name & Address of the Purchaser’s designated Officer

Dear Sir,

We the undersigned bidder have read and examined the detailed specification and bidding documents for execution of various electrical installations works and do herewith submit our bid for the following packages:

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of the Purchaser</th>
<th>Name of the Division</th>
<th>Package Code Reference</th>
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We declare the following:

1.0 PRICES AND VALIDITY:

1.01 All the prices and price components stated in our bid proposal are firm and not subject to any price adjustment, in line with the bidding documents. All the prices and other terms and conditions of this proposal are valid for a period of 180 days from the date of opening of the bids. We further declare that prices stated in our proposal are in accordance with “Instructions to Bidders” of bidding documents.

1.02 We do hereby confirm that our bid prices as quoted in attached Schedules include all import duties and levies including license fees lawfully payable by us on imported items and other taxes, duties and levies.
applicable on bought-out components, materials, equipment and other items and confirm that any such
taxes, duties and levies additionally payable shall be to our account.

1.03 We confirm that the Sales tax on Works Contract, Turnover Tax or any other similar taxes under the Sales Tax Act, as applicable, are included in our quoted bid price and there shall not be any liability on this account to the Purchasers. We understand that Purchasers shall, deduct such taxes at source as per the rules and issue TDS Certificate to us.

1.04 We confirm that, in our Bid Price, we have considered service tax in line with lawful prevalent practice.

1.05 Price components of various items are indicated in the B.O.Q. for the respective works.

1.06 We further declare that while quoting the price, the due credit under MODVAT scheme, re-christened as CENVAT scheme, as per relevant Government policies wherever applicable, have been taken into account.

1.07 We, having studied the bidding document in three volumes relating to taxes & duties and hereby, declare that if any income tax, charge on income tax or any other corporate tax is attracted under the law, we agree to pay the same.

1.08 We are aware that the Price schedules do not generally give a full description of the supplies to be made and work to be performed under each item and we shall be deemed to have read the Technical Specifications and other bidding documents and drawings to ascertain the full scope of work included in each item while filling in the related and prices. We agree that the entered rates and prices shall be deemed to include the full scope as aforesaid, including overheads and profits.

1.09 We understand that in the price schedule, if there is discrepancy between the unit price and total price, the same shall be corrected as per relevant provisions.

1.10 We declare that prices for items left blank in the schedules will be deemed to have been included in other items. The TOTAL for each schedule and the TOTAL of Grand summary shall be deemed to be the total price for executing the facilities and sections there of in complete accordance with the contract, whether or not each item has been priced.

2.0 CONSTRUCTION OF THE CONTRACT

2.01 We declare that we are making the offer on the basis of indivisible supply-cum- Erection contract on a single source responsibility basis.
3.0 **BID SECURITY (EMD)**

We are enclosing DD/BG no. dtd. Amounting to Rs. (Rupees only) issued by bank branch, payable on Bhubaneswar towards Bid Security against our above Bid.

4.0 **EQUIPMENT PERFORMANCE GUARANTEE**

We declare that the ratings and performance figures of the equipment to be furnished and erected by us are guaranteed. The Guaranteed particulars of different equipments are enclosed along with our bid.

5.0 **BID PRICING**

We further declare that the prices stated in our proposal are in accordance with your 'Instruction of Bidders of Conditions of Contract, Volume-1 of the bid documents.

6.0 **PRICE ADJUSTMENT**

We declare that all the prices and price components stated in our offer are on FIRM price basis.

7.0 **QUALIFICATION**

We confirm having submitted the Qualification Data in original plus one copy, as required by you under clause 6.0 'Invitation for Bids'. Further we have filled in the information for qualification requirements. In case you require any further information in this regard, we agree to furnished the same in time

8.0 **DEVIATIONS**

8.01 We declare that the contract shall be executed strictly in accordance with the specifications and documents except for the variations and deviations all of which have been detailed out exhaustively in the following schedules, irrespective of whatever has been stated to the contrary any where else in our proposal.

   a) Commercial Deviations Schedule

   b) Cost of withdrawal of Deviations on Critical

   c) Technical Deviation Schedule

8.02 We confirm that specified stipulation of following critical clauses is acceptable to us and no deviations/exceptions are taken on any account whatsoever in the following clauses:

   (a) Payment Terms

   (b) Bid Guarantee

   (c) Contract Performance Guarantee

   (d) Liquidated Damages for delay

   (e) Prices and Price Adjustment
8.03 Further, we agree that the additional conditions, deviations, if any, found in our bid proposal documents other than those stated in attached Deviation Schedules, save that pertaining to any rebates offered, shall not be given effect to.

9.0 ADDITIONAL INFORMATION

We have included with this proposal additional information listed. We further confirm that such additional information does not imply any additional deviation beyond those covered in appropriate schedules and in case of any contradiction between these additional information and other provisions of Bid, the latter prevail.

10.0 GUARANTEE DECLARATION

We guarantee that the equipment offered shall meet the rating and performance requirements stipulated in this specification. The Guarantee Declaration which shall attract levy of liquidated damages for non-performance are indicated in the relevant schedule.

11.0 BOUGHT-OUT AND SUB-CONTRACTED ITEM

We are furnishing herewith at appropriate Schedule, the detail of all major item of supply amounting to more than 10% of our Bid Price, which were propose subletting giving detail of the name of sub-contractor/sub-vendor and quantity for each item.

12.0 WORK SCHEDULE

If this proposal is accepted by you, we agree to submit engineering data, provide services and complete the entire work from time to time, in accordance with schedule indicated in the proposal. We fully understand that the time schedule stipulated in this proposal is the essence of the contract, if awarded. The completion schedule of the various major key phases of the work is indicated in the designated schedule.

13.0 CONTRACT PERFORMANCE GUARANTEE

We further agree that if our Bid is accepted we shall provide an irrevocable Bank guarantee towards Contract Performance Guarantee, of value equivalent to ten percent (10%) of the Contract Price initially valid up to the end of ninety (90) days after the end of the contract warranty period in the form of Bank Guarantee in your favour within 15 (fifteen) days from the date of ‘Notice of Award of Contract’ and enter into a formal agreement with you immediately thereafter.

14.0 CHECK LIST
We have included a check list duly filled in Schedule. We understand that only this check list, commercial and technical deviation will be read out during the part-I bid opening before the bidders present.

(For Joint Venture/consortium only) We, the Partners of joint venture/ consortium submitting their Bid, do agree and confirm that in case of Award of the Contract on the joint venture, we shall be jointly and severally responsible for the execution of the contract in accordance with contract terms and conditions.

We, hereby declare that only the persons or firms interested in this proposal as principals are named herein and that no other persons or firms other that those mentioned herein have any interest in this proposal or in the contract to be entered into if we are awarded the contract, and that this proposal is made without any connection with any other person, firm or party likewise submitting a proposal and that this proposal is in all respect for and in good faith, without collusion or fraud.

Dated this ………………….day of …………………………….20…..

Thanking you,

Yours faithfully,

(Signature of the Authorised Signatory)

Printed Name ……………………………

Designation ……………………………

Common Seal off the company………..

(To be signed by lead partner case of Joint Venture) Signature of other partner (s) in case of Joint Venture)

Printed Name …………………

Designation …………………

Date : ……………………………

Place :

(Written power of Attorney of all signatories of the bid to commit the Bidder must be enclosed with the Bid.
In case of joint venture, the written Power of Attorney of all signatories from respective partners must be enclosed with the Bid.)

*** Applicable case of a Bid from Joint Venture of Firms. Further, the Bid must be signed by each partner of the Joint venture.
DECLARATION FORM

To,

The Project Head
< Purchaser>
<Address>

Sir,

Having examined the above specifications together with the Tender terms and conditions referred to therein

1 – I / We the undersigned do hereby offer to supply the materials as well as their installation covered there on in complete shape in all respects as per the rules entered in the attached contract schedule of prices in the tender.

2 – I / We do hereby under take to complete the entire installation work within the time specified in the tender.

3 – I / We do hereby guarantee the technical particulars given in the tender supported with necessary reports from concerned authorities.

4 – I / We do hereby certify to have purchased a copy of the tender specifications by remitting Cash / Demand draft & this has been duly acknowledged by you in your letter No…………Dt…………

5 – I / We do hereby agree to furnish the composite Bank Guarantee in the manner specified / acceptable by WESCO & for the sum as applicable to me / us as per clause No.13 of Annexure -V of this specification within fifteen days of issue of Letter of intent / Work Order, in the event of Work order being decided in my / us favour, failing which I / We clearly understand that the said LOI / W.O. shall be liable to be withdrawn by the purchaser

Signed this……………..Day of……………………….20…

Yours faithfully

(Signature of Bidder with Seal of Company)

(This form should be duly filled up by the Bidder & submitted along with the original copy of the Tender)
ANNEXURE – III

PROFORMA FOR CONTRACT PERFORMANCE BANK GUARANTEE
(To be executed on Rs. 100/- Non-judicial Stamp Paper purchased in the name of the BG Issuing Bank)

This Guarantee Bond is executed this ___ day of __________________ by us,
______________________________ Bank at ___________________
P.O.__________ P.S. ____________ Dist ________________ State __________

Whereas the WESCO Ltd., Regd. Office: N 1/22, IRC Village, Nayapalli, BBSR - 15 a Company, constituted Company Act 1956 (here in after called “Purchaser”) has placed Work Order No._______ Dt.___________ (hereinafter called “Agreement”) with M/s________________________ (hereinafter called “the Contractor”) for supply and installation of __________ (description of the works) and whereas WESCO Ltd. has agreed (1) to exempt the Contractor from making payment of security deposit, (2) to release 100% payment of the cost of materials as per the said agreement and (3) to exempt from performance guarantee on furnishing by the Contractor to the WESCO Ltd. a composite Bank Guarantee of the value of 10% (ten percent) of the Contract price of the said Agreement.

1. Now, therefore, in consideration of the Purchaser having agreed (1) to exempt the Contractor for making payment of security deposit, (2) to release 100% payment to the Contractor and (3) to exempt from furnishing performance guarantee in terms of the said Agreement as aforesaid, we the _____________________ Bank, Address ____________________________ (code No. ________) (hereinafter referred to as “the Bank”) do hereby undertake to pay to the Purchaser an amount not exceeding Rs._____________ (Rupees _______________________________ ) only against any loss or damage caused to or suffered by the Purchaser 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 Purchaser stating that the amount claimed is due by way of loss or damage caused to or suffered by Purchaser 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 Purchaser 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 irrevocable. 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 effect during the period that would be taken for the performance of the said Agreement and it shall continue to remain in force endorsable till all the dues of the Purchaser under by virtue of the said Agreement have been fully paid and its claim satisfied or discharged or till Purchaser 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 our Bhubaneswar branch at _________________________ (Name, address of the Bhubaneswar branch and code No.) 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 Purchaser 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(s) or for any forbearance act or omission on part of the Purchaser or any indulgence by the Purchaser 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 Purchaser in writing.

Dated ___________ the __________ day of Two thousand __________.

Not withstanding anything contained herein above.

Our liability under this Bank Guarantee shall not exceed Rs.______________ (Rupees ________ ____________ ) only.

The Bank Guarantee shall be valid up to ______________ only.
Our ......................... branch at Bhubaneswar (Name & Address of the Bhubaneswar branch) is liable to pay the guaranteed amount depending on the filing of claim and any part thereof under this Bank Guarantee only and only if you serve upon us at our Bhubaneswar branch a written claim or demand and received by us at our Bhubaneswar branch 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 purchase order/ agreement:

(3) Amount of P.O. :

(4) Name of Materials :

(5) Name of the Bank:

(6) Amount of the Bank Guarantee:

(7) Name, Address and Code No. of the Bhubaneswar Branch of the Issuing Bank:

(8) Validity period or date up to which the agreement is valid:

(9) Signature of the Constituent Authority of the Bank with seal:

(10) Name & addresses of the Witnesses with signature:

(11) The Bank Guarantee shall be accepted only after getting confirmation from the respective Banks.
PROFORMA OF BANK GUARANTEE FOR ADVANCE PAYMENT

(To be stamped in accordance with Stamp Act)

(To be executed on Rs. 100/- Non-judicial Stamp Paper purchased in the name of the BG Issuing Bank)

Ref........................................ Bank Guarantee No....................

Date ....................................

The WESCO Ltd.
(Full postal address)

Dear Sir,

In consideration of WESCO Ltd. (hereinafter referred to as the ‘Purchaser’, which expression shall, unless repugnant to the context or meaning thereof include its successors, administrators and assigns) having awarded to M/s........................... (hereinafter referred to as the "Contractor" which expression shall unless repugnant to the context or meaning thereof, include its successors, administrators, executors and assigns), a Contract by issue of Purchaser’s Letter of Award No.......................... dated ............... and the same having been acknowledged by the Contractor, resulting in a Contract bearing No.......................... dated .................. valued at ...................... for .......................................................... (scope of work)........................................... (hereinafter called the ‘Contract’) and the Purchaser having agreed to make an advance payment to the Contractor for performance of the above Contract amounting ................................. (in words and figures ) as an advance against Bank Guarantee to be furnished by the Contractor.

We,.......................................................... (Name of the Bank)

having its Head Office at ................. (hereinafter referred to as the ‘Bank’, which expression shall, unless repugnant to the context or meaning thereof, include its successors, administrators, executors and assigns ) do hereby guarantee and undertake to pay the Purchaser, immediately on demand any or, all monies payable by the Contractor to the extent of ................................. as aforesaid at any time upto ........ @ ............... without any demur, reservation, contest, recourse or protest and / or without any reference to the Contractor. Any such demand made by the Purchaser on the Bank shall be conclusive and binding notwithstanding any difference between the Purchaser and the Contractor or any dispute pending before any Court, Tribunal, Arbitrator or any other authority. We agree that the guarantee herein contained shall be irrevocable and shall continue to be enforceable till the Purchaser discharges this guarantee.
The Purchaser shall have the fullest liberty without affecting in any way the liability of the Bank under this guarantee, from time to time to vary the advance or to extend the time for performance of the Contract by the Contractor. The Purchaser shall have the fullest liberty without affecting this guarantee, to postpone from time to time the exercise of any powers.

Vested in them or of any right which they might have against the Contractor, and to exercise the same at any time in any manner, and either to enforce or to forbear to enforce any covenants, contained or implied, in the Contract between the Purchaser and the Contractor or any other course or remedy or security available to the Purchaser. The Bank shall not be released of its obligations under these presents by an exercise by the Purchaser of its liberty with reference to the matters aforesaid or any of them or by reason of any other act or forbearance or other acts of omission or commission on the part of the Purchaser or any other indulgence shown by the Purchaser or by an other matter or thing, whatsoever, which under law would, but for this provision have the effect of relieving the Bank.

Bank also agrees that the Purchaser at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor, in the first instance without proceeding against the Contractor and notwithstanding any security or other guarantee that the Purchaser may have in relation to the Contractor’s liabilities.

Notwithstanding anything contained hereinabove our liability under this guarantee is limited to ................. and it shall remain in force upto and including ............@ .......... and shall be extended from time to time for such period (not exceeding one year), as may be desired by M/s. ....................... on whose behalf this guarantee has been given.

The Guarantee will not be discharged due to change in the name, style and constitution of the Bank and or Contractor(s).

All other contentions in B.G will safe guard the interest of <Purchaser>.

We, the _________________________ Bank lastly undertake not to revoke this Guarantee during its currency except with the previous consent of the <Purchaser> in writing.

Dated ___________ the __________ day of Two thousand __________

Not withstanding anything contained herein above.

Our liability under this Bank Guarantee shall not exceed Rs.______________ (Rupees _______ _____) only.
The Bank Guarantee shall be valid up to ___________________ only.

Our ………………… branch at Bhubaneswar (Name & Address of the Bhubaneswar branch) is liable to pay the guaranteed amount depending on the filing of claim and any part thereof under this Bank Guarantee only and only if you serve upon us at our Bhubaneswar branch a written claim or demand and received by us at our Bhubaneswar branch on or before Dt.__________ otherwise bank shall be discharged of all liabilities under this guarantee thereafter.

For ______________________________
(indicate the name of the Bank)

Dated this .......... Day of ........20....... at ...........................................

WITNESS

........................................................................................................
(Signature).......................................................................................(Signature)
........................................................................................................
(Name)..............................................................................................(Name)
........................................................................................................
(Official Address)...........................................................................(Designation with Bank Stamp)

Attorney as per
Power of Attorney No.....................
Dated ..........................................................

@ This date shall be ninety (90) days after the schedule date of completion of the Contract.
ANNEXURE – V

FORM OF POWER OF ATTORNEY FOR JOINT VENTURE
(On Non –Judicial Stamp Paper of Appropriate value
to be Purchased in the Name of Joint Venture)

KNOW ALL MEN BY THESE PRESENTS THAT WE, the Partners whose details are given
hereunder…………………………….. have formed a joint Venture under the laws of
………………………………………………... and having our Registered Office (s)/Head Office (s) at
………………………………………. (hereinafter called the ‘Joint Venture’ which expression shall unless
repugnant to the context or meaning thereof, include its successors, administrators and assigns) acting
through M/s…………………………………. being the Partner in-charge do hereby constitute, nominate
and appoint M/s……………………………………………. a company incorporated under the laws of
………………and having its Registered/Head Office at ……………as our duly constituted lawful Attorney
(hereinafter called “Attorney” or “Authorised Representative” or “Partner in charge”) to exercise all or
any of the powers for and on behalf of the joint venture in regard to specification No…………….. for
construction of ……………. (name of the package) of ………………. (name of the <Purchaser>)
(hereinafter called the “Purchaser”) and the bids for which have been invited by the Purchaser, to
undertake the following acts :

(i) To submit proposal and participate in the aforesaid Bid – Specification of the Purchaser on
behalf of the “Joint Venture”.

(ii) To negotiate with Purchaser the terms and conditions for award of the contract pursuant to the
aforesaid Bid and to sign the contract with the Purchaser for and on behalf of the “Joint
Venture”.

(iii) To do any other act or submit any document related to the above.

(iv) To receive, accept and execute the contract for and on behalf of the “Joint Venture”.

It is clearly understood that the Partner in-charge (Lead Partner) shall ensure performance of the
contracts(s) and if one or more Partner fail to perform their respective portion of the contracts(s), the
same shall be deemed to be a default by all the partners.

It is expressly understood that this power of Attorney shall remain valid binding and irrevocable till
completion of the Defect of liability period in terms of the contract.

The Joint Venture hereby agrees and undertakes to ratify and confirm all the whatsoever the said
Attorney/ Authorised Representative / Partner in-charge quotes in the bid, negotiates and signs the
Contract with the Purchaser and / or proposes to act on behalf of the Joint Venture by virtue of this
Power of Attorney and the same shall bind the Joint Venture as if done by itself.
IN WITNESS THEREOF the Partners Constituting the Joint Venture as aforesaid have executed these presents on this ............ day of .......... under the Common Seal (s) of their Companies

for and on behalf of the Partners of Joint Ventures

The Common Seal of the above Partners of the Joint Venture :

The Common Seal has been affixed there unto in the presence of :

WITNESS

1. Signature ........................................
   Name ...........................................
   Designation ..................................
   Occupation .................................

2. Signature ........................................
   Name ...........................................
   Designation ..................................
   Occupation .................................
FORM OF JOINT VENTURE/ CONSORTIUM AGREEMENT

(To be executed on non-judicial stamp paper of appropriate value to be purchased in the name of joint venture)

PROFORMA OF JOINT VENTURE AGREEMENT BETWEEN

………………………………………………. AND ……………………………………………….

SPECIFICATION NO. ………………………………………………. OF WESCO Ltd.

THIS Joint Venture Agreement executed on this ……….. day of …………… Two thousand and………………………….. between M/s. …………….…………….a company incorporated under the laws of……………………………………………….. and having its Registered Office at ……………. …………….……………. (hereinafter called the "Lead Partner" which expression shall include its successors, executors and permitted assigns), M/s. …………….…………….. a company incorporated under the laws of …………….…………….……………. and having its Registered Office at ……………. …………….……………. (hereinafter called the "Partner" which expression shall include its successors, executors and permitted assigns) and M/s. …………….…………….……………. a company incorporated under the laws of …………….……………. and having its Registered Office at ……………. …………….……………. (hereinafter called the "Partner" which expression shall include its successors, executors and permitted assigns) for the purpose of making a bid and entering into a contract (in case of award) against the Specification No.: …………….…………….……………. for Construction of …………….……………. of (Purchaser)., a company incorporated under the ……………. having its. Registered Office at ……………. …………….……………. (hereinafter called the "Purchaser).'

WHEREAS the Purchaser invited bids as per the above mentioned Specification for the design manufacture, supply and erection, testing and commissioning of Equipment Materials stipulated in the bidding documents under subject Package for

AND WHEREAS clause – 5 of IFB forming part of the bidding documents, stipulates that a Joint Venture of two or more qualified firms as partners, meeting the requirement of clause – 5 of IFB as applicable may bid, provided the Joint Venture fulfills all other requirements of clause – 5 of IFB and in such a case, the BID shall be signed by all the partners so as to legally bind all the Partners of the Joint Venture, who will be jointly and severally liable to perform the Contract and all obligations hereunder.

The above clause further states that the Joint Venture agreement shall be attached to the bid and the contract performance guarantee will be as per the format enclosed with the bidding document without any restriction or liability for either party.
AND WHEREAS the bid has been submitted to the Purchaser vide proposal No dated by Lead Partner based on the Joint Venture agreement between all the Partners under these presents and the bid in accordance with the requirements of clause – 5 of IFB has been signed by all the partners.

NOW THIS INDENTURE WITNESSETH AS UNDER:

In consideration of the above premises and agreements all the Partners to this Joint Venture do hereby now agree as follows:

1. In consideration of the award of the Contract by the Purchaser to the Joint Venture partners, we, the Partners to the Joint Venture agreement do hereby agree that M/s ………………………………… shall act as Lead Partner and further declare and confirm that we shall jointly and severally be bound unto the Purchaser for the successful performance of the Contract and shall be fully responsible for the design, manufacture, supply, and successful performance of the equipment in accordance with the Contract.

2. In case of any breach of the said Contract by the Lead Partner or other Partner(s) of the Joint Venture agreement, the Partner(s) do hereby agree to be fully responsible for the successful performance of the Contract .and to carry out all the obligations and responsibilities under the Contract in accordance with the requirements of the Contract.

3. Further, if the Purchaser suffers any loss or damage on account of any breach in the Contract or any shortfall in the performance of the equipment in meeting the performance guaranteed as per the specification in terms of the Contract, the Partner(s) of these presents undertake to promptly make good such loss or damages caused to the Purchaser, on its demand without any demur. It. shall not be necessary or obligatory for the Purchaser to proceed against Lead Partner to these presents before proceeding against or dealing with the other Partner(s).

4. The financial liability of the Partners of this Joint Venture agreement to the Purchaser, with respect to any of the claims arising out of the performance of non- performance of the obligations set forth in the said Joint Venture agreement, read in conjunction with the relevant conditions of the Contract shall, however, not be limited in any way so as to restrict or limit the liabilities of any of the Partners of the Joint Venture agreement.

5. It is expressly understood and agreed between the Partners to this Joint Venture agreement that the responsibilities and obligations of each of the Partners shall be as delineated in Appendix-I (*To be incorporated suitably by the Partners) to this agreement. It is further agreed by the Partners that the above sharing of responsibilities and obligations shall not in any way be a limitation of joint and several responsibilities of the Partners under this Contract.
6. This Joint Venture agreement shall be construed and interpreted in accordance with the laws of India and the courts of Delhi shall have the exclusive jurisdiction in all matters arising thereunder.

7. In case of an award of a Contract, We the Partners to the Joint Venture agreement do hereby agree that we shall be jointly and severally responsible for furnishing a contract performance security from a bank in favour of the Purchaser in the forms acceptable to purchaser for value of 10% of the Contract Price in the currency/currencies of the Contract.

8. It is further agreed that the Joint Venture agreement shall be irrevocable and shall form an integral part of the Contract, and shall continue to be enforceable till the Purchaser discharges the same. It shall be effective from the date first mentioned above for all purposes and intents.

IN WITNESS WHEREOF the Partners to the Joint Venture agreement have through their authorized representatives executed these presents and affixed Common Seals of their companies, on the day, month and year first mentioned above.

1. Common Seal …………………………….. of For Lead Partner
   has been affixed in my/our presence
   pursuant to the Board of Director's (Signature of authorized resolution
   dated …………………………….. representative)
   Name... ……………………………..
   Signature.. …………………………….. Designation ……………………………..
   Name ………………………………………. Common Seal of the company
   Designation………………………………………..

2. Common Seal of ……………………………….. For other Partners
   has been affixed in my/our presence
   pursuant to the Board of Director's (Signature of authorized
   resolution dated representative)
   Name... ……………………………..
   Signature.. …………………………….. Designation ……………………………..
   Name ………………………………………. Common Seal of the company
   Designation………………………………………..

WITNESSES :
1. ……………………………………….. 2. ………………………………………..
   (Signature) (Signature)
   Name ………………………………………. Name ………………………………………..
   ……………………………………….. ………………………………………..
   (official address) (Official address)
LETTER OF COMPLIANCE OF QUALIFYING REQUIREMENT
(In case of Bidder being a Single Firm)

To
The Project Head
<Purchaser>
<Address>

Dear Sirs,

I/We ……………. (Name of Bidder) are submitting the bid as a single firm. In support of our meeting the Qualifying requirements (QR) for bidders, stipulated in this tender specification, we furnish herewith the details/documents etc. as follows.

Table – A : Previous Works Experience :

<table>
<thead>
<tr>
<th>Package Quoted for</th>
<th>Description of Proposed Works</th>
<th>Tender Qty</th>
<th>Sl. No.</th>
<th>FY</th>
<th>Name of Client</th>
<th>WO Ref</th>
<th>Qty Installed &amp; Commissioned</th>
<th>Documents provided in proof of having executed the works during the relevant FY.</th>
</tr>
</thead>
<tbody>
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</tbody>
</table>

Table – B : Minimum Annual Turnover :

<table>
<thead>
<tr>
<th>Package Quoted for</th>
<th>Estimated Cost of the Package (Rs. in Lakh)</th>
<th>Annual Turnover Data (Rs. in Lakh)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Financial Year</td>
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</tbody>
</table>

Last Five Year preceding to the year of tender

Minimum Turnover
**Table – C : Access to Credit Facility :**

<table>
<thead>
<tr>
<th>Package Quoted for</th>
<th>Estimated Cost of the Package (Rs. in Lakh)</th>
<th>Liquid Assets as on 31.03.2010</th>
<th>Credit Facility</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Description (Rs. in Lakh)</td>
<td>Description (Rs. in Lakh)</td>
<td></td>
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<tr>
<td>Cash in Hand</td>
<td></td>
<td>Cash Credit</td>
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<td>Cash at Bank</td>
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<td>LC</td>
<td></td>
</tr>
<tr>
<td>Total Estimated Cost of the packages quoted for</td>
<td>Fixed Deposits</td>
<td>Others (Specify)</td>
<td></td>
</tr>
<tr>
<td>One fifth of the total Estimated Cost as above.</td>
<td>Total Liquid Assets</td>
<td>Total Credit Facility</td>
<td></td>
</tr>
</tbody>
</table>

**Note:** Continuation sheets, of like size and format, may be used as per Bidder's requirements and annexed to this Schedule.

I/We declare that we are fulfilling the qualifying requirements as per clause no. 2.0 of Section – I, Invitation for Bids (IFB).

For & on behalf of ………… (Name of the Bidder).
LETTER OF COMPLIANCE OF QUALIFYING REQUIREMENT  
(In case of Bidder being a Joint Venture / Consortium Firm)

To  
The Project Head  
<Purchaser>  
<Address>  

Dear Sirs,  

I/We ................. (Name of Bidder) are submitting the bid as a single firm. In support of our meeting the Qualifying requirements (QR) for bidders, stipulated in this tender specification, we furnish herewith the details/documents etc. as follows.

Name of the members of the JV / Consortium  

1.  
2.  
3.  

Table – A : Previous Works Experience : Name of the Member (any one member only)

<table>
<thead>
<tr>
<th>Package Quoted for</th>
<th>Description of Proposed Works</th>
<th>Tender Qty</th>
<th>Sl. No.</th>
<th>FY</th>
<th>Name of Client</th>
<th>WO Ref</th>
<th>Qty Installed &amp; Commissioned</th>
<th>Documents provided in proof of having executed the works during the relevant FY.</th>
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</tr>
</tbody>
</table>

Table – B : Average Annual Turnover : (All the members of JV/Consortium taken together)

<table>
<thead>
<tr>
<th>Package Quoted for</th>
<th>Estimated Cost of the Package (Rs. in Lakh)</th>
<th>Annual Turnover (Rs. in Lakh)</th>
<th>Annual Turnover (Rs. in Lakh)</th>
<th>Total Annual Turnover (Rs. in Lakh)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Name of Member</td>
<td>Name of Member</td>
<td>Name of Member</td>
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<td></td>
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<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Financial Year</td>
<td>Turnover (Rs. in Lakh)</td>
<td>Financial Year</td>
<td>Turnover (Rs. in Lakh)</td>
<td>Financial Year</td>
</tr>
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<tr>
<td>FY 2008 - 09</td>
<td>FY 2008 - 09</td>
<td>FY 2009 - 10</td>
<td>FY 2009 - 10</td>
<td>FY 2010 - 11</td>
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<td>Total</td>
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<tr>
<td>Total Estimated Cost of the packages quoted for</td>
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<td></td>
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</tr>
</tbody>
</table>

**Table – C : Access to Credit Facility : (All the members of JV/Consortium taken together)**

<table>
<thead>
<tr>
<th>Package Quoted for</th>
<th>Estimated Cost of the Package (Rs. in Lakh)</th>
<th>Liquid Assets as on 31.03.2011</th>
<th>Credit Facility</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Member 1 (Rs. in Lakh)</td>
<td>Member 1 (Rs. in Lakh)</td>
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<td>Description</td>
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<td>Cash in Hand</td>
<td>Cash Credit</td>
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<td>Cash at Bank</td>
<td>LC</td>
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<td>Fixed Deposits</td>
<td>Others (Pl Specify)</td>
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<tr>
<td></td>
<td></td>
<td>Total Liquid Assets</td>
<td>Total Credit Facility</td>
</tr>
<tr>
<td></td>
<td>Liquid Assets as on 31.03.2011</td>
<td>Member 2 (Rs. in Lakh)</td>
<td>Member 2 (Rs. in Lakh)</td>
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<tr>
<td></td>
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<td>Description</td>
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<td>Cash in Hand</td>
<td>Cash Credit</td>
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<td>Cash at Bank</td>
<td>LC</td>
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<td></td>
<td>Fixed Deposits</td>
<td>Others (Pl Specify)</td>
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<tr>
<td></td>
<td></td>
<td>Total Liquid Assets</td>
<td>Total Credit Facility</td>
</tr>
<tr>
<td></td>
<td>Liquid Assets as on 31.03.2011</td>
<td>Total for JV 2 (Rs. in Lakh)</td>
<td>Total for JV 2 (Rs. in Lakh)</td>
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<tr>
<td></td>
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<td>Description</td>
<td>Description</td>
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<td>Cash in Hand</td>
<td>Cash Credit</td>
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<td>Cash at Bank</td>
<td>LC</td>
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<tr>
<td></td>
<td></td>
<td>Fixed Deposits</td>
<td>Others (Pl Specify)</td>
</tr>
<tr>
<td></td>
<td>Total Estimated Cost of the packages quoted for</td>
<td>Fixed Deposits</td>
<td>Others (Pl Specify)</td>
</tr>
</tbody>
</table>
One fifth of the total Estimated Cost as above. | Total Liquid Assets | Total Credit Facility |

Note: Continuation sheets, of like size and format, may be used as per Bidder’s requirements and annexed to this Schedule.

I/We declare that we are fulfilling the qualifying requirements as per clause no. 2.0 of Section – I, Invitation for Bids (IFB).

For & on behalf of ........... (Name of the Bidder).
(All members of JV / Consortium should sign).

Details of qualification and experience of key personnel proposed for carrying out the works

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Name of Personnel</th>
<th>Degree/ Diploma</th>
<th>Branch</th>
<th>Year of Passing</th>
<th>Past Experience</th>
</tr>
</thead>
<tbody>
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<td>From</td>
</tr>
</tbody>
</table>

Date: (Signature) .................

Place: (Printed Name) .................

(Designation) .................

(Common Seal) .................

Note: 1. Continuation sheets, of like size and format, may be used as per Bidder’s requirements and annexed to this Schedule.

2. In case of Joint Venture, separate sheet for each partner of Joint Venture should be used.
Details for sub-contracting elements amounting to more than 10% of bid price

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Item Description</th>
<th>Qty. proposed to be bought-out/ Sub-contracted</th>
<th>Source of Supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Date:  
(Signature) …………………..

Place:  
(Printed Name) ………………..

(Designation) …………………

(Common Seal) ………………..
DETAILS OF COMMERCIAL DEVIATIONS

Bidder’s Name & Address

To

The Project Head

< Purchaser>

<Address>

Dear Sirs,

Sub: Commercial Deviation for Construction of Name of the project.

The following are the Commercial Deviations and variations from and exceptions to the specifications and documents for the subject Project. These deviations and variations are exhaustive. Except for these deviations, the entire work shall be performed as per your specifications and documents.

<table>
<thead>
<tr>
<th>Volume/Clause</th>
<th>Ref./Page No.</th>
<th>As specified in the Specification</th>
<th>Commercial deviation and variation to the specification</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Date: 

(Signature) ......................

Place: 

( Printed Name) ....................

(Designation) .....................

(Common Seal) .....................

**Note:** 1. Continuation sheets, of like size and format, may be used as per Bidder requirements and annexed to this Schedule.

2. This will be read out during opening of Part-I Bid.
Dear Sirs,

Sub: Technical Deviation for Construction of ……………… Name of the Project.

The following are the Technical Deviations and variations from and exceptions to the specifications and documents for the subject package. These deviations and variations are exhaustive. Except for these deviations, the entire work shall be performed as per your specifications and documents.

<table>
<thead>
<tr>
<th>Volume/Clause</th>
<th>Ref./Page No.</th>
<th>As specified in the Specification / Relevant ISS</th>
<th>Technical deviation and variation to the specification</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Date: (Signature) …………………..

Place: (Printed Name) ………………

(Designation) …………………

(Common Seal) …………………

Note:
1. Continuation sheets, of like size and format, may be used as per Bidder’s requirements and annexed to this Schedule.
2. The deviations and variations, if any, shall be brought out separately for each of the equipment.
3. This will be read out during opening of Part – I bid.
Bidder’s Name & Address

To

The Project Head

< Purchaser>

<Address>

Dear Sirs,

We have enclosed with our proposal the following additional information for the subject, package.

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Brief description of Information</th>
<th>Ref.&amp; Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Date: .............................................................

(Signature) ................................

Place: ............................................................

(Printed Name) ..............................

(Designation) ............................

(Common Seal) ............................

Note: Continuation sheets, of like size and format, may be used as per Bidder’s requirements and annexed to this Schedule.
BOUGHT OUT & SUB CONTRACTED ITEMS

Bidder’s Name & Address

To
The Project Head
< Purchaser>
< Address>

Dear Sirs,

We hereby furnish the details of the items/sub-assemblies amounting to more than 10% of our bid price, we propose to buy for the purpose of subject package

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Item description</th>
<th>Qty. Proposed</th>
<th>Source of Supply</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Be bought/</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sub-contracted</td>
<td></td>
</tr>
</tbody>
</table>

1. …………………………. ………………………….. …………………………..
2. …………………………. ………………………….. …………………………..
3. …………………………. ………………………….. …………………………..
4. …………………………. ………………………….. …………………………..
5. …………………………. ………………………….. …………………………..
6. …………………………. ………………………….. …………………………..
7. …………………………. ………………………….. …………………………..

Date: (Signature) ……………………………..
Place: ( Printed Name) ………………..
(Designation) ……………………………..

(Common Seal)
WORK COMPLETION SCHEDULE

Bidder’s Name & Address
To
The Project Head
< Purchaser>
<Address>

Dear Sirs,

We hereby declare that the following Work Completion Schedule shall be followed by us for the purpose of subject package

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Description of Work</th>
<th>Period in Months (from the date of LOA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Completion of detailed engineering</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Procurement of raw materials</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Establishment of site office</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Erection</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(a) Commencement</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(b) Completion</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Testing &amp; Pre-commissioning</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(a) Commencement</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(b) Completion</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Commissioning</td>
<td></td>
</tr>
</tbody>
</table>

Date: (Signature) .......................  
Place: (Printed Name) .................  
          (Designation) ...................  
          (Common Seal) ...................  


**CHECK LIST**

Bidder’s Name & Address

To

The Project Head

< Purchaser>

<Address>

Dear Sirs,

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Item Description</th>
<th>Status of the Submission of data</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bid Guarantee</td>
<td>Yes /No</td>
<td>If yes please give details No, amount, validity &amp; date of issue.</td>
</tr>
<tr>
<td>2</td>
<td>Qualifying Data</td>
<td>Yes /No</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Commercial Deviation</td>
<td>Yes /No</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Technical Deviation</td>
<td>Yes /No</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Cost of withdrawn of deviations</td>
<td>Yes /No</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Bid validity</td>
<td>Yes /No</td>
<td>If yes state here the period.</td>
</tr>
<tr>
<td>7</td>
<td>Period of completion</td>
<td>Yes/No</td>
<td>If, yes please state here the period of completion.</td>
</tr>
<tr>
<td>8</td>
<td>Additional information offered by bidder</td>
<td></td>
<td>State here briefly</td>
</tr>
</tbody>
</table>

**N.B.:** The contents of this schedule will be read out during opening of Part-I Bid.

.................................

Signature of Bidder

Date & Seal:
N.B :-

1. The bid guarantee one original and one copy shall be furnished in two separate sealed envelope appropriately superscribed thereon.

2. All Schedules pertaining to prices (originals) shall be furnished in a sealed envelope duly superscribed thereon. Similarly one set of copies of such schedules shall be given in a separate sealed envelope (these are not to be opened during opening of Part –I ).

3. All other schedules, one set original and another copy shall be submitted in two separate sealed envelope (these are to be opened during Part –I bid opening )

Date: ........................................ ...

Place: ........................................ ...

(Signature) .........................

(Printed Name) .........................

(Designation) .........................

(Common Seal) .........................
PROFORMA OF INDEMNITY BOND TO BE EXECUTED BY THE CONTRACTOR FOR THE MATERIALS HANDED OVER BY WESCO FOR PERFORMANCE OF ITS CONTRACT

(On non-Judicial stamp paper of appropriate Value)

INDEMNITY BOND

THIS INDEMNITY BOND is made this .......... day of ..........20 ............... by ................. a Company registered under the Companies Act, 1956/ Partnership Firm / Proprietary Concern having its Registered Office at ..............(hereinafter called as ‘Contractor’ or “Obligor” which expression shall include its successors and permitted assigns ) in favour of Western Electricity Supply Company of Orissa Ltd. (WESCO), a Company incorporated under the Companies Act, 1956 having its Registered Office at N 1/22, IRC Village, Nayapalli, Bhubaneswar - 751015 and its project at ............... ..... (hereinafter called “WESCO” Which expression shall include its successors and assigns:

WHEREAS WESCO has awarded to the Contractor a Contract for ............... vide its Letter of Award / Contract No................. dated................. (hereinafter called the “Contract”) in terms of which WESCO is required to handover various equipment to the Contractor for execution of the Contract.

And WHERAS by virtue of Clause No............. of the said Contract, the Contractor is required to execute an Indemnity Bond in favour of WESCO for the Equipment handed over to it by WESCO for the purpose of performance of the Contract / Erection portion of the Contract (hereinafter called the “Equipment”)

NOW THEREFORE, This Indemnity Bond witnessth as follows:

1. That in consideration of various equipment as mentioned in the Contract, valued at Rs... .................. (Rupees .................. ) handed over to the Contractor for the purpose of performance of the Contract, the Contractor hereby undertakes to indemnify and shall keep WESCO indemnified, for the full value of the Equipment. The Contractor hereby acknowledges receipt of the Equipment as per despatch title documents handed over to the Contractor duly endorsed in their favour and detailed in the Schedule appended hereto. It is expressly understood by the Contractor that handing over of the despatch title documents in respect of the said Equipment duly endorsed by WESCO in favour of the Contractor shall be construed as handing over of the Equipment purported to be covered by such title documents and the Contractor shall hold such Equipment is trust as a Trustee for and on behalf of WESCO.

2. That the Contractor is obliged and shall remain absolutely responsible for the safe transit / protection and custody of the Equipment at WESCO project Site against all risks, whatsoever, till the Equipment are duly used / erected in accordance with the terms of the Contract and the Plant / Package duly erected and commissioned in accordance with the terms of the Contract, is taken over by WESCO. The Contractor undertakes to keep WESCO harmless against any loss or damage that may be caused to the Equipment.
3. The Contractor undertakes that the Equipment shall be used exclusively for the performance / execution of the Contract strictly in accordance with its terms and conditions and no part of the equipment shall be utilized for any other work or purpose whatsoever. It is clearly understood by the Contractor that non-observance of the obligations under this Indemnity Bond by the Contractor shall inter-alia constitute a criminal breach of trust on the part of the Contractor for all intents and purpose including legal / penal consequences.

4. That WESCO is and shall remain the exclusive Purchaser of the Equipment free from all encumbrances, charges or liens of any kind, whatsoever. The Equipment shall at all times be open to inspection and checking by Engineer in Charge / Engineer or other employees/agents authorized by him in this regard. Further, WESCO shall always be free at all times to take possession of the Equipment in whatever form the Equipment may be, if in its opinion the Equipment are likely to be endangered, mis-utilised or converted to uses other than those specified in the Contract, by any acts of omission or commission on the part of the Contractor binds himself and undertakes to comply with the direction of demand of WESCO to return the Equipment without any demur or reservation.

5. That this indemnity Bond is irrevocable. If at any time any loss or damage occurs to the Equipment or the same or any part thereof is mis-utilised in any manner whatsoever, then the Contractor hereby agrees that the decision of the Engineer-in-Charge/Engineer of WESCO as to assessment of loss or damage to the Equipment shall be final and binding on the Contractor. The Contractor binds itself and undertakes to replace the lost and/or damaged Equipment at its own cost and/or shall pay the amount of loss of WESCO without demur, reservation or protest. This is without prejudice to any other right or remedy that may be available to WESCO against the Contractor under the Contract and under this Indemnity Bond.

6. NOW THE CONDITION of this Bond is that if the Contractor shall duly and punctually comply with terms and conditions of this Bond to the satisfaction of WESCO THEN, the above Bond shall be void, but otherwise, it shall remain in full force and virtue.

IN WITNESS WHEREOF, the Contractor has hereunto set its hand through its authorised representative under the common seal of the Company, the day, month and year first above mentioned.

SCHEDULE
### Particulars of the Materials handed over

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Particulars of Receipt</th>
<th>Value of the Materials</th>
<th>Signature of Attorney</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>(authorised representative as a token of receipt)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Store SIV No.</th>
<th>Date</th>
<th></th>
<th></th>
</tr>
</thead>
</table>

For an on behalf of M/s.................................

**WITNESS**

1.  1. Signature ...................................... Signature .................................

2. Name ........................................ Name ........................................

3. Address........................................ Designation ................................

Authorised representative *

2.  1. Signature ......................................

2. Name ...........................................(Common Seal in case of Company)

3. Address ........................................

* Indemnity Bonds are to be executed by the authorised person and (i) in case of Contracting Company under common seal of the Company or (ii) having the Power of Attorney issued under common seal of the company with authority to execute Indemnity Bonds, (iii) In case of (ii), the original Power of Attorney if it is specifically for this Contract or a Photostat copy of the Power of Attorney if it is General Power of Attorney and such documents should be attached to Indemnity Bond.