

**BHARAT HEAVY ELECTRICALS LTD.  
(TRANSMISSION BUSINESS GROUP)**

**GENERAL TERMS AND CONDITIONS FOR TENDER ENQUIRY / CONTRACT**

**This is to be submitted duly signed by bidder in original. Clause-wise deviations and / or additional conditions / clarifications, if any, are to be brought out clearly in “Schedule of Commercial Deviation”. Deviations and / or additional conditions / clarifications, if any, mentioned elsewhere in the bid / offer, shall not be considered.**

| Sr.<br>No. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
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| 1.         | <p><b>INSTRUCTION TO BIDDERS :</b></p> <p>1.1 Sealed bids are invited for the items mentioned in the tender enquiry conforming to the NIT including Technical Specifications. Bids should be typed and free from overwriting and erasures. Corrections or additions / deletions, if any, must be clearly written and attested, otherwise offer may be rejected.</p> <p>1.2 Bidder must ensure that their bid is submitted / dropped in the tender box on or before <b>14-00 Hrs.</b> IST on the due date of opening, unless otherwise specified in the NIT, at the address as follows :-</p> <p style="padding-left: 40px;">Tender Box,<br/>Materials Management,<br/>Transmission Business Group,<br/>Bharat Heavy Electricals Limited,<br/>5<sup>th</sup> Floor, Tower-A,<br/>Advant Navis IT Business Park,<br/>Plot-7, Sector-142,<br/>Noida Expressway, Noida,<br/>Dist. G. B. Nagar, U. P. ĩ 201305</p> <p>1.3 In case tender enquiry is floated though the e-procurement system, offer / bid has to be submitted through the e-procurement system <b>ONLY</b> as per instructions given in the e-procurement portal (<a href="https://bheleps.buyjunction.in">https://bheleps.buyjunction.in</a>).</p> <p>1.4 The bids shall be opened at 14-30 Hrs. IST on the due date of opening, in the presence of participating bidders who may like to be present, unless otherwise specified in the NIT. Bids received late are liable for rejection. Bidders sending bids by courier or post will have to ensure that it is timely delivered at the above address.</p> <p>1.5 Bids are to be submitted duly signed with seal in two parts :-</p> <p style="padding-left: 40px;">a) <b>Techno-commercial Bid (Part-I)</b> ĩ To be submitted in 2 sets (original + copy). A copy of Price Bid (Part-II) clearly mentioning all the necessary information as per format <b>without prices</b> ĩUn-Priced BidĚ is also to be enclosed in Part-I Bid.</p> <p style="padding-left: 40px;">b) <b>Price Bid (Part-II)</b> ĩ To be submitted only in one set in a separate sealed envelope. This should not contain any Technical and / or Commercial Terms and Conditions. The rates should be quoted both in figures and words.</p> <p>1.6 The Part-I and Part-II Bids are to be sealed in separate envelopes and marked</p> |

| Sr. No. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
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|         | <p>as "Techno-commercial Bid (Part-I)" and "Price Bid (Part-II)" respectively. Both the envelopes are to be kept in another common envelope and marked as "BID". Each envelope should be sealed and super scribed with tender enquiry no., item / package name, project name and due date of opening. Bidder's name and address shall also be mentioned on each envelope.</p> <p>1.7 For any technical clarification, please contact official mentioned in the tender enquiry / NIT.</p> <p>1.8 For any commercial clarification please contact official issuing tender enquiry / NIT.</p> <p>1.9 Price bid (Part-II) should not contain any additional information / description other than given in "Un-Priced Bid" submitted with "Techno-commercial Bid (Part-I)" except prices, otherwise bid is liable for rejection.</p> <p>1.10 Price Bid submitted along with the bid shall remain valid up to validity of offer. Any discount / revised offer submitted by the bidder on its own shall be accepted provided it is received before the due date and time of offer submission (i.e. Part-I Bid). The discount shall be applied on pro-rata basis to all items including optional items, if any, unless specified otherwise by the bidder. Discount offered shall be valid for full duration of validity of the offer including extension of validity, if any. Unsolicited Supplementary / Revised Price Bid submitted after the due date and time of offer submission (i.e. Part-I Bid), during validity period of offer, unless asked by BHEL, shall not be considered. Withdrawal of quotation by the bidder, at any stage after its opening, may entail suitable action against such bidder by BHEL.</p> <p>1.11 The consultants / firm (and any of its affiliates) shall not be eligible to participate against tender enquiry for the related goods or works or services for the same project, if they were engaged by BHEL-TBG for the consultancy services.</p> <p>1.12 In case any Foreign OEM / Foreign Principal insists on engaging the services of an agent, such agent shall not be allowed to represent more than one manufacturer / supplier in the same tender. Moreover, either the agent could bid on behalf of the manufacturer / supplier or the manufacturer / supplier could bid directly but not both. In case bids are received from the manufacturer / supplier and the agent, bid received from the agent shall be ignored.</p> <p>1.13 Non-conformities / errors / discrepancies in quoted prices in price bids shall be dealt as follows :-</p> <p>a) If, in the price structure quoted for the required goods / services / works, there is discrepancy between the unit price and the total price (which is obtained by multiplying the unit price by the quantity), the unit price shall prevail and the total price corrected accordingly, unless in the opinion of BHEL there is an obvious misplacement of the decimal point in the unit price, in which case the total price as quoted shall govern and the unit price corrected accordingly.</p> <p>b) If there is an error in a total corresponding to the addition or subtraction of subtotals, the subtotals shall prevail and the total shall be corrected.</p> <p>c) If there is a discrepancy between words and figures, the amount in</p> |

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|         | <p>words shall prevail, unless the amount expressed in words is related to an arithmetic error, in which case the amount in figures shall prevail subject to (a) and (b) above.</p> <p>d) If there is such discrepancy in an offer as mentioned in (a), (b) &amp; (c) above, the same shall be conveyed to the bidder with target date upto which the bidder has to send his acceptance on the above lines and if the bidder does not agree to the decision of the BHEL, the bid is liable to be ignored.</p> <p>1.14 In case the scope of the successful bidder / supplier against this tender enquiry includes Erection, Testing and Commissioning (ETC) of the equipment / material at site in addition to Supply, Purchase Order shall be placed for Supply Portion and Contract shall be separately awarded for ETC at Site Portion. General Terms and Conditions for Tender Enquiry / Contract mentioned herein shall be applicable for both Supply &amp; ETC at Site. Additional Terms and Conditions for Tender Enquiry / Contract for Erection, Testing and Commissioning at Site (BHEL/TBG/GTC-ETC/2016 Rev. 01) shall be applicable for ETC at Site only which is to be read in conjunction with General Terms and Conditions for Tender Enquiry / Contract mentioned herein. However, any breach of either the Purchase Order or the Contract shall be deemed to be breach of the other.</p> <p>1.15 Taxes and Duties payable extra as per Clause No. 2.3 in NIT, if not specified/quoted clearly as extra shall be considered as included in Ex-works Price and therefore shall not be reimbursed. Taxes and duties not payable extra as per NIT shall be deemed to be included in Ex-works Price.</p> <p>1.16 If the rates for taxes and duties in respect of the quoted materials and / or services assumed by the Supplier are less than the tariff prevailing at the time of tendering, Supplier will be responsible for such under quotations. However if the rates assumed are higher than the correct rates prevailing at the time tendering, the difference will be to the credit of BHEL.</p> <p>Note :<br/>Representative / official deputed by the bidder to witness tender opening must produce authorization letter for the same.</p> |
| 2.      | <p><b>PRICES :</b></p> <p>2.1 Unless specifically indicated in the NIT, all prices shall be FIRM. No enhancement of rate for whatsoever reasons unless and until asked by BHEL shall be allowed.</p> <p>2.2 Unless specifically indicated in the NIT, the prices shall be on INR basis.</p> <p>2.3 Unless specifically indicated in the NIT, the prices are to be quoted on FOR (Site / Destination) basis excluding GST. The break-up of prices shall be as under :-</p> <p>a) <b>Ex-works Price:</b> Ex-works price including packing &amp; forwarding charges.</p> <p>b) <b>Freight:</b> Freight for door delivery up to destination / site / store are to be quoted separately.</p> <p>c) <b>Insurance:</b> Insurance for door delivery up to destination / site / store are to be quoted separately.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

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|         | <p>d) <b>Type Test Charges:</b> If asked in the technical specification, it is to be quoted separately for each test.</p> <p>e) <b>Charges for Supervision of Erection, Testing &amp; Commissioning (ETC) at Site:</b> To be quoted separately if specified in NIT/Price Schedule.</p> <p>f) <b>Charges for Testing &amp; Commissioning at Site:</b> To be quoted separately if specified in NIT/Price Schedule.</p> <p>g) <b>Charges for Erection, Testing &amp; Commissioning at Site:</b> To be quoted separately if specified in NIT/Price Schedule.</p> <p>h) Training Charges: To be quoted separately if specified in NIT/Price Schedule.</p> <p>2.4 <b>GST rates</b> along with HSN/SAC code as applicable on Sr No (a) to (h) above is to be mentioned separately in percentage in both un-priced bid and price bid.</p> <p>Note :</p> <p>i) Unless otherwise specified in the NIT, the purchase order shall be placed on Ex-works basis for Indian bidders.</p> <p>ii) Prices quoted by Indian bidders shall be in Indian Rupees only.</p> <p>iii) In case Supervision of Erection, Testing &amp; Commissioning (ETC) at Site or Testing &amp; Commissioning at Site or Erection, Testing &amp; Commissioning at Site is also in scope of the bidder along with supply, bidder has to ensure that prices quoted for such services also are in line with special terms &amp; conditions of the NIT, if any.</p> <p>iv) Unless otherwise specified in the NIT, Unloading at Site / Destination shall not be in the scope of the supplier.</p> <p>v) Prices in respect of Sr No (a) to Sr No (h) of Clause 2.3 above are to be quoted inclusive of all taxes &amp; Duties, charges. Levies, royalty etc. if any, excluding GST.</p> |
| 3.      | <p><b>TERMS OF PAYMENT :</b></p> <p><b>3.1 For Supply only in scope of the supplier</b></p> <p>100% of payment within 60 days from the date of receipt of complete invoice along with documents in 3 sets (original + 2 copies) as follows :</p> <ul style="list-style-type: none"> <li>· LR / GR duly endorsed by BHEL Site Official.</li> <li>· Material Receipt Certificate issued by BHEL Site Official.</li> <li>· GST Compliant Tax Invoice</li> <li>· Packing List (Case-wise)</li> <li>· Copy of Transit Insurance Certificate from underwriters.</li> <li>· Material Inspection Clearance Certificate (MICC) issued by BHEL Quality Management</li> <li>· Guarantee Certificate</li> <li>· Copy of Performance Bank Guarantee (PBG)</li> <li>· Certificate of acceptance of Type Test Reports issued by BHEL Engineering Management wherever specifically mentioned in the Purchase Order.</li> </ul> <p><b>3.2 For Supply where Supervision of Erection, Testing &amp; Commissioning (ETC) at Site is in scope of the supplier or Supply where Testing &amp; Commissioning at Site is in scope of the supplier</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

| Sr. No. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
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|         | <p>a) 95% of payment within 60 days from the date of receipt of complete invoice along with documents in 3 sets (original + 2 copies) as follows :</p> <ul style="list-style-type: none"> <li>· LR / GR duly endorsed by BHEL Site Official.</li> <li>· Material Receipt Certificate issued by BHEL Site Official.</li> <li>· GST Compliant Tax Invoice</li> <li>· Packing List (Case-wise)</li> <li>· Copy of Transit Insurance Certificate from underwriters.</li> <li>· Material Inspection Clearance Certificate (MICC) issued by BHEL Quality Management</li> <li>· Guarantee Certificate</li> <li>· Copy of Performance Bank Guarantee (PBG)</li> <li>· Certificate of acceptance of Type Test Reports issued by BHEL Engineering Management wherever specifically mentioned in the Purchase Order.</li> </ul> <p>b) 5% of payment within 60 days from the date of receipt of complete invoice along with documents in 3 sets (original + 2 copies) as follows :</p> <ul style="list-style-type: none"> <li>· Certificate of successful completion of Supervision of Erection, Testing &amp; Commissioning at Site if it is in the scope of the supplier or Certificate of successful completion of Testing &amp; Commissioning at Site if it is in the scope of the supplier.</li> <li>· Certificate of completion of final documentation as per Purchase Order / Technical Specification issued by BHEL Engineering Management</li> </ul> <p><b>3.3 For Supply where Erection, Testing &amp; Commissioning (ETC) at Site is in scope of the supplier</b></p> <p>a) 90% of payment within 60 days from the date of receipt of complete invoice along with documents in 3 sets (original + 2 copies) as follows :</p> <ul style="list-style-type: none"> <li>· LR / GR duly endorsed by BHEL Site Official.</li> <li>· Material Receipt Certificate issued by BHEL Site Official.</li> <li>· GST Compliant Tax Invoice</li> <li>· Packing List (Case-wise)</li> <li>· Copy of Transit Insurance Certificate from underwriters.</li> <li>· Material Inspection Clearance Certificate (MICC) issued by BHEL Quality Management</li> <li>· Guarantee Certificate</li> <li>· Copy of Performance Bank Guarantee (PBG)</li> <li>· Certificate of acceptance of Type Test Reports issued by BHEL Engineering Management wherever specifically mentioned in the Purchase Order</li> </ul> <p>b) 10% of payment within 60 days from the date of receipt of complete invoice along with documents in 3 sets (original + 2 copies) as follows :</p> <ul style="list-style-type: none"> <li>· Certificate of successful completion of Erection, Testing &amp; Commissioning at Site issued by BHEL Site Official / Construction Management</li> <li>· Certificate of completion of final documentation as per Purchase Order / Technical Specification issued by BHEL Engineering Management</li> </ul> <p><b>3.4 For Type Test Charges</b></p> <p>100% payment along with applicable GST within 60 days from the date of receipt of complete GST compliant Tax invoice along with copy of Certificate of acceptance of Type Test Reports issued by BHEL Engineering Management in 3 sets (original + 2 copies) on completion of delivery (at site, if F&amp;I is in scope of</p> |

| Sr. No. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
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|         | <p>supplier) of main supplies (excluding spares) for which Type Tests are applicable. List of main supplies (excluding spares) for which Type Tests are applicable shall be certified by BHEL Engineering Management.</p> <p>3.5 For Charges for Supervision of Erection, Testing &amp; Commissioning at Site</p> <p>100% payment along with applicable GST within 60 days from the date of receipt of complete GST compliant Tax invoice along with certificate of successful completion of Supervision of Erection, Testing &amp; Commissioning at Site issued by BHEL Site Official / Construction Management in 3 sets (Original + 2 copies).</p> <p>3.6 For Charges for Testing &amp; Commissioning at Site</p> <p>100% payment along with applicable GST within 60 days from the date of receipt of complete GST compliant Tax invoice along with certificate of successful completion of Testing &amp; Commissioning at Site issued by BHEL Site Official / Construction Management in 3 sets (Original + 2 copies).</p> <p>3.7 For Training Charges</p> <p>100% payment along with applicable GST within 60 days from the date of receipt of complete GST compliant Tax invoice along with certificate of completion of training issued by BHEL Engineering Management in 3 sets (original + 2 copies).</p> <p>Note :</p> <ul style="list-style-type: none"> <li>i) Supplier has to submit invoice(s) as per PO or approved billing break-up of prices (if applicable as per NIT).</li> <li>ii) In case of supplies for overseas project, Material Receipt Certificate issued by BHEL Authorized Representative shall also be acceptable.</li> <li>iii) In case of Transit Insurance under Open Insurance Policy, Intimation / Declaration of Transit Insurance as per terms of the relevant Open Insurance Policy along with copy of Open Insurance Policy from underwriters shall also be acceptable.</li> <li>iv) Supplier has to ensure commencement of transit insurance from the date not later than LR / GR date.</li> <li>v) Supplier has to submit Tax Invoice(s). Supplier should ensure that Tax Invoice should comply all statutory requirements under GST Law to enable BHEL to avail input credit</li> <li>vi) MSMED Act, 2006 and the rules made thereunder as amended from time to time shall be applicable for release of payment to suppliers qualified &amp; registered as Micro &amp; Small Enterprises based on documents mentioned in the NIT for MSME.</li> <li>vii) Supplier has to submit PBG (as per BHEL format) &amp; Guarantee Certificate as per PO terms.</li> <li>viii) In case any shortages and / or damages in supplies, an amount calculated</li> </ul> |

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|         | <p>based on comments against Material Receipt Certificate issued by the BHEL Site Official shall be withheld from the supply payment against 3.1(a) or 3.2(a) above to be deemed fit by BHEL subject to a minimum of 10% of the total ex-works value of the invoice corresponding to the LR / GR against which any shortages and / or damages are reported. The withheld amount shall be released after the shortages and / or damages in supplies are supplied / replenished against Certification by BHEL Site Official.</p> <p>ix) Payment of GST component shall be made only if vendor has deposited the Tax and credit for the same is reflected in GSTN (GST Network). In case credit of the same is not reflected in GSTN , vendor may alternatively furnish BG of GST Amount for a period valid for not less than 1 month .In case of disallowance of credit /non reflection of credit in GSTN , amount will be recovered from supplier along with applicable Interest , penalty etc from any of his dues.</p> <p>x) If GST is payable by BHEL on reverse Charge Mechanism basis, vendor should ensure the submission of GST compliant Tax invoice immediately on dispatch/ performance of service. In case of non-compliance any additional charges towards interest, penalty etc, will be to vendors account.</p> <p>xi) TDS under GST Act, if applicable, shall be deducted unless Exemption Certificate If applicable, from the appropriate authority is furnished to BHEL along with Invoice.</p>                                                                                                                                                                                                            |
| 4.      | <p><b>INTEREST LIABILITY :</b></p> <p>In case of any delay in payment due to any reason, BHEL shall not pay any interest on delayed payment. Also, no interest shall be payable by BHEL on the bank guarantee / deposit amount or balance payment or any other money which may become due owing to difference or misunderstanding or any dispute before any quasi judicial authority between BHEL and the Supplier / Contractor.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 5.      | <p><b>GUARANTEE :</b></p> <p>The equipment / material supplied and services rendered (if applicable) shall be guaranteed to be free from all defects and faults in design &amp; engineering, material, workmanship &amp; manufacture and in full conformity with the Purchase Order / Contract, Technical Specifications &amp; approved drawings / data sheets, if any, for 18 months from the date of last delivery or 12 months from the date of commissioning, whichever is earlier.</p> <p>Wherever Erection, Testing &amp; Commissioning at Site are also in the scope of the Supplier, the guarantee period shall be 18 months from the date of last delivery or 12 months from the date of commissioning, whichever is later.</p> <p>The defective equipment / material / component shall be replaced free of cost at site. Freight &amp; Insurance during transit shall also be in the scope of the supplier / contractor. Any expenditure for dismantling and re-erection of the replaced equipment / material / component shall be to supplier's / contractor's account. All replacements during the guarantee period shall be delivered at site promptly and satisfactorily within a period not more than 45 days from the date of reporting the defect / rejection etc.</p> <p>In the event of the supplier / contractor failing to replace the defective equipment / material / component within the time period mentioned above, BHEL may proceed to undertake the replacement of such defective equipment / material / component at the risk and cost of the supplier / contractor without prejudice to any other rights under the contract and recover the same from PBG / other dues of this Purchase</p> |

| Sr. No. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
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|         | <p>Order / Contract or any other Purchase Order / Contract executed by the supplier / contractor.</p> <p>Note :</p> <ul style="list-style-type: none"> <li>i) In case of Illumination System, items viz. Lamps, Tubes, Ballast, Starters, Capacitors &amp; Fuses will not be under Guarantee after commissioning.</li> <li>ii) In addition to the above guarantee period, Extended Guarantee / Warranty, if any, shall be as per NIT / Technical Specifications.</li> <li>iii) In case offer of agent of Foreign OEM / Foreign Principal is considered, as per Clause No. 1.12 above, Guarantee as mentioned above has to be provided by the Foreign OEM / Foreign Principal also.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 6.      | <p><b>LATENT DEFECT :</b></p> <p>Liability for latent defects shall be for defects inherently lying within material or arising out of design deficiency which does not manifest itself during guarantee period but later and shall be limited to five years from the expiry of the guarantee period.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 7.      | <p><b>PERFORMANCE BANK GUARANTEE (PBG) :</b></p> <p>Supplier shall arrange to submit Performance BG / Deposit on a non-judicial stamp paper of appropriate value along with first invoice or within 60 days from placement of Purchase Order (PO) whichever is earlier, in line with one of the applicable options as follows :-</p> <p><u>Option A</u></p> <p>A single rolling PBG for Rs. 50 Lakhs initially valid for 18 months with claim period of 3 months extra over and above 18 months for all the Purchase Orders being executed for Transmission Business Group, BHEL. However, validity of the PBG shall be extended till 18 months from the date of last delivery with 3 months claim period extra over and above 18 months.</p> <p>Single Rolling PBG option shall not be applicable in case Ex-works value of the PO at the time of placement of PO exceeds Rs. One Crore.</p> <p><u>Option B</u></p> <p>PBG for 10% of the total Ex-works PO value, valid for 18 months from the date of last delivery with claim period of 3 months extra over and above 18 months. Ex-works PO value at the time of placement of PO shall be considered for calculation of the PBG amount.</p> <p><u>Option C</u></p> <p>In case the total Ex-works PO value at the time of placement of PO does not exceed Rs. Ten Lakhs, interest free Deposit of 10% of the total Ex-works PO value at the time of placement of PO in form of Demand Draft favouring Bharat Heavy Electricals Limited and payable at New Delhi / Delhi / Noida shall also be acceptable to BHEL in lieu of PBG, which shall be released after expiry of 21 months from the date of last delivery after deduction, if any, within 60 days from receipt of invoice in 3 sets (original + 2 copies) to be submitted by the supplier.</p> <p>Note :</p> <ul style="list-style-type: none"> <li>i) The Bank Guarantee shall be from any bank as per Annexure for List of Banks (32 Nos.). The original PBG should be sent by issuing Bank directly to AGM (Finance), TBG, BHEL, Noida.</li> <li>ii) Extension of validity of the PBG in original, as per above clause, should be sent by issuing Bank directly to AGM (Finance), TBG, BHEL, Noida at least 45 days before expiry of validity of the PBG.</li> <li>iii) Unless otherwise specified in the NIT, deviation taken for non-submission of PBG / Deposit, as applicable, shall not be accepted.</li> </ul> |



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|         | <p>iv) Supplier has to confirm one of the applicable options for submission of PBG / Deposit before placement of PO.</p> <p>v) In case of non submission PBG / Deposit, as applicable, BHEL reserve the right for Risk Purchase as per terms of the NIT and impose Suspension of Business Dealings with the Supplier / Contractor.</p> <p>vi) BHEL reserve the right to encash the Bank Guarantee and forfeit the amount in the event of any default, failure or neglect on part of the Supplier in fulfilment of performance of the Purchase Order.</p> <p>vii) Value of the Bank Guarantee (at the time of submission) shall remain unchanged for any subsequent variations in Purchase Order value up to <math>\pm 20\%</math>. Beyond this variation of <math>\pm 20\%</math>, the Supplier shall arrange to enhance or may reduce the value of the Bank Guarantee accordingly for the total variation promptly.</p> <p>viii) Vendor to ensure submission of Certificate of Final Documentation /Confirmation regarding Non applicability of Final Documentation, as the case may be, as referred in clause No 9 regarding Final Documentation. BG shall be released only after submission of the same to BHEL TBMM.</p>                                                                                                                             |
| 8.      | <p><b>SUBMISSION OF DRAWINGS / DOCUMENTS FOR APPROVAL :</b></p> <p>Supplier shall submit the master document list within 7 days from date of Purchase Order / Contract, unless otherwise specified in the NIT, with planned dates for submission which shall be in line with activity schedule as per Purchase Order / Contract and shall be finalized with BHEL Engineering Management. Date of first submission of drawings / documents shall be certified by BHEL Engineering Management after the receipt of applicable drawings / documents (e.g. project specific cover sheet, GTP, OGA drawings, schemes, type test reports etc.) by BHEL. During detailed engineering stage, necessary hard copies of the engineering drawings / documents shall also be submitted by the supplier as per the Purchase Order / Contract requirement. The supplier shall also submit the packing drawings as per technical specifications.</p> <p>In case item(s) offered require any interface details of other item (not in the scope of supplier &amp; required for operating the equipment), the supplier has to submit interfaces schedule along with submission of engineering drawings / documents. It shall be responsibility of the supplier to get the details of the interfaced item from BHEL before manufacturing to avoid any mismatch at site.</p> |
| 9.      | <p><b>FINAL DOCUMENTATION :</b></p> <p>Final documentation as called in the Technical /contract specification is to be submitted within 3 months from the date of first delivery of respective equipment, item/material. After submission of Final Documentation, BHEL Engineering Management (TBEM) will issue a Certificate of Completion of Final Documentation. Wherever Final Documentation is not applicable, BHEL Engineering Management (TBEM) will issue confirmation regarding the same, Vendor to submit the Certificate of Final Documentation /Confirmation regarding Non applicability of Final Documentation, as the case may be, to BHEL TBMM. In case of Non Submission of Certificate of Final Documentation /Confirmation regarding Non applicability of Final Documentation, BG will be liable for encashment.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 10.     | <p><b>INSPECTION :</b></p> <p>BHEL / customer / third party shall inspect equipment / material before despatch. Stage inspection during manufacturing may also be carried out. Material to be despatched only after getting Material Despatch Clearance Certificate (MDCC) / MICC issued by BHEL.</p> <p>Supplier shall send inspection call on prescribed format / web site only, with an advance notice of 15 days.</p> <p>Supplier to ensure submission of all routine / acceptance test reports, inspection</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

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|         | <p>reports and all other documents related to inspection, immediately to BHEL.</p> <p>BHEL representative is authorised to carry out audits along with Third Party Inspection Agency at vendor's / supplier's works before clearing the items for despatch.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 11.     | <p><b>DESPATCH DOCUMENTS :</b></p> <p>Despatch documents to be immediately sent to BHEL on despatch are as follows :-</p> <ul style="list-style-type: none"> <li>• Copy of Invoice</li> <li>• Copy of LR / GR in case of Indian suppliers or BL / AWB in case of foreign suppliers</li> <li>• Copy of Packing List (Case-wise)</li> <li>• Copy of Transit Insurance Certificate from underwriters</li> <li>• Copy of Guarantee Certificate</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 12.     | <p><b>DELIVERY PERIOD :</b></p> <p>Delivery / Completion requirement shall be mentioned in the NIT. Bidder to specify best delivery / completion period possible in weeks from the date of LOI / PO as per activity schedule for consideration by BHEL.</p> <p>Time required for type test, if applicable, is to be separately indicated.</p> <p>Note :</p> <p>LR / GR date or invoice date (whichever is later) for indigenous supplies and BL / AWB date for FOB / CIF (if applicable) contracts shall be considered as delivery date.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 13.     | <p><b>LIQUIDATED DAMAGES FOR DELAYED DELIVERY:</b></p> <p>In case of delay in execution of Purchase Order beyond the contractual delivery time, an amount of 0.5% of the total Purchase Order value for supply (incl. taxes and duties, freight &amp; insurance as applicable) per week of delay or part thereof subject to a maximum of 10% of the total Purchase Order value for supply (incl. taxes and duties, freight &amp; insurance as applicable) shall be deducted as Liquidated Damages (LD) along with applicable GST (if any) on LD.</p> <p>However, in case of staggered (lot-wise) contractual delivery schedule, an amount of 0.5% of the total Purchase Order value for supply (incl. taxes, duties, freight &amp; insurance as applicable) of delayed lot per week of delay or part thereof subject to maximum of 10% of the total Purchase Order value. (Incl taxes, duties, Freight &amp; Insurance as applicable) shall be deducted as Liquidated Damages (LD) along with applicable GST (if any) on LD.</p> <p>Note :</p> <p>i) In case of any amendment / revision in PO /WO, the LD shall be linked to the amended / revised Purchase Order / Contract value and delivery / completion time / schedule, if applicable.</p> <p>ii) LR / GR date or invoice date (whichever is later) for indigenous supplies and BL / AWB date for FOB / CIF (if applicable) for imported supplies shall be treated as the date of dispatch for levying LD as above.</p> <p>iii) However, for indigenous supply, if time period between date of receipt of material at site / destination by Site Official &amp; the date of LR / GR or invoice (whichever is later) is more than 30 days, where distance from place of despatch as per LR / GR is upto 1000 Kms or if time period between date of receipt of material at site / destination by Site Official &amp; the date of LR / GR or invoice (whichever is later) is more than 45 days, where distance from place of despatch as per LR / GR is more than 1000 Kms, such excess period shall also be considered for LD purpose.</p> <p>iv) If, as per supplier, delay is not attributable to the supplier, delay analysis with documentary evidence may be submitted by the supplier at the earliest but not</p> |

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|                | later than six months from the end of the financial year in which the payment is withheld. Based on the above details / documents submitted by the supplier, BHEL shall take final decision and if considered appropriate by BHEL, withheld amount (full or part as the case may be) shall be released, otherwise, full or balance withheld amount shall be treated as deduction of Liquidated Damages (LD) towards delayed delivery.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>14.</b>     | <p><b>VALIDITY OF OFFER :</b></p> <p>The offer shall be valid for 120 days from the due date of opening of tender (i.e. techno-commercial bid unless otherwise specified in the NIT).</p> <p>Prices of Spares, wherever they optional items, shall be valid till two years from the date of placement of PO.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>15.</b>     | <p><b>ACCEPTANCE / REJECTION OF TENDER :</b></p> <p>BHEL reserve the right to reject in full or part, any or all tender without assigning any reason thereof.</p> <p>BHEL also reserve right to vary the quantities as mentioned in the NIT. Acceptance of offer is subject to vendor approval by customer before opening of price bid.</p> <p>BHEL shall not be bound by any power of attorney granted by tenderer or by changes in composition of the firm made subsequent to award of order / contract. BHEL may however recognize such power of attorney and changes after obtaining proper legal advice, cost of which will be chargeable to the seller / contractor concerned. If the tenderer deliberately gives wrong information, BHEL reserves the right to reject such an offer at any stage or cancel the order / contract, if awarded, and forfeit the security deposit and bank guarantee.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>16.</b>     | <p><b>DEVIATION :</b></p> <p>The bids having deviation(s) w.r.t. tender are liable for rejection. However, BHEL, at its discretion, may load the prices for evaluation of offer with prior intimation to bidder.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>17.</b>     | <p><b>TENDER EVALUATION :</b></p> <p>Comparative statement shall be prepared and evaluated on total cost basis at destination/site (as per terms of NIT) considering overall quantity indicated in NIT unless contrary to same is specifically mentioned in the tender enquiry / NIT. Total cost for this purpose shall include cost of scope of work as mentioned in NIT along with applicable taxes &amp; duties, and other services etc. (if applicable). GST input credit available to BHEL shall be reduced from prices while determining L1 status.</p> <p>In case all bidders are foreign &amp; Port of Import (destination port) is same for all the bidders, evaluation of offers shall be done on CIF (Port of Import) basis. Otherwise, evaluation of offers shall be done on the basis of delivered cost at site /destination to BHEL. Further, in case of foreign bidders, marine freight &amp; insurance are to be quoted separately &amp; the purchase order may be placed on FOB basis with an option for delivery on CIF / CFR basis, if required, later.</p> <p>In case of foreign bidders, Exchange Rate (TT selling rate of State Bank of India) as on date of tender opening (Part-I Bid in case of two part bid) shall be considered. If the relevant day happens to be a bank holiday, then the forex rate as on the previous bank (SBI) working day shall be taken for tender evaluation.</p> |
| <b>18.</b>     | <p><b>LOADING CRITERIA :</b></p> <p>List of permissible deviations &amp; loading criteria thereof are as follows :-</p> <p>a) Payment Terms<br/>Base rate of SBI (as applicable on the date of bid opening / techno-commercial bid opening in case of two part bids) + 6% shall be considered for loading for the period of relaxation sought by bidder(s) against terms of payment in the NIT.</p> <p>b) Liquidated Damages (LD) for Delayed Delivery</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

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|         | <p>Loading on LD clause shall be to the extent to which it is not agreed to by the bidder (at offered value).</p> <p>c) In case of foreign bidders, if the quoted prices is on CIF basis only, it shall be loaded to arrive at total FOR (Site / Destination) price, as applicable, by factors as follows :-</p> <ul style="list-style-type: none"> <li>i) Port handling / clearing charges: @ 1% of CIF value to arrive at Customs Assessable Value.</li> <li>ii) Custom Duty (including CVD &amp; SAD) as per NIT prevailing on date of price bid opening.</li> <li>iii) Inland Freight &amp; Transit Insurance: @ 5% of CIF value where distance between site / destination and Port of Discharge is upto 1000 Kms or @ 7% of CIF value where distance between site / destination and Port of Discharge is more than 1000 Kms.</li> </ul> <p>Note :<br/>Additional deviations (if considered acceptable by BHEL) &amp; the loading criteria shall be communicated to all the qualified bidders before price bid opening.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 19.     | <p><b>ARBITRATION :</b></p> <p>In the event of any dispute emanating from and relating to this contract, the matter shall be referred to the sole arbitration of the person appointed by the competent authority of BHEL. Subject to aforesaid, the provisions of "The Arbitration and Conciliation Act, 1996" and the rules made thereunder as amended from time to time in India shall apply to the arbitration proceedings. The venue of arbitration shall be in New Delhi.</p> <p>Further there shall be no claim for any pre-reference or pendente-lite interest on the claims and any claim for such interest made shall be void.</p> <p>However, in case of contract with Public Sector Enterprise / Undertaking (PSE/PSU) or Govt. Dept., the extant guidelines of Govt. of India shall be followed.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 20.     | <p><b>LEGAL SETTLEMENT :</b></p> <p>Indian Courts at New Delhi / Delhi shall have exclusive jurisdiction to decide the dispute, if any, arising out of or in respect of the contract(s) to which these conditions are applicable. Contract, including all matters connected with contract, shall be governed by the Indian Law, both substantive and procedural, for the time being in force including modification thereto.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 21.     | <p><b>SUB-CONTRACTING :</b></p> <p>In case further subcontracting of BHEL Purchase Order / Contract or part thereof is envisaged by supplier, the same can be done after written permission is obtained from BHEL. However it shall not absolve the Supplier / Contractor of the responsibility of fulfilling BHEL Purchase Order / Contract requirements. In case of subcontracting of Purchase Order / Contract awarded by BHEL or part thereof without such permission, BHEL reserve the right to cancel the Purchase Order / Contract and source such material / component / equipment / system from any other agency at the risk and cost of the Supplier / Contractor.</p> <p>If Supplier / Contractor is an individual or proprietary concern and the individual or the proprietor dies or the partnership is dissolved or substantially affected, then unless BHEL is satisfied that legal representative of individual Supplier / Contractor or proprietor of proprietary concern and surviving partners of partnership firm are capable of carrying out and completing the Purchase Order / Contract, BHEL shall be entitled to cancel the Purchase Order / Contract as to its incomplete portion and without being in any way liable to payment of any compensation to legal representative of Supplier / Contractor and / or to surviving partners of Supplier's / Contractor's firm on account of cancellation of the Purchase Order / Contract.</p> <p>Decision of BHEL that legal representatives of deceased Supplier / Contractor or</p> |

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|         | <p>surviving partners of the Supplier's / Contractor's firm cannot carry out and complete the Purchase Order / Contract shall be final and binding on the parties hereto.</p> <p>Terms and Conditions shall not get affected in case of de-merger / amalgamation / taking-over / re-constitution etc.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 22.     | <p><b>RISK PURCHASE :</b></p> <p>In case the Supplier / Contractor fails to supply or fails to comply with terms &amp; conditions of the Purchase Order / Contract or delivers equipment / material not of the contracted quality or fails to adhere to the contract specifications or fails to perform as per the activity schedule and there are sufficient reasons even before expiry of the delivery / completion period to justify that supplies shall be inordinately delayed beyond contractual delivery / completion period, BHEL reserve the right to cancel the Purchase Order / Contract either in whole or in part thereof without compensation to Supplier / Contractor and if BHEL so desires, may procure such equipment / material / items not delivered or others of similar description where equipment / material / items exactly complying with particulars are not readily procurable in the opinion of BHEL which is final and in such manner as deemed appropriate, at the risk and cost of the Supplier / Contractor and the Supplier / Contractor shall be liable to BHEL for any excess cost to BHEL. However, the Supplier / Contractor shall continue execution of the Purchase Order / Contract to the extent not cancelled under the provisions of this clause.</p> <p>Recovery amount on account of purchases made by BHEL at the risk and cost of Supplier / Contractor shall be the difference of total value of new Purchase Order (PO) value and total value of old Purchase Order for applicable items, where the total value of new PO is more than total value of old PO for applicable items, plus additional 15% of the total ex-works value of new PO as overheads.</p> <p>The Supplier / Contractor shall on no account be entitled to any gain on such risk &amp; cost purchase. In case the purchase order (PO) value of the new PO is less than the PO value of the old PO, 15% of the total ex-works value of the new PO shall be recovered as overheads and the difference between the PO value of the old PO and the new PO shall not be considered for calculation of the recovery amount.</p> |
| 23.     | <p><b>ADJUSTMENT OF RECOVERY :</b></p> <p>Any amount payable by the Supplier / Contractor under any of the condition of this contract shall be liable to be adjusted against any amount payable to the Supplier / Contractor under any other Purchase Order / Contract awarded to him by any BHEL unit. This is without prejudice to any other action, as may be deemed fit, by BHEL.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 24.     | <p><b>FORCE MAJEURE CONDITION :</b></p> <p>If by reason of war, civil commotion, act of god, Government restrictions, strike, lockout which are not in control of Supplier / Contractor the deliveries / services are delayed, Supplier / Contractor shall not be held responsible.</p> <p>If at any time during the continuance of the Purchase Order / Contract, the performance in whole or in part by either party of any obligations under the Purchase Order / Contract is prevented or delayed by reason of any war hostilities, acts of the public enemy, restrictions by Govt. of India, civil commotion, sabotage, fires, floods, explosion, epidemics, quarantine restrictions, strike, lock-outs or acts of God (hereinafter referred to as 'event'), which are not in control of Supplier / Contractor or BHEL, then provided notice of the happening of such event is given by either party to the other within fifteen (15) days from the date of occurrence thereof, neither party shall by reason of such event be entitled to terminate the Purchase Order / Contract nor shall have any claim for damages against each other in respect of such non-performance and delay in performance. Performance under the Purchase Order / Contract shall be resumed immediately after such event has come to an end or</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

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|         | <p>ceased to exist and decision of BHEL as to whether the deliveries have to be resumed or not shall be final, conclusive and binding on the parties hereto.</p> <p>In the event of the parties hereto not able to agree that a force majeure event has occurred, the parties shall submit the disputes for resolution pursuant to the provisions hereunder, provided that the burden of proof as to whether a force majeure event has occurred shall be upon the party claiming such an event.</p> <p>Notwithstanding above provisions, BHEL shall reserve the right to cancel the Purchase Order / Contract, wholly or partly, in order to meet the overall project schedule and make alternative arrangements for completion of delivery and other schedules.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 25.     | <p><b>MANUFACTURING QUALITY PLAN (MQP) :</b><br/>Supplier to submit approved MQP in line with requirement of BHEL/customer.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 26.     | <p><b>SUPPLIER PERFORMANCE MONITORING AND RATING SYSTEM :</b><br/>BHEL reserve the right for evaluation of Supplier Performance Rating as per Supplier Performance Monitoring and Rating System of BHEL for necessary action. Details are available at BHEL Website <a href="http://www.bhel.com">www.bhel.com</a> for reference.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 27.     | <p><b>DEALING WITH BANNED SUPPLIERS / CONTRACTORS IN BHEL :</b><br/>Offers of the bidders, who are on the banned list, as also the offers of the bidders who engage the services of the banned firms, shall be rejected. The list of banned firms is available on BHEL website <a href="http://www.bhel.com">www.bhel.com</a> for reference.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 28.     | <p><b>ORDER OF PRECEDENCE :</b><br/>The order of precedence shall be as follows :-</p> <ol style="list-style-type: none"> <li>Special Terms &amp; Conditions (STC) for Tender Enquiry / Contract, if any</li> <li>General Terms &amp; Conditions (GTC) for Tender Enquiry / Contract &amp; Additional General Terms &amp; Conditions (GTC) for Tender Enquiry / Contract for Erection Testing &amp; Commissioning (ETC) at Site, if applicable</li> </ol> <p>Provisions in (a) above shall prevail over (b). In case of conflict, between Technical Specifications and STC / GTC, bidder to seek necessary clarifications from BHEL concerned official as specified in NIT.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 29.     | <p><b>PACKING :</b><br/>Packing shall be in conformity with specifications and shall be such as to ensure prevention of damages, corrosion, deterioration, shortages, pilferage and loss in transit or storage.</p> <p>In case of shipment by sea or air, the packing shall be sea-worthy or air-worthy respectively and of international standards.</p> <p>Different types of spares i.e. start-up / commissioning spares and initial spares (mandatory spares and recommended O&amp;M spares) are to be packed separately.</p> <p>Packing List shall be submitted as per standard format along with advance set of documents for claiming payment which shall also indicate :-</p> <ol style="list-style-type: none"> <li>Case / Packing size (as applicable).</li> <li>Gross weight and net weight of each package.</li> <li>Detailed contents of the package with quantity of each item separately.</li> </ol> <p>Project, Item / Package Description, BHEL's PO No. with date &amp; Case / Packing Mark should also be clearly mentioned on the Case / Packing and Packing List for identification. Also, Packing List must be duly signed &amp; should include respective Invoice No. &amp; LR No.</p> <p>Note :</p> <p>Foreign suppliers to furnish details to arrange inland transportation by BHEL, if applicable, as follows :-</p> <ol style="list-style-type: none"> <li>No. of Packages</li> <li>Size with Weight (Gross &amp; Net) of each Package</li> <li>No. of Containers with type &amp; size required for inland transportation</li> </ol> |

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|                | iv) Type of Cargo (Break Bulk / LCL / FCL)<br>v) Customs Tariff No.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>30.</b>     | <p><b>COLOUR CODING :</b></p> <p>Aluminium stickers are required to be attached to large components but plastic sheet tags should be tied with small components, giving details like purchase order, description of the component, quantity etc.</p> <p>Tags should be of the colour as follows :-</p> <ul style="list-style-type: none"> <li>a) Main equipment : Yellow or White tag</li> <li>b) Start-up / Commissioning spares : Blue tag</li> <li>c) Mandatory spares : Pink or Red tag</li> <li>d) Recommended / O&amp;M spares : Green tag</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>31.</b>     | <p><b>MICRO, SMALL &amp; MEDIUM ENTERPRISES (MSME) :</b></p> <p>MSMED Act 2006 as amended from time to time &amp; extant regulations of Govt. of India for MSME will be applicable.</p> <p>Micro &amp; Small Enterprises (MSE) can avail the intended benefits only if they submit along with the offer / bid, attested copies of either Acknowledgement of Entrepreneur Memorandum Part-II (EM-II certificate) having deemed validity (five years from the date of issue of acknowledgement in EM-II) or valid NSIC certificate or EM-II certificate along with attested copy of a CA certificate (As per BHEL format where deemed validity of EM-II certificate of five years have expired) applicable for the relevant financial year (latest audited). Date to be reckoned for determining the deemed validity will be the date of opening (for Techno-commercial Bid : Part-I in case of two part bid). Non-submission of such documents will lead to consideration of their bid at par with other bidders. No benefit shall be applicable for this enquiry if any deficiency in the above required documents are not submitted before price bid opening. If the tender is to be submitted through e-procurement portal, then the above required documents are to be uploaded on the portal. Documents should be notarized or arrested (in original) by a Gazetted officer.</p> <p>Copy of Udyog Aadhaar Memorandum with Acknowledgement of Ministry of Micro, Small &amp; Medium Enterprises should also be furnished.</p> |
| <b>32.</b>     | <p><b>BUSINESS ETHICS / SUSPENSION OF BUSINESS DEALINGS WITH SUPPLIERS / CONTRACTORS :</b></p> <p>If any bidder / supplier / contractor during pre-tendering / tendering / post tendering / award / execution / post-execution, indulges in malpractices cheating, bribery, fraud or other misconduct or formation of cartel so as to influence the bidding process or influences the price or fails to perform or is in default without any reasonable cause etc or performs any act considered objectionable as per extant guidelines, action may be taken against such bidders/supplier/contractor as per extant Guidelines for Suspension of Business Dealings with Suppliers/Contractors. Abridged version of same is available at BHEL website (<a href="http://www.bhel.com">www.bhel.com</a>) on Supplier Registration Page.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>33.</b>     | <p><b>REVERSE AUCTION :</b></p> <p>BHEL reserve the right to go for Reverse Auction (RA) instead of opening the sealed envelope price bid, submitted by the bidder or price bid submitted by the bidder through e-procurement system. This will be decided after techno-commercial evaluation. All bidders to give their acceptance for participation in RA. Non-acceptance to participate in RA may result in non-consideration of their bids, in case BHEL decides to go for RA.</p> <p>In case BHEL decides to go for Reverse Auction, only those bidders who have given their unconditional acceptance to participate in RA will be allowed to participate in the Reverse Auction. Those bidders who have given their acceptance to participate in Reverse Auction will have to necessarily submit online sealed bid in the Reverse Auction. Non-submission of online sealed bid by the bidder will be considered as tampering of the tender process and will invite action by BHEL as per extant guidelines in vogue.</p> <p>General Terms and Conditions of RA are available at Annexure. Business Rules for</p>                                                                                                                                                                                                                                                                                                                                                                                                           |

| Sr. No. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|         | <p>RA shall be sent to the bidders before conducting RA.</p> <p>Abridged Version of "Common Guidelines for Conducting Reverse Auction" may also be seen at BHEL website (<a href="http://www.bhel.com">www.bhel.com</a>) on "Supplier Registration" Page &amp; "Tender Notifications" Page.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 34.     | <p><b>INTEGRITY PACT :</b></p> <p>Bidders shall have to enter into Integrity Pact with BHEL, duly signed with seal in original, if specified in NIT / RFQ failing which bidder's offer shall be liable for rejection.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 35.     | <p><b>TERMINATION OF CONTRACT :</b></p> <p>BHEL shall have the right to cancel the Purchase Order / Contract without any financial implication to BHEL if vendor approval by end user / customer is withdrawn or in case of Suspension of Business Dealings with the Suppliers / Contractors by BHEL.</p> <p>BHEL shall have the right to cancel Purchase Order / Contract, wholly or in part, in case they are obliged to do so on account of any decline, diminution, curtailment or stoppage of their business and in that event, the Supplier's / Contractor's compensation claim shall be settled mutually.</p> <p>In case of cancellation of Purchase Order / Contract for main supply, all other associated Purchase Orders / Contracts like those for Mandatory Spares / Recommended Spares / Erection, Testing &amp; Commissioning (ETC) / Supervision of ETC, if any, would also get cancelled.</p>                                                                                             |
| 36.     | <p><b>SHELF LIFE :</b></p> <p>Supplier has to inform the list of the items / sub-items which have limited shelf life like consumables or those required for the first fill and shall indicate the corresponding shelf life period in the offer. Such items / sub-items shall be manufactured / despatched only after getting formal clearance from BHEL.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 37.     | <p><b>LIMITATION OF LIABILITY :</b></p> <p>Notwithstanding any other provisions, except in cases of wilful misconduct and / or criminal negligence / acts,</p> <p>a) Neither the Supplier / Contractor nor BHEL shall be liable to the other, whether in Purchase Order / Contract, tort, or otherwise, for any consequential loss or damage, loss of use, loss of production or loss of profits or interest costs, provided however that this exclusion shall not apply to any obligation of the Supplier / Contractor to pay Liquidated Damages to the BHEL and</p> <p>b) Notwithstanding any other provisions incorporated elsewhere in the contract, the aggregate liability of the Contractor in respect of this contract, whether under the Contract, in tort or otherwise, shall not exceed total Contract Price, provided however that this limitation shall not apply to any obligation of the Vendor to indemnify BHEL with respect to Patent Infringement or Intellectual Property Rights.</p> |
| 38.     | <p><b>SHORTAGES / DAMAGES :</b></p> <p>a) Against Supply only or Supply where Supervision of Erection, Testing &amp; Commissioning (ETC) at Site or Supply where Testing &amp; Commissioning at Site is in scope of the supplier :</p> <p>Any shortages and / or damages in supplies shall be supplied / replenished free of cost by the supplier as early as possible but not later than 30 days from the date of intimation by BHEL to the supplier.</p> <p>b) Against Supply where Erection, Testing &amp; Commissioning (ETC) at Site is in scope of the supplier :</p>                                                                                                                                                                                                                                                                                                                                                                                                                               |



| Sr. No. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|         | <p>Any shortages and / or damages in supplies and during handling / storage, erection, testing and commissioning at site shall be supplied / replenished free of cost by the Supplier / Contractor, as early as possible, to meet the contractual completion time / schedule.</p> <p>Note: There shall not be any extension in the contractual delivery time / schedule due to any shortages and / or damages in supplies.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 39.     | <p><b>VARIATION OF CONTRACT VALUE / QUANTITY VARIATION :</b><br/> BHEL shall have the right to variation in quantities of items within <math>\pm 30\%</math> of the total Purchase Order / Contract value at the time of placement of PO or award of Contract on overall basis for all amendments together within two years from the date of original Purchase Order / Contract or completion of execution of the Purchase Order / Contract whichever is earlier but quantities of individual items may vary to any extent or may get deleted unless otherwise specified in the technical specifications. No compensation is payable due to variation in the quantities and the Supplier / Contractor shall be bound to accept the same the contracted prices / rates without any escalation. However, if the Purchase Order / Contract is on "Lumpsum" basis, no variation of Purchase Order / Contract value shall be admissible to the Supplier / Contractor within the scope of Purchase Order / Contract, as long as the inputs remain unchanged.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 40.     | <p><b>STATUTORY VARIATION :</b><br/> GST rates prevailing at the time of dispatch of goods / completion of services shall be payable by BHEL. All other taxes, duties, charges, royalty, cess, other levies shall be deemed to be included in the Ex Works Prices / Charges quoted by bidders and no variations shall be payable in respect thereof. No other variations such as on customs duty, exchange rate, minimum wages, prices of controlled commodities, any other input etc. shall be payable by the BHEL.</p> <p>Notwithstanding anything above, where the actual completion of the supply / services occurs beyond the period stipulated in the Purchase Order / Contract or any extension thereof, variations referred to above, will be limited to the rates prevailing on the dates of such agreed completion periods only. For variations after the agreed completion periods, the Supplier / Contractor alone shall bear the impact for the upward revisions and for downward revisions BHEL shall be given the benefit of reduction in applicable taxes /GST. This will be without prejudice to the levy of liquidated damages for delay in delivery / completion.</p> <p>If new tax is introduced by Central/ State Govt / Municipality becomes directly applicable on items specified in Bill of Quantities/Purchase Order/Contract, full reimbursements shall be made provided it becomes applicable on items specified in Bill of Quantities.</p> <p>However, any additional tax implication due to delay in delivery, beyond the Contractual Delivery, attributable to supplier shall be borne by supplier.</p> |
| 41.     | <p><b>MODE OF PAYMENT :</b><br/> Payment shall be made directly to the Supplier / Contractor by BHEL through NEFT / RTGS.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 42.     | <p><b>CONFIDENTIALITY :</b><br/> Supplier / Contractor shall, at all times, undertake to maintain complete confidentiality of all data, information, software, drawings &amp; documents etc. belonging to BHEL and also of systems, procedures, reports, input documents, manuals, results and any other BHEL documents discussed and / or finalized during the course of execution of Purchase Order / Contract.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 43.     | <p><b>INDEMNIFICATION :</b><br/> The Supplier / Contractor shall indemnify and keep indemnified and hold harmless BHEL and its employees and officers from and against any and all claims, suits, actions or administrative proceedings, demands, losses, damages, costs and</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

| Sr. No. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
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|         | expenses and any other claim of whatsoever nature in respect of the death or injury of any person or loss of or damage to any property arising during the course and out of the execution of the Purchase Order / Contract.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 44.     | <p><b>TITLE OF GOODS :</b></p> <p>a) Ownership of the equipment / material procured in India, shall be transferred to BHEL upon loading on to the mode of transport to be used for transportation of the said equipment / material from the works to the site / destination and upon endorsement of the dispatch documents in favour of BHEL.</p> <p>b) Ownership of the equipment / material to be imported into the country where the site is located, if not procured in India, shall be transferred to BHEL upon loading on the mode of transport to be used for transportation of the equipment / material from the country of origin to that country / destination and upon endorsement of despatch document in favour of BHEL.</p> <p>c) Notwithstanding the transfer of ownership of the equipment / material, the responsibility for care and safe custody thereof together with the risk of loss or damage thereto for whatsoever reason shall remain with the Supplier.</p> |
| 45.     | <p><b>COMPLIANCE OF STATUTORY REQUIREMENTS :</b></p> <p>The vendor shall comply with all State and Central Laws / Acts, Statutory Rules, Regulations etc., as may be enacted by the Government during the tenure of the Purchase Order / Contract and having in force and applicable to the Purchase Order / Contract and nothing shall be done by the Supplier / Contractor in contravention of any Law / Act and / or Rules / Regulations, thereunder or any amendment thereof.</p> <p>The Supplier / Contractor shall pay all taxes, fees, licence charges / deposits, duties, tolls, royalty, commissions or other charges which may be levied on account of any of his operations connected with the Purchase Order / Contract. In case BHEL is constrained to make any of such payments, BHEL shall recover the same from the Supplier / Contractor either from moneys due to him or otherwise as deemed fit.</p>                                                                |
| 46.     | <p><b>ACCEPTANCE OF ORDER :</b></p> <p>Supplier should acknowledge and accept the Letter of Award / Purchase Order issued by BHEL within 7 days of the issue of Letter of Award / Purchase Order.</p> <p>In case of any discrepancy / typographical error in issue of Purchase Order / Contract, the agreed terms &amp; conditions, scope of work, rates / prices for placement of PO / award of contract shall be applicable and BHEL reserves the right to issue amendment(s) to PO / Contract for correction of discrepancies / typographical errors in the PO / Contract at a later date.</p>                                                                                                                                                                                                                                                                                                                                                                                      |
| 47.     | <p><b>FRAUD PREVENTION POLICY :</b></p> <p>The Bidder along with its associate / collaborators / sub-contractors / sub-vendors / consultants / service providers shall strictly adhere to BHEL Fraud Prevention Policy displayed on BHEL website <a href="http://www.bhel.com">http://www.bhel.com</a> and shall immediately bring to the notice of BHEL Management about any fraud or suspected fraud as soon as it comes to their notice.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

Signature of Bidder (Authorized Signatory) with Date & Seal

SCHEDULE OF PRICE (Part II) (UNPRICED COPY)

UPPTCL

**( BIDDER TO STRICTLY ENSURE SUBMITTING THE PRICE BIDS IN THIS FORMAT )**

**CABLE TERMINATION KIT**

VENDOR NAME / OFFER REF:

MENTION THE WORKS FROM WHICH MATERIAL SHALL BE SUPPLIED -

ENQUIRY No. -48G2000368 dated 19/12/2019

|  | S.No. | Description of Item                                                                                                                                          | HSN Code | Unit | Quantity | Unit Price     | Total          | GST @__on Ex Works | Unit Freight & Insurance | Total Freight & Insurance | GST @__ on Freight & Insurance | TOTAL (FOR Destination) PRICE (Rs.) |
|--|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|------|----------|----------------|----------------|--------------------|--------------------------|---------------------------|--------------------------------|-------------------------------------|
|  |       |                                                                                                                                                              |          |      |          | Ex-works (Rs.) | Ex-Works (Rs.) |                    |                          |                           |                                |                                     |
|  | 1     | SUPPLY- CABLE TERMINATION KIT : 19/33 KV(E), 1CX630 SQ MM, COPPER CONDUCTOR, XLPE INSULATED, ARMoured, FRLS PVC OUTER SHEATH POWER CABLE for Rasara (Ballia) |          | Nos  | 12       |                |                |                    |                          |                           |                                |                                     |
|  | 2     | SUPPLY- CABLE TERMINATION KIT : 19/33 KV(E), 1CX630 SQ MM, COPPER CONDUCTOR, XLPE INSULATED, ARMoured, FRLS PVC OUTER SHEATH POWER CABLE for Shamli          |          | Nos  | 12       |                |                |                    |                          |                           |                                |                                     |
|  |       | Total cost to BHEL (in figures)                                                                                                                              |          |      |          |                |                |                    |                          |                           |                                |                                     |
|  |       | Total cost to BHEL (in words)                                                                                                                                |          |      |          |                |                |                    |                          |                           |                                |                                     |

1. It is certified that M/s \_\_\_\_\_ have quoted as per the specified price format of the tender, otherwise offer shall be liable for rejection.
2. PLEASE NOTE THAT UNPRICED COPY OF PRICE BID ( i.e. WITH ALL PRICE BLANKED) SHALL BE FURNISHED ALONGWITH TECHNO-COMMERCIAL BID.
3. Vendor to mention the word "QUOTED" against each item in UNPRICED SCHEDULE.

SEAL & SIGNATURE OF TENDERER



# BHARAT HEAVY ELECTRICALS LIMITED

## TRANSMISSION BUSINESS ENGINEERING MANAGEMENT

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|                                                  |                                                                                                       |          |         |             |                  |          |
|--------------------------------------------------|-------------------------------------------------------------------------------------------------------|----------|---------|-------------|------------------|----------|
| DOCUMENT No.                                     | TB-406-316-19A                                                                                        | Rev. No. | 00      | Prepared    | Checked          | Approved |
| TYPE OF DOC.                                     | TECHNICAL SPECIFICATION                                                                               |          | SIGN    | [Signature] |                  |          |
| TITLE<br><b>19/33kV (E)Cable Termination Kit</b> |                                                                                                       |          | NAME    | TTR         | SKS/MSM          | AG       |
|                                                  |                                                                                                       |          | DATE    | 04.12.19    | 04.12.19         | 04.12.19 |
|                                                  |                                                                                                       |          | GROUP   | TBEM        | W.O. No          |          |
| Customer                                         | Uttar Pradesh Transmission Corporation Ltd. (UPPTCL)                                                  |          |         |             |                  |          |
| Project                                          | 400/220/132 kV GIS Substation at Shamli (UP) &<br>400/220/132 kV GIS Substation at Rasra, Ballia (UP) |          |         |             |                  |          |
| Station                                          | Shamli & Rasra, Ballia                                                                                |          |         |             |                  |          |
|                                                  |                                                                                                       |          |         |             |                  |          |
|                                                  |                                                                                                       |          |         |             |                  |          |
|                                                  |                                                                                                       |          |         |             |                  |          |
|                                                  |                                                                                                       |          |         |             |                  |          |
|                                                  |                                                                                                       |          |         |             |                  |          |
| Rev No.                                          | Date                                                                                                  | Altered  | Checked | Approved    | Revision Details |          |
| Distribution                                     |                                                                                                       |          | To      | TBEM        |                  |          |
|                                                  |                                                                                                       |          | Copies  | 1           |                  |          |



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## 1 Scope, Quantities and Specific Technical Requirements

### 1.1 Scope

This technical specification covers the requirements of design, engineering, manufacture, testing & inspection, packing, loading at works and transport to site of **19/33kV (E) Cable Termination Kits** along with its accessories etc. as mentioned in this section and in various other sections of this specification.

The scope includes: --

- 1) Crimping type cable lugs, including hardware for fastening the lug to the equipment terminal
- 2) Heat Shrinkable type or pre-moulded type cable termination kit including the stress cone, boot and etc.
- 3) Cable gland / cable clamping arrangement where ever required
- 4) Any other item required to complete the cable termination work at site

The equipment is required for the following project:

Name of customer : Uttar Pradesh Transmission Corporation Ltd. (UPPTCL)

Name of the project : : 1) 400/220/132 kV GIS Substation at Shamli (UP)

: 2) 400/220/132 kV GIS Substation at Rasra, Ballia (UP)

Site : Shamli (UP) & Rasra, Ballia (UP)

Refer section-3 of this document for project details and general specification.

### 1.2 Quantities

| Sl.No | Item Description                                                                                                                            | Installation                 | Quantity (Nos)# |        |
|-------|---------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|-----------------|--------|
|       |                                                                                                                                             |                              | Shamli          | Ballia |
| 1.    | Cable Termination Kit for 19/33 kV(E), 1Cx630 mm <sup>2</sup> Copper conductor, XLPE insulated, Armoured, FRLS PVC outer sheath Power Cable | Outdoor Installation in yard | 12              | 12     |

# Final quantity may vary upto  $\pm 30\%$  at contract stage.

**Notes :-** The supplier shall furnish the list of all the required accessories along with the above cable termination kits.

### 1.3 Specific Technical Specification

Cable Termination kits shall be suitable for Cables of following parameters:

| S. No. | PARTICULAR               | UNIT | DATA     |
|--------|--------------------------|------|----------|
| 1.     | Rated Voltage            | kV   | 33       |
| 2.     | Type of Insulation       |      | XLPE     |
| 3.     | Single core / Multi core |      | Single   |
| 4.     | Armoured /Unarmoured     |      | Armoured |

| S. No. | PARTICULAR                                                     | UNIT            | DATA             |
|--------|----------------------------------------------------------------|-----------------|------------------|
| 5.     | Material of Conductor                                          |                 | Copper           |
| 6.     | System                                                         |                 | grounded system  |
| 7      | Highest System Voltage                                         | kV              | 36               |
| 8.     | Conductor Size                                                 | mm <sup>2</sup> | 630              |
| 9.     | Material                                                       |                 | Standard Copper  |
| 10.    | Shape of conductor                                             |                 | Compact Circular |
| 11.    | One minute power frequency dry and wet withstand voltage (rms) | kVrms           | 70               |
| 12     | Full wave impulse withstand voltage (1.2/50 microsec)          | kVp             | 170              |
| 13.    | Continuous Withstand Temperature                               | °C              | 90               |
| 14.    | Short Circuit Withstand Temp.                                  | °C              | 250              |

#### **1.4 Type tests**

Bidder shall ensure that the cable termination kits procured have valid type test certificates as per relevant IS/IEC from CPRI or any other accredited testing lab. Type test certificates for 19/33kV (E) Cable Termination kits shall not be more than five years old as on 07.09.18. In those cases, where type test certificates are of dates earlier than 07.09.13, Bidder/manufacturer shall carry out the type tests at CPRI or any other accredited testing lab prior to dispatch of equipment with no commercial implication to BHEL/UPPTCL.

Type tests and special tests to be conducted/ valid certificates to be submitted shall be governed as follows,

In case any of Type tests have not been conducted on the offered design of 19/33 kV (E) Cable termination kit, there has been a change in the design after the type tests, the requisite tests shall be conducted by bidder on the offered cable termination kit without any extra cost and delivery impact to BHEL/UPPTCL.

#### **1.5 Prequalifying Conditions for the Supply of Individual Equipments**

##### **A. Manufacturing Experience**

The offered cable termination kit must have manufactured and supplied 33kV or higher rating cable termination kits in earlier projects.

#### **1.6 Manufacturing quality plan**

The successful bidder shall submit the Quality Plan for BHEL/UPPTCL approval. In case bidder has reference Quality plan agreed with BHEL/UPPTCL, same can be submitted for specific project after award of contract for BHEL/UPPTCL approval.



There shall be no commercial implication to BHEL on account of Quality Plan approval.

All materials shall be procured, manufactured, inspected and tested by bidder/vendor/ sub-vendor as per approved quality plan. The bidder/vendor shall perform all tests necessary to ensure that the material and workmanship conform to the relevant standards and comply with the requirements of the specification. Charges for all these tests for all the equipment & components shall be deemed to be included in the bid price.

### **1.7 Deviations**

The bidder shall list all the deviation from the specification separately. Offers without specific deviation will be deemed to be totally in compliance with the specification and NO DEVIATION on any account will be entertained at a later date.



## 2 Equipment Specification

### 2.1 General

This section covers the general technical requirements of **19/33kV (E) Cable Termination Kits**. In case of any discrepancies between the requirements mentioned in this section and those specified in section-3 of this specification, this section shall prevail and shall be treated as binding requirement.

### 2.2 Standards

The 19/33kV (E) Cable Termination Kits and accessories shall conform to the following standards.

|                                     |                                                                                                                                          |
|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| IS 13573:1992 & amendment 1996,1997 | Joints and terminations of Polymeric cables for Voltages from 6.6 kV upto and including 33 kV - Performance Requirements and Type tests. |
| VDE 0278                            | Accessories for cables rated upto 36 kV                                                                                                  |
| IS 7098 (Part II)                   | Specification for Cross-linked Polyethylene insulated PVC sheathed cables (from 3.3 kV upto 33 kV)                                       |
| IEEE 48:1975                        | Standard Test Procedures and Requirements for High Voltage Alternating Current Cable Accessories                                         |
| IEC 507                             | Specification for Salt fog test                                                                                                          |
| EATS-09-13                          | Electricity Association Technical Specification 09-13                                                                                    |

### 2.3 Technical Requirements

The material of stress control cones shall have volume resistivity of minimum 1000 MΩ-cm for the termination. The cable termination kits shall be suitable for termination of the cable on outdoor installation in yard and shall be single phase types as specified in the Bill of Quantities.

Terminations and joints shall be either of a heat shrinkable or pre-moulded type. They shall be factory assembled kits of the cable manufacturer containing all the necessary components to reinstate the cable insulation, metallic shielding of each core, together with the reinstatement of the outer sheath, equivalent for size of cable.

Each terminating or jointing kit shall be in a separate package and a list of materials indicating quantities and weights in the kit and an instruction sheet be included in the package.

Kit shall contain sufficient clearing solvents and cleaning clothes for the proper making of the joints or terminations.

Voltage stress relief shall be provided and this may be inherent in the heat recoverable polymeric material or alternatively incorporated in the pre-moulded terminations. The termination or joints shall be capable of tolerating any variances in the manufacture dimensions of the cable such as oval, out of round, sector



or oversize cable cores. The terminations shall be capable of immediate energization once all the components have been installed. The terminating or jointly material shall not be subject to storage limitations such as controlled temperature or humidity restrictions nor have shelf life limitations.

The termination kits shall have the following features (one or more of which may be included in one item):

- Bi-metallic compression lugs
- Weather-proof seal between lugs and termination
- Non-tracking weather resistant exterior complete with weather skirts for outdoor terminations
- Built in stress control equipment
- Cooper braid for earthing onto screen
- All other items necessary to complete the kit.

Heat shrinkable polymeric materials and terminations shall comply with requirements of IEC 60502, IEC 604696 appendix C, IEC600060 sub clause 3.3, IEC 60071, IEC60507 Chapter3.

The material of completed termination and joints shall be for the appropriate type of service, and voltage. They shall include ferrules, lugs and other material necessary for the terminating and jointing of the conductor and clamps braid etc. necessary for the terminating, jointing of screen and sheath for earth continuity.

All heat shrinkable polymeric tubing and pre-moulded materials shall be ultra violet stable non-tracking (per ASTM D2302) and suitable for operation in the presence of severe external contamination and environmental pollution.

The entire termination or joints shall be environmentally sealed and capable of preventing the ingress of external moisture and contamination.

The external leakage insulation between high voltage conductor and ground as specified in IEEE 48 shall be non-tracking, erosion-resistant and weather resistant flexible sleeve.

The offered kit shall provide for total environmental sealing of the cable crotch and at the lug end. The exact dimensions of cables shall be furnished at the time of order.

The kit shall be complete in all respects, complete with all accessories, jointing material, insulating stress control and sealing material as well as the instruction booklet explaining method of using the kit.

Material used for construction of a termination shall perfectly match with the dielectric, chemical and physical characteristics of the associated cable. The material and design concepts shall incorporate high degree of operating compatibility between the cable and the termination. Stress grading system involving taping is not acceptable.

The bidder shall indicate the required net dimensions of the cable joints in the form of length, breadth and depth in millimeters.

The bidder shall specifically list the precautions to be observed while carrying out the termination to avoid any damage to the kit or cable or the personnel or installation. Detailed instructions with suitable illustrations shall be provided in an instruction booklet, which shall be furnished with each kit to enable proper execution of work at site.

#### **2.4 Information to be furnished**

- Detailed sectional views of the termination/ assembly, including environmental sealing of cable at both the lug and crutch ends.
- Detailed bill of material
- Type and routine test certificates.
- Instruction booklet
- Details of testing

#### **2.5 Technical documents to be furnished with the offer**

- Bidder shall furnish documentary evidence confirming requirements of volume resistivity and relative permittivity of the material of the stress control cones.
- Detailed sectional views of the termination/ assembly, including environmental sealing of cable at both the lug and crutch ends.
- Full details of the kit and its components.
- A copy of the booklet.
- Information required to be submitted with offer as per different clauses of the specification
- Type test certificates.
- The bidder shall furnish the detailed guaranteed technical particulars of the accessories like termination kit offered by them.



### 3 General Technical Requirements

Please refer **Section-3 "General technical Requirements of Specifications (GTR)"**



#### 4 Guaranteed Technical Particulars

To be furnished for each type and size of cable

| Sl. No | Description                                                                                          | UNIT | DATA |
|--------|------------------------------------------------------------------------------------------------------|------|------|
| 1      | Type of Kit                                                                                          |      |      |
| 2      | Applicable Standards for the termination and major raw materials                                     |      |      |
| 3      | Shelf Life of Kit                                                                                    |      |      |
| 4      | Design life of kit                                                                                   |      |      |
| 5      | Guaranteed life of kit                                                                               |      |      |
| 6      | Net Dimension of Kit                                                                                 |      |      |
| 7      | Net weight of kit                                                                                    |      |      |
| 8      | Craft sensitivity and reliability                                                                    |      |      |
| 9      | Time required for completing termination including preparation time                                  |      |      |
| 10     | Time required for energisation after completing the termination.                                     |      |      |
| 11     | Special storage requirements, if any, for ambient of upto 50°C                                       |      |      |
| 12     | Whether provision is made for<br>1) Stress relief<br>2) Track resistance<br>3) Sealing               |      |      |
| 13     | Whether any additional support is required for the termination?                                      |      |      |
| 14     | Details of site facilities including equipment required for carrying out installation of termination |      |      |
| 15     | Make and type of<br>1) Lugs<br>2) Glands/ Clamps provided with the kit                               |      |      |
| 16     | Creepage distance of outdoor kit                                                                     |      |      |
| 17     | Any other information                                                                                |      |      |



## 5 Technical Check List

### CHECK LIST FOR INFORMATION TO BE FURNISHED WITH OFFER RETURN THIS CHECKLIST AS PART OF THE OFFER DULY SIGNED

The offer may not be considered if the following information and this Checklist are not enclosed with the Offer.

| Sl. No. | Parameters                 | Data                                                                                                                                                                                                                                                                                                                           | Confirmation | Remarks |
|---------|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|---------|
| 1.      | Applicable Standards       | As per TS                                                                                                                                                                                                                                                                                                                      | Yes/No       |         |
| 2.      | Type of termination kit    | Heat Shrinkable type                                                                                                                                                                                                                                                                                                           | Yes/No       |         |
|         |                            | pre-moulded type cable                                                                                                                                                                                                                                                                                                         | Yes/No       |         |
| 3.      | Accessories                | Considered the following in offer<br>1) Crimping type cable lugs, including hardware for fastening the lug to the equipment terminal<br>2) Cable gland / cable clamping arrangement where ever required                                                                                                                        | Yes/No       |         |
| 4.      | Quantity & Variation       | Quoted as per Spec clause 1.2                                                                                                                                                                                                                                                                                                  | Yes          |         |
| 5.      | Technical parameters       | The offered cable termination kit meets cable requirement as per spec clause 1.3                                                                                                                                                                                                                                               | Yes          |         |
| 6.      | Type tests                 | Offered equipment is type testes as per relevant standard as per clause 1.4                                                                                                                                                                                                                                                    | Yes          |         |
| 14.     | Prequalifying Conditions   | Documentary proof against the Technical (Qualifying) requirements mentioned in clause 1.5 of section 1, has been attached along with offer.<br>Note: Bidder to ensure completeness of offer in this regard. No further communication regarding Qualifying requirement documentary proof is envisaged during tender evaluation. | Yes          |         |
| 15.     | Manufacturing quality plan | Bidder to confirm the manufacturing quality plan requirement as per clause 1.6                                                                                                                                                                                                                                                 | Confirmed    |         |
| 16.     | Technical requirements     | Bidder to confirm the Technical requirement as per clause 2.3                                                                                                                                                                                                                                                                  | Confirmed    |         |

1. **Clause No. 1.2 / 1.3 of GTC** - The tender is invited through e-Procurement System only. The bidder shall submit his response through bid submission to the tender on e-Procurement platform at <https://bhel.abcpocure.com>  
Vendors participating through this tender will necessarily have to buy Class-II/III Digital Signature Certificate (DSC) for Signing & Encryption (Required both digital signature certificate: Signing & Encryption) of bids issued by any of the valid Certifying Authorities (approved by Controller of Certifying Authorities) in India.
2. **Clause No. 1.7 of GTC** – For any technical clarification, please contact Sh. T. T. Reddy, Dy. Manager (TBEM) / Ms. Muneet Mehta, DGM (TBEM); Contact No. 0120-06748511/8518; e-mail: [ttreddy@bhel.in](mailto:ttreddy@bhel.in) / [muneet@bhel.in](mailto:muneet@bhel.in)
3. **Clause No. 1.8 of GTC** - For any commercial clarification, please contact Ms. Archana Kumari, Dy. Manager (TBMM) / Sh. A K Chowdhary, AGM (TBMM); Contact No. 0120-6748467 / 8129; e-mail: [archanak@bhel.in](mailto:archanak@bhel.in) / [akchowdhary@bhel.in](mailto:akchowdhary@bhel.in)
4. Delivery plan is **Immediate (For Ballia) & Jun 2020 (For Shamli)**. Bidder to submit best delivery plan in the activity schedule.
5. **Clause No. 34 of GTC** - Integrity Pact is Not Applicable.
6. Project Status: Domestic.
7. Permissible Technical Deviations: No permissible Technical Deviation has been envisaged.
8. Clause No. 7 - If no option is specified, by default option B shall be considered for confirmation.
9. **Clause No. 5 of GTC** -  
**For Ballia** - Guarantee period is required 18 months from the date of last delivery or up to 02/07/2021 whichever is later.  
**For Shamli** - Guarantee period is required 18 months from the date of last delivery or up to 16/01/2022 whichever is later.
10. **Clause No. 7 of GTC** - Option – B shall be considered. Validity period of BG is required as per Guarantee Clause mentioned above with claim period of 3 months extra over and above.
11. **Clause no. 13 of GTC (Liquidated Damage)** : In case of delay in execution of Purchase Order beyond the contractual delivery time, an amount of 0.5% of the total Purchase Order value for supply (excluding taxes and duties, freight & insurance as applicable) per week of delay or part thereof subject to a maximum of 10% of the total Purchase Order value for supply (excluding taxes and duties, freight & insurance as applicable) shall be deducted as Liquidated Damages (LD) along with applicable GST (if any) on LD. Other terms as per **General Terms and Condition** (GTC - BHEL/TBG/GTC/2016 Rev-1).
12. **Clause No. – 17 of GTC**: - Tender Evaluation - Comparative statement shall be prepared and evaluated on total cost basis at destination /site on overall quantity basis for both the projects. However, separate POs shall be placed project wise.
13. The link for Online Supplier registration Portal is <https://supplier.bhel.in/>.
14. **Clause No. 33 for Reverse Auction of NIT shall be as follows:**

“BHEL reserves the right to go for Reverse Auction (RA) (Guidelines as available on

www.bhel.com) instead of opening the sealed envelope price bid, submitted by the bidder. This will be decided after techno-commercial evaluation. Bidders to give their acceptance with the offer for participation in RA. Non-acceptance to participate in RA may result in non-consideration of their bids, in case BHEL decides to go for RA.

Those bidders who have given their acceptance to participate in Reverse Auction will have to necessarily submit 'Process compliance form' (to the designated service provider) as well as 'Online sealed bid' in the Reverse Auction. Non-submission of 'Process compliance form' or 'Online sealed bid' by the agreed bidder(s) will be considered as tampering of the tender process and will invite action by BHEL as per extant guidelines for suspension of business dealings with suppliers/ contractors (as available on www.bhel.com).

The bidders have to necessarily submit online sealed bid less than or equal to their envelope sealed price bid already submitted to BHEL along with the offer.

The envelope sealed price bid of successful L1 bidder in RA, if conducted, shall also be opened after RA and the order will be placed on lower of the two bids (RA closing price & envelope sealed price) thus obtained. The bidder having submitted this offer specifically agrees to this condition and undertakes to execute the contract on thus awarded rates.

If it is found that L1 bidder has quoted higher in online sealed bid in comparison to envelope sealed bid for any item(s), the bidder will be issued a warning letter to this effect. However, if the same bidder again defaults on this count in any subsequent tender in the unit, it will be considered as fraud and will invite action by BHEL as per extant guidelines for suspension of business dealings with suppliers/ contractors (as available on www.bhel.com)."

As a reminder to the bidders, system will flash following message (in RED Color) during the course of 'online sealed bid':

"Bidders to submit online sealed bid less than or equal to their envelope sealed bid already submitted to BHEL"

**In addition to above RA guidelines, bidder note that**

(A) In case where RA is conducted successfully Reverse auction shall be conducted as per existing procedure of BHEL. Ranking of bids shall be based on final price fed by respective bidder (including H1 bidder) in reverse auction process. If L1 bid is from a 'Local Supplier', L-1 bidder may be considered for further award of work. No other Bidder shall be invited to match price of L-1 Bidder.

If L1 bid is not from a 'Local Supplier', the lowest evaluated bidder among the 'Local Suppliers' based on the ranking of the price after RA, will be invited to match the L1 price provided 'Local Supplier's price is within the Margin of Purchase Preference i.e. +20% of L1 price. In case such local supplier agrees to match the price of L-1 Bidder, such local supplier may be considered for further award of work. In case such lowest eligible 'Local Supplier' fails to match the L1 price, the eligible 'Local Supplier' with the next higher bid within the Margin of Purchase Preference( i.e 20% of L-1 Price) as above shall be invited to match the



L1 price, and so on, and may be considered for award of work accordingly. In case none of the 'Local Suppliers' within the Margin of Purchase Preference (i.e 20% of L-1 price) matches the L1 price, then the L1 bidder may be considered for award of work.

(B) In case where RA is failed

Price bid shall be opened as per reverse auction procedure of BHEL and based on the same make in India policy shall be implemented.

**15. Pre-Qualification Criteria-**

**Technical** – As per clause no. 1.5 of Technical Specification.

**Commercial** : Vendor should be approved by customer UPPTCL and or / POWERGRID for required item.

The Bidder must ensure that they confirm the Pre-qualifying requirement.

BHEL Reserves the Right to reject any offer from Bidder in case of Non – Compliance to the Pre-qualifying criteria.

- 16. Offer of techno – commercially acceptable vendors shall be considered for Price Bid Opening / RA subject to their approval from Customer.
- 17. Endorsed LR is not required in GST regime.
- 18. Vendor to quote as per specified price format of NIT, otherwise their offer shall be liable to be rejected.

Following confirmation to be provided by vendor:

***“We confirm that we have quoted as per specified price format provided along with this tender”.***

**To promote Make in India as per govt. guideline following clause has been added:**

For this procurement, Public Procurement (Preference to Make in India), Order 2017 dated 15.06.2017 & 28.05.2018 and subsequent orders issued by the respective nodal ministry shall be applicable even if issued after issue of this NIT but before finalization of contract/PO/WO against this NIT.

Minimum local content in this tender shall be 50% and the margin of purchase preference shall be 20%. Bidder shall provide self-certification regarding local content in the prescribed format.

In the event of any Nodal Ministry prescribing higher or lower percentage of purchase preference and/ or local content in respect of this procurement, same shall be applicable.

Preference to Make in India will be as per the Public Procurement (Preference to Make in India), Order 2017 available in the following link:

[http://dipp.nic.in/sites/default/files/publicProcurement\\_MakeinIndia\\_15June2017.pdf](http://dipp.nic.in/sites/default/files/publicProcurement_MakeinIndia_15June2017.pdf)  
[http://dipp.nic.in/sites/default/files/Revised-PPP-MII-Order-2017\\_28052018.pdf](http://dipp.nic.in/sites/default/files/Revised-PPP-MII-Order-2017_28052018.pdf)

**It is mandatory for bidder to submit the enclosed format duly filled, signed and stamped by their authorized person.**

**IMPORTANT INSTRUCTION: -**

- Preference to Make in India will be as per the Public Procurement (Preference to Make in India), Order 2017
- The Notice Inviting Tender (NIT)/ the tender requirement of BHEL will not be henceforth published in newspapers. All the concerned are hereby notified that tender enquiries of BHEL will be published on BHEL tender website ([www.bhel.com](http://www.bhel.com)) and Government's Central Public Procurement Portal (<https://eprocure.gov.in/>).
- You are requested to kindly note and refer above website for tender of BHEL.
- Bidder to mention their works address below from where material will be supplied to Site.

Works Address- -----  
-----  
-----

**ALL OTHER TERMS AND CONDITIONS SHALL BE AS PER GTC Rev-1.**

**(Sign and seal of Bidder)**

Name:

Signature:

Stamp:

|                                        |                                   |
|----------------------------------------|-----------------------------------|
| Item Name :                            | CABLE TERMINATION KIT             |
| Enquiry No. :                          | 48G2000368 dated 19/12/2019       |
| Project :                              | UPPTCL Rasara (Ballia) and Shamli |
| Type of project                        | Transmission                      |
| Applicable percentage of Local Content | 50%                               |

**Format for Affidavit of Self certification regarding Minimum Local Content in line with PPP-MII order, 2017 if applicable, to be provided on a non-judicial stamp paper of Rs. 100/-.**

**Date: / /2019**

I \_\_\_\_\_ S/o, \_\_\_\_\_ D/o, \_\_\_\_\_ W/o, \_\_\_\_\_ Resident of \_\_\_\_\_ hereby solemnly affirm and declare as under:

That I will agree to abide by the terms and conditions of the Public Procurement (Preference to Make in India) Order, 2017 (*hereinafter PPP-MII order*) of Government of India issued vide Notification No:P-45021/2/2017 -BE-II dated 15/06/2017, its revision dated 28/05/2018 and any subsequent modifications/ Amendments, if any and

That the information furnished hereinafter is correct to the best of my knowledge and belief and I undertake to produce relevant records before the procuring entity/**BHEL** or any other Government authority for the purpose of assessing the local content of goods/services/works supplied by me for ..... (*Enter the name of the Equipment/Item for Project*).

That the local content for all inputs which constitute the said goods/services/works has been verified by me and I am responsible for the correctness of the claims made therein.

That the goods/services/works supplied by me for ..... (*Enter the name of the Equipment/Item for Project*) meets the 'Minimum Local Content' as defined in the PPP-MII order.

That the value addition for the purpose of meeting the 'Minimum Local Content' has been made by me at ..... (*Enter the details of the location(s) at which value addition is made*).

That in the event of the local content of the goods/services/works mentioned herein is found to be incorrect and not meeting the prescribed Minimum Local Content criteria, based on the assessment of procuring agency (ies)/**BHEL**/Government Authorities for the purpose of assessing the local content, action shall be taken against me in line with the PPP-MII order and provisions of the Integrity pact/ Bidding Documents.

I agree to maintain the following information in the Company's record for a period of 8 years and shall make this available for verification to any statutory authority.

- i Name and details of the Local Supplier  
(Registered Office, Manufacturing unit location, nature of legal entity)
- ii. Date on which this certificate is issued
- iii. Goods/services/works for which the certificate is produced
- iv. Procuring entity to whom the certificate is furnished
- v. Percentage of local content claimed and whether it meets the Minimum Local Content prescribed
- vi. Name and contact details of the unit of the Local Supplier (s)
- vii. Sale Price of the product
- viii Ex-Factory Price of the product
- ix. Freight, insurance and handling
- x. Total Bill of Material
- xi List and total cost value of input used to manufacture the Goods/to provide services/in construction of works
- xii. List and total cost of input which are domestically sourced. Value addition certificates from suppliers, if the input is not in-house to be attached
- xiii. List and cost of inputs which are imported, directly or indirectly

For and on behalf of..... (Name of firm/entity)

**Authorized signatory (To be duly authorized by the Board of Directors)**

<Insert Name, Designation and Contact No.>

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## **GENERAL TECHNICAL REQUIREMENTS OF SPECIFICATIONS (GTR)**

### **1.0 GENERAL**

This section stipulates the General Technical Requirements (GTR) under the Contract and will form an integral part of the Technical Specification.

The provisions under this section are intended to supplement general requirements for the materials, equipments and services covered under respective equipment sections and are not exclusive. However in case of conflict between the requirement specified in this section and requirements specified under respective equipment sections, the requirements specified under respective sections shall hold good.

Every effort will be made to supply all equipment as per the technical details furnished in the specification. However, due to the standard manufacturing practice of various equipment suppliers and depending on the selected vendor, there may be slight variations from indicated values at the contract stage. Such variations should not affect the quality and performance of the equipment.

It is not the intent to specify completely in technical specifications of equipments/ materials all details of the design and construction of equipment. However, the equipment shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation. The Purchaser will interpret the meaning of drawing and specification and shall have the power to reject any work or material which in his judgement is not in accordance therewith. The equipment offered shall be complete with all components necessary for its effective and trouble free operation. Such components shall be deemed to be within the scope of Bidder's supply, irrespective of whether these are specifically brought out in this specification and/or commercial order or not.

### **2.0 COMPLETENESS OF EQUIPMENTS**

**2.1** Equipments furnished shall be complete in every respect with all mountings, fittings, fixtures and standard accessories specified &/or normally provided with such equipment and/ or needed for erection, completion and safe operation of the equipment as required by applicable codes though they may not have been specifically detailed in the Technical Specifications. Materials and components not specifically stated in the specification but which are necessary for commissioning and satisfactory operation of the substation unless specifically excluded shall be deemed to be included in the scope of the specification and shall be supplied without any extra cost All similar standard components/ parts of similar standard equipment provided, shall be inter-changeable with one another.

**2.2** The Bidder shall supply type tested (including special test as per technical specification) equipments and materials. The test reports/details shall be furnished by the Bidder in the bid. In the event of any discrepancy in the test reports i.e. any test report not acceptable due to any design/manufacturing changes or due to non-compliance with the requirement stipulated in the Technical Specification and/or IEC/ IS, same, shall be carried out without any additional cost implication to the Purchaser. The Purchaser reserves the right to get any or all type tests conducted/ repeated.

The reports for all type tests and additional type tests as per technical specification furnished by the Bidder shall be of the tests conducted within last 05(five) years prior to the date of bid opening. The type tests conducted should have either been conducted in accredited laboratory (accredited based on ISO/ IEC Guide 25/ 17025 or EN 45001 by the national accreditation body of the country where laboratory is located) or witnessed by UPPTCL or representative authorized by UPPTCL or Utility or representative of accredited test lab or reputed consultant.

### **3.0 STANDARDS**

**3.1** Except as modified by this Bid specification, all material and equipment shall conform to the requirement of the latest editions of relevant ISS/ IEC and other applicable standards. The equipments/ works shall be designed, engineered, manufactured, built, tested and commissioned shall be carried out in accordance with the Acts, Rules, Laws and Regulations in force in India.

**3.2** In addition to meeting the specific requirements called for in the respective sections of the Technical Specification, the equipment shall also conform to the general requirement of the relevant standards which shall form an integral part of the specification. When the specific requirements stipulated in the specifications exceed or differ than those required by the applicable standards, the stipulation of the specification shall take precedence.

**3.3** In the event of the Bidder offering equipment conforming to standards other than ISS/IES standards, which ensure equivalent or better performance than that specified in the standards, the salient point of comparison between the standards adopted and relevant ISS/ IEC standards shall be indicated clearly in the proposal, along with English language version of such standard or relevant extract of the same. The equipment conforming to standards other than IS/IEC shall be subject to Purchaser's approval.

**3.4** The standards mentioned in the respective equipment specifications are not mutually exclusive or complete in themselves. The equipment &/or work shall also conform to any other applicable standard, even if not specifically mentioned in these specifications.

**3.5** Should the Bidder wish to depart from the provisions of the specifications, either on accounts of manufacturing practices or for any other reason, he shall clearly mention the departure and submit complete justification supported by information, drawings etc. as will enable to assess the suitability of equipment(s) offered. In the event of the Bidder's specifications, drawings, forms and tables etc. being found to disagree with the requirement of the Bid specifications at any stage, Bid specifications shall be binding, unless the departures have been duly approved in writing by the Purchaser.

### **3.6 REFERENCE OF STANDARDS**

| <b>Reference</b> | <b>Abbreviation</b>                        | <b>Name and Address</b>                                                                                |
|------------------|--------------------------------------------|--------------------------------------------------------------------------------------------------------|
| IEC/ CISPR       | International Electro technical Commission | Bureau Central de la Commission, Electro Technique International, 1 Rue de verembe Geneva, Switzerland |
| IS               | Indian Standards,                          | Bureau of Indian Standard, Manak Bhavan, 9, Bahadur Shah Zafar Marg, New Delhi-110 002, INDIA          |

|      |                                                 |                                                                                                         |
|------|-------------------------------------------------|---------------------------------------------------------------------------------------------------------|
| BS   | British Standards,                              | British Standards Institution, 101, Pentonville Road, N-19-ND UK                                        |
| ISO  | International Organization For Standardization, | Danish Board of Standardization Danish Standardising Sraat, Aurehoegvej-12, DK-2900, Heelstrup, DENMARK |
| NEMA | National Electric Manufacture Associate         | 115, East 44th Street, New York NY 10017 U.S.A                                                          |

#### 4.0 PROJECT DATA

|      |                                                                    |                           |
|------|--------------------------------------------------------------------|---------------------------|
| i.   | Location                                                           | UTTAR PRADESH             |
| ii.  | Altitude                                                           | not exceeding 1000 Meters |
| iii. | Climatic Conditions                                                |                           |
| (a)  | Design maximum ambient Air Temperature                             | 50 <sup>0</sup> C         |
| (b)  | Minimum ambient air temperature in shade                           | 0 <sup>0</sup> C          |
| (c)  | Relative Humidity                                                  | 100%Max.                  |
| (d)  | Wind Load                                                          | 195 Kg./ Sq.m.            |
| (e)  | Seismic Level                                                      | 0.3 g                     |
| (f)  | Isoceraunic Level                                                  | 50days/ year              |
| (g)  | Average annual rain fall                                           | 1200 mm                   |
| (h)  | Hot and humid tropical Climate conducive to rust and fungus growth |                           |

#### 5.0 SYSTEM PARTICULARS

|       |                                 |                                   |
|-------|---------------------------------|-----------------------------------|
| (i)   | Rated System voltage            | 420 kV, 245kV, 145kV, 36kV        |
| (ii)  | System frequency                | 50 Hz, This may vary by $\pm 5\%$ |
| (iii) | Number of phases                | Three                             |
| (iv)  | Neutral                         | Effectively Earthed               |
| (v)   | <b>Auxiliary power supply:-</b> |                                   |

Auxiliary electrical equipment shall be suitable for operation on the following supply system:

|     |                                                                                      |                                                             |
|-----|--------------------------------------------------------------------------------------|-------------------------------------------------------------|
| (a) | Power device (Like drive motors)                                                     | 400V, 3Phase, 4Wire 50Hz<br>Effectively earthed AC system.  |
| (b) | Lighting fixtures, space heaters, fractional Horse Power motors and control devices. | 250V, 2wire, 50Hz,<br>AC supply with one<br>point grounded. |
| (c) | DC alarm, Control and Protective Devices from sub station batteries as under         | 2wire ungrounded DC supplies                                |
|     | (i)                                                                                  | 400 kV S/S : 220V DC (ii)                                   |
|     |                                                                                      | 220/132kV S/S : 110V DC (iii)                               |
|     |                                                                                      | Communication : 48 V DC<br>equipment                        |



The above supply voltage is subject to variation as follows:

All devices must be suitable for a continuous operation over the entire range of voltage variations :

- (i) AC
  - Voltage may vary by  $\pm 10\%$ .
  - Frequency by  $\pm 5\%$
  - Combined Voltage & frequency by  $\pm 10\%$ .
- (ii) DC
  - a) 220 V may vary between 187 & 242 V
  - b) 110 V may vary between 93 & 121 V
  - c) 48 V may vary between 41 & 53 V

## 6.0 SYSTEM PARAMETERS

The following system parameters shall prevail:

| Sl. No. | Description of Parameters                                                                                                                                                              | 400 kV<br>System                                                              | 220 kV<br>System      | 132 kV<br>System      | 33 kV<br>System      |
|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|-----------------------|-----------------------|----------------------|
| 1.      | Nominal system voltage                                                                                                                                                                 | 4000kV                                                                        | 220kV                 | 132kV                 | 33kV                 |
| 2.      | Maximum operating voltage of the system(rms)                                                                                                                                           | 420kV                                                                         | 245kV                 | 145kV                 | 36kV                 |
| 3.      | Rated frequency                                                                                                                                                                        | 50Hz                                                                          | 50Hz                  | 50Hz                  | 50Hz                 |
| 4.      | No. of phase                                                                                                                                                                           | 3                                                                             | 3                     | 3                     | 3                    |
| 5.      | Rated short time current                                                                                                                                                               | 50 kA for<br>3 Sec.                                                           | 40 kA for 3<br>sec    | 31.5 kA for 3<br>sec  | 25 kA for 3<br>sec   |
| 6.      | Dry and wet one minute power frequency withstand voltage                                                                                                                               | 680 kV                                                                        | 460 kV                | 275 kV                | 95 kV                |
| 7.      | Dry and wet impulse withstand voltage positive and negative                                                                                                                            | 1550 kVp                                                                      | 1050 kVp              | 650 kVp               | 250 kVp              |
| 8.      | Corona extinction voltage                                                                                                                                                              | 320 kV                                                                        | 156 kV                | 105 kV                | -                    |
| 9.      | Max. Radio interference voltage for frequency between 0.5 MHz and 2 MHz at 508 kV rms for 765kV, 320kV rms for 400kV system and 156kV rms for 220kV system & 92kV rms for 132kV system | 1000<br>microvolt                                                             | 1000<br>microvolt     | 500<br>microvolt      | -                    |
| 10.     | Minimum total creepage                                                                                                                                                                 | 25mm/<br>kV<br>(10500 mm)                                                     | 25mm/ kV<br>(6125 mm) | 25mm /kV<br>(3625 mm) | 25mm/kV<br>(1300 mm) |
| 11.     | Min. clearances                                                                                                                                                                        |                                                                               |                       |                       |                      |
|         | i. Phase to phase                                                                                                                                                                      | 4000mm (for<br>Conductor-<br>conductor)<br>4200mm<br>(for rod -<br>Conductor) | 2100 mm               | 1300 mm               | 320 mm               |
|         | ii. Phase to earth                                                                                                                                                                     | 3500 mm                                                                       | 2100 mm               | 1300 mm               | 320 mm               |

|     |                           |                     |                     |                     |                     |
|-----|---------------------------|---------------------|---------------------|---------------------|---------------------|
|     | iii) Sectional clearances | 6500 mm             | 5000 mm             | 4000 mm             | 3000 mm             |
| 12. | System neutral earthing   | Effectively Earthed | Effectively Earthed | Effectively Earthed | Effectively Earthed |

Major technical parameters of bushings/ hollow column/ support insulators are given below:

| Sl. No | Parameters                                               | 400 kV System | 220 kV System | 132 kV System | 33 kV System |
|--------|----------------------------------------------------------|---------------|---------------|---------------|--------------|
| (a)    | Max. System voltage Um (kV)                              | 420           | 245           | 145           | 36           |
| (b)    | Impulse withstand voltage (dry & wet) (kVp)              | ± 1425        | ± 1050        | ± 650         | ±170         |
| (c)    | Switching surge withstand voltage (dry & wet) (kVp)      | 1050          | -             | -             | -            |
| (d)    | Power frequency withstand voltage (dry and wet) (kV rms) | 650           | 460           | 275           | 75           |
| (e)    | Total creepage distance(min) (mm)                        | 10500         | 6125          | 3625          | 900          |

Insulator shall also meet requirement of IEC- 815 for 420kV, 245kV, 145kV and 36kV systems, as applicable having alternate long and short sheds.

## 7.0 SERVICES TO BE PERFORMED BY THE EQUIPMENT

All equipments shall perform satisfactorily under various electrical, electromechanical and meteorological conditions of the installation site.

All equipment shall be able to withstand all external and internal mechanical thermal and electromechanical forces due to various factors like wind load temperature variation, ice & snow (wherever applicable) short circuit etc for the equipment.

The Bidder shall design the various forces which the terminal connectors of the equipment are required to withstand.

All outdoor EHV equipments except marshalling kiosks shall be suitable for hot line washing.

To facilitate erection of equipment, all items to be assembled at site shall be "match marked".

## 8.0 CLAMPS AND CONNECTORS INCLUDING TERMINAL CONNECTORS

**8.1** Each equipment shall be supplied with necessary terminals and connectors as required by the design for the particular installation. The terminal connector shall be suitable for the conductor used for particular installation, which are as under as per UPPTCL's practice:

**8.2** Where copper to aluminum connections are required, bimetallic clamps shall be used, which shall be properly designed to ensure that any deterioration of the connection is kept to a minimum and restricted to part which are not current carrying or subjected to stress. The design details of the joint shall be furnished to the Purchaser by the Bidder.

- 8.3** Low voltage connectors, grounding connectors and accessories for grounding all equipment are also included in the scope of work.
- 8.4** No current carrying part of any clamp shall be less than 10 mm thick. All ferrous parts shall be hot dip galvanized. Copper alloy liner of minimum 2 mm thickness shall be used with aluminum body for Bimetallic clamps.
- 8.5** All casting shall be free from blow holes, surface blisters cracks and cavities. Sharp edges and corners shall be blurred and rounded off.
- 8.6** Flexible connectors, braids or laminated straps made for the terminal clamps for bus posts shall be suitable for both expansion or through (fixed/sliding) type connection of 4" IPS AL. tube as required. In both the cases the clamp height (top of the mounting pad to centre line of the tube) should be same.
- 8.7** The clamps/ connectors shall be designed to carry the same current as the conductor and the temperature rise shall be equal or less than that of the conductor at the specified ambient temperature. The rated current for which the clamp/ connector is designed with respect to specified reference ambient temperature, shall also be indelibly marked on each component of the clamp/connector, except on hardware.
- 8.8** All current carrying parts shall be designed and manufactured to have minimum contact resistant.
- 8.9** Clamps and connectors shall be designed to be corona controlled. Corona extinction voltage for 420kV, 220kV and 132kV class clamps shall not be less than 320, 156 and 105kV (rms) respectively and R.I.V. level shall not be more than specified 1000, 1000 and 500 micro volts for 420kV, 220kV and 132kV system at the test voltage specified.

## **9.0 SUPPORT STRUCTURES**

- 9.1** The base design of all the equipments, to be installed on auxiliary structures, shall conform to the standard auxiliary structure designs presently being used in UPPTCL at 400/220/132/33kV Substations.
- 9.2** All equipment support structures shall be supplied alongwith brackets, angles, stools etc. for attaching the operating mechanism, control cabinets and marshalling box (wherever applicable) etc.
- 9.3** The support structures should be hot dip galvanised with minimum 610 gram/sq.m net of zinc.

## **10.0 COLOUR SCHEME AND CODES FOR PIPE SERVICE**

The Bidder shall propose a colour scheme for the those equipments/ items for which the colour scheme has not been specified in the specification. For the approval of purchaser. The decision of Purchaser shall be final. The scheme shall include.

Finishing colour of Indoor equipment.

Finishing colour of Outdoor equipment.

Finish colour of all cubicles.

Finishing colour of various auxiliary system equipment including piping

Finishing colour of various building items.

All steel structures, plates etc. shall be painted with non-corrosive paint with a suitable primer. It may be noted that normally all electrical equipments in switchyard are painted with shade 631 of IS-5. The indoor cubicles, GIS enclosures and other miscellaneous items, the colour scheme shall be approved by the Purchaser during detailed engineering.

## **11.0 MATERIAL/ WORKMANSHIP**

### **11.1 General Requirement**

Where the specification does not contain references to workmanship, equipment, materials and components of the covered equipment, it is understood that the same must be new, of highest grade of the best quality of their kind, conforming to best engineering practice and suitable for the purpose for which they are intended.

The design of the works shall be such that installation, future expansions, replacements and general maintenance may be undertaken with a minimum of time and expenses. Each component shall be designed to be consistent with its duty and suitable factors of safety, subject to mutual agreements. All joints and fastenings shall be devised, constructed and documented so that the component parts shall be accurately positioned and restrained to fulfill their required function. In general screw threads shall be standard metric threads. The use of other thread forms will only be permitted when prior approval has been obtained from the Purchaser.

Whenever possible, all similar part of the Works shall be made to gauge and shall also be made interchangeable with similar parts. All spare parts shall also be interchangeable and shall be made of the same materials and workmanship as the corresponding parts of the Equipment supplied under the Specification. Where feasible, common component units shall be employed in different pieces of equipment in order to minimize spare parts stocking requirements. All equipment of the same type and rating shall be physically and electrically interchangeable.

All materials and equipment shall be installed in strict accordance with the manufacturer's recommendation(s). Only first-class work in accordance with the best modern practices will be accepted. Installation shall be considered as being the erection of equipment at its permanent location. This, unless otherwise specified, shall include unpacking, cleaning and lifting into position, grouting, leveling, aligning, coupling of or bolting down to previously installed equipment bases/foundations, performing the alignment check and final adjustment prior to initial operation, testing and commissioning in accordance with the manufacturer's tolerances, instructions and the Specification. All factory assembled rotating machinery shall be checked for alignment and adjustments made as necessary to re-establish the manufacturer's limits. Suitable guards shall be provided for the protection of personnel on all exposed rotating and/or moving machine parts and shall be designed for easy installation and removal for maintenance purposes. The spare equipment(s) shall be installed at designated locations and tested for healthiness.

The Bidder shall apply oil and grease of the proper specification to suit the machinery, as is

necessary for the installation of the equipment. Lubricants used for installation purposes shall be drained out and the system flushed through where necessary for applying the lubricant required for operation. The Bidder shall apply all operational lubricants to the equipment installed by him.

All oil, grease and other consumables used in the Works/ Equipment shall be purchased in India unless the Bidder has any special requirement for the specific application of a type of oil or grease not available in India. In such is the case he shall declare in the proposal, where such oil or grease is available. He shall help Purchaser in establishing equivalent Indian make and Indian Contractor. The same shall be applicable to other consumables too.

A cast iron or welded steel base plate shall be provided for all rotating equipment which are to be installed on a concrete base unless otherwise agreed to by the Purchaser. Each base plate shall support the unit and its drive assembly, shall be of design with pads for anchoring the units and shall have a raised up all around and shall have threaded in air connections, of so required.

## **11.2 PROVISIONS FOR EXPOSURE TO HOT AND HUMID CLIMATE**

Outdoor equipment supplied under the specification shall be suitable for service and storage under tropical conditions of high temperature, high humidity, heavy rainfall and environment favourable to the growth of fungi and mildew. The indoor equipments located in non-air conditioned areas shall also be of same type.

## **12.0 SPACE HEATERS**

The heaters shall be suitable for continuous operation at 240V AC supply. On-off switch and fuse shall be provided for the heater.

One or more adequately rated thermostatically connected heaters shall be supplied to prevent condensation in any compartment. The heaters shall be installed in the lower portion of the compartment and electrical connections shall be made sufficiently away from below the heaters to minimize deterioration of supply wire insulation. The heaters shall be suitable to maintain the compartment temperature to prevent condensation.

The heaters shall be suitably designed to prevent any contact between the heater wire and the air and shall consist of coiled resistance wire centered in a metal sheath and completely encased in a highly compacted powder of magnesium oxide or other material having equal heat conduction and electrical insulation properties, or they shall consist of resistance wire wound on a ceramic and completely covered with a ceramic material to prevent any contact between the wire and the air. Alternatively, they shall consist of a resistance wire mounted into a tubular ceramic body built into an envelope of stainless steel or the resistance wire is wound on a tubular ceramic body and embedded in glaze. The surface temperature of the heaters shall be restricted to a value which will not shorten the life of the heater sheaths or that of insulator wire or other component in the compartments.

## **13.0 FUNGI STATIC VARNISH**

Besides the space heaters, special moisture and fungus resistant varnish shall be applied on parts which may be subjected or predisposed to the formation of fungi due to the presence or deposit of nutrient substances. The varnish shall not be applied to any surface of part where

the treatment will interface with the operation or performance of the equipment. Such surfaces or parts shall be protected against the application of the varnish.

#### **14.0 VENTILATION OPENING**

In order to ensure adequate ventilation, compartments shall have ventilation openings provided with fine wire mesh of brass to prevent the entry of insects and to reduce to a minimum the entry of dirt and dust. Outdoor compartment openings shall be provided with shutter type blinds and suitable provision shall be made so as to avoid any communication of air/ dust with any part in the enclosures of the Control Cabinets, Junction boxes and Marshalling Boxes, panels etc.

#### **15.0 DEGREE OF PROTECTION**

The enclosures of the Control Cabinets, junction boxes and Marshalling Boxes, panels etc. to be installed shall be provided with degree of protection as detailed here under:

- a) Installed out door : IP-55
- b) Installed indoor in air conditioned area : IP-31
- c) Installed in covered area : IP -52
- d) Installed indoor in non air-conditioned area where possibility of entry of water is limited: IP-41
- e) For LT Switchgear (AC & DC distribution Boards): IP-52

The degree of protection shall be in accordance with :13947 (Part-I)/ IEC-60947 (Part-I)/ IS 12063 / IEC-60529. Type test report for degree of protection test, on each type of the box shall be submitted for approval.

#### **16.0 RATING PLATES, NAME PLATES AND LABELS**

Each main and auxiliary item of substation is to have permanently attached to it in a conspicuous position a rating plate of non-corrosive material upon which is to be engraved manufacturer's name, year of manufacture, equipment name, type or serial number together with details of the loading conditions under which the item of substation in question has been designed to operate, and such diagram plates as may be required by the Purchaser. The rating plate of each equipment shall be according to IEC requirement.

All such nameplates, instructions plates, rating plates CB, CT, VT, SA, Isolators and Relay & Protection panels equipments shall be bilingual with Hindi inscription first followed by English. Alternatively two separate plates one with Hindi and the other with English inscriptions may be provided.

#### **17.0 FIRST FILL OF CONSUMABLES, OIL AND LUBRICANTS**

All the first fill of consumables such as oils, lubricants, filling compounds, touch up paints, soldering/brazing material for all copper piping of circuit breakers and essential chemicals etc. which will be required to put the equipment, covered under the scope of the specifications, into successful operation, shall be furnished by the Bidder unless specifically excluded under

the exclusions in these specifications and documents.

## **18.0 PACKAGING AND PROTECTION**

All the equipments shall be suitably protected, coated, covered or boxed and crated to prevent damage or deterioration during transit, handling and storage at site till the time of erection. The Bidder shall also submit packing details/associated drawing for any equipment/material, to facilitate the Purchaser to repack any equipment/material at a later date. The Bidder shall be responsible for any loss or damage during transportation, handling and storage due to improper packing. Any demurrage, wharfage and other such charges claimed by the transporters, railways etc. shall be to the account of the Bidder.

All coated surfaces shall be protected against abrasion, impact, discolouration and any other damages. All exposed threaded portions shall be suitably protected with either a metallic or a non-metallic protectin device. All ends of all valves and pipings and conduit equipment connections shall be properly sealed with suitable devices to protect them from damage. The parts which are likely to get rusted, due to exposure to weather should also be properly treated and protected in a suitable manner.

## **19.0 SURFACE FINISH**

All interiors and exteriors of tanks, control cubicles and other metal parts shall be thoroughly cleaned to remove all rust, scales, corrosion, greases or other adhering foreign matter. All steel surfaces in contact with insulating oil as far as accessible shall be painted with not less than two coats of heat resistant, oil insoluble, insulating paints.

All metal surfaces exposed to atmosphere shall be given two primer coats of zinc chromate and two coats of epoxy paint with epoxy base thinner. All metal parts not accessible for painting shall be made of corrosion resisting material. All machine finished or bright surfaces shall be coated with a suitable preventive compound and suitably wrapped or otherwise protected. All paints shall be carefully selected to withstand tropical heat and extremes of weather within the limit specified. The paint shall not scale off or wrinkle or be removed by abrasion due to normal handling.

All external painting shall be as per shade No. 631 of IS: 5.

## **20.0 HOT DIP GALVANISING**

All ferrous parts including all sizes of nuts, bolts, plain and spring washers, support channels, structures, shall be hot dip galvanized conforming to latest version of IS: 2629 or any other equivalent authoritative standard. However, hardware less than M12 size shall be electro-galvanized. Minimum weight of zinc coating shall be 610 gm/ sq.mm and minimum thickness of coating shall be 85 microns for all items thicker than 6 mm. For items lower than 6mm thickness, requirement of coating shall be as per relevant ASTM. For surface which shall be embedded in concrete, the zinc coating shall be 610 gm/sq. m minimum.

The galvanized surfaces shall have a continuous and uniform thick coating of zinc, firmly adhering to the surface of steel. The finished surface shall be clean and smooth and shall be free from defects like discoloured patches, bare spots, unevenness of coating, spelter which is loosely attached to the steel globules, spiky deposits, blistered surface, flaking or peeling off,

etc. The presence of any of these defects noticed on visual or microscopic inspection shall render the material liable to rejection.

After galvanizing, no drilling or welding shall be performed on the galvanized parts of the equipment excepting that nuts may be threaded after galvanizing. Sodium dichromate treatment shall be provided to avoid formation of white rust after hot dip galvanization.

Galvanised material must be transported properly to ensure that galvanised surfaces are not damaged during transit. Application of zinc rich paint at site shall not be allowed.

## **21.0 PROTECTIVE GUARDS**

Suitable guards shall be provided for protection of personnel on all exposed rotation and/of moving machine parts. All such guards with necessary spares and accessories shall be designed for easy installation and removal for maintenance purpose.

## **22.0 TOOLS AND TACKLES**

The Bidder shall supply with the equipment one complete set of all special tools and tackles for the erection, assembly, dis-assembly and maintenance of the equipment. However, these tools and tackles shall be separately packed and brought on to site.

## **23.0 CONTROL CABINETS, JUNCTION BOXES, TERMINAL BOXES AND MARSHALLING BOXES FOR OUTDOOR EQUIPMENT**

- 23.1** All types of boxes, cabinets etc. shall generally conform to and be tested in accordance with IS-5039/ IS-8623, IEC-60439, as applicable, and the clauses given below.
- 23.2** Control cabinets, junction boxes, marshalling boxes and terminal boxes shall be made of sheet steel or aluminum enclosure and shall be dust, water and vermin proof. Sheet steel used shall be at least 2.0 mm thick cold rolled or 2.5 mm hot rolled. The box shall be properly braced to prevent wobbling. There shall be sufficient reinforcement to provide level surfaces, resistance to vibrations and rigidity during transportation and installation. In case of aluminum enclosed box, the thickness of aluminum shall be such that it provides adequate rigidity and long life as comparable with sheet steel of specified thickness.
- 23.3** Cabinet/boxes shall be free standing floor mounting type, wall mounting type or pedestal mounting type as per requirements. A canopy and sealing arrangements for operating rods shall be provided in marshalling boxes/ Control cabinets to prevent ingress of rain water.
- 23.4** Cabinet/boxes shall be provided with double hinged doors with padlocking arrangements. The distance between two hinges shall be adequate to ensure uniform sealing pressure against atmosphere. The quality of the gasket shall be such that it does not get damaged/cracked during the operation of the equipment.
- 23.5** All doors, removable covers and plates shall be provided gasket all around with suitably profiled EPDM/Neoprene gaskets. The gasket shall be tested in accordance with approved quality plan, IS:11149 and IS:3400. The quality of gasket shall be such that it does not get damaged/cracked during 10(ten) years of operation of the equipment or its major overhaul whichever is earlier. All gasketed surfaces shall be smooth straight and reinforced if necessary to minimize distortion



and to make a tight seal. Ventilating Louvers, if provided, shall have screen and filters, the screen shall be fine wire mesh made of brass.

**23.6** All boxes/ cabinets shall be designed for the entry of cables from bottom by means of weather proof and dust-proof connections. Boxes and cabinets shall be designed with generous clearances to avoid interference between the wiring entering from below and any terminal blocks or accessories mounted within the box or cabinet. Suitable cable gland plate projecting at least 150 mm above the base of the marshalling kiosk/box shall be provided for this purpose along with the proper blanking plates. Necessary number of cable glands shall be supplied and fitted on this gland plate. Gland plate shall have provision for some future glands to be provided later, if required.

**23.7** A 240V, single phase, 50 Hz, 15 amp AC plug and socket shall be provided in the cabinet with ON-OFF switch for connection of hand lamps. Plug and socket shall be of industrial grade.

**23.8** For illumination, a 20 Watts fluorescent tube or 15 watts CFL/LED bulb shall be provided. The switching of the fittings shall be controlled by the door switch.

For junction boxes of smaller sizes such as lighting junction box, manual operated earth switch mechanism box etc., plug socket, heater and illumination is not required to be provided.

**23.9** All control switches shall be of rotary type. Toggle piano switches shall not be accepted.

**23.10** Positive earthing of the cabinet shall be ensured by providing two separate earthing pads. The earth wire/ strip shall be terminated on to the earthing pad and secured by the use of self etching washer. Earthing of hinged door shall be done by using a separate earth wire.

**23.11** The bay marshalling kiosks shall be provided with danger plate and a diagram showing the numbering/connection/ earthing by pasting the same on the inside of the door.

**23.12** a) The following routine tests alongwith the routine tests as per IS: 5039 shall also be conducted.

Check for wiring  
Visual and dimension check

b) The enclosure of bay marshalling kiosk, junction box, terminal box shall be type tested for IP-55 as per IS: 13947. After IP-55 test, 2.5 kVrms for 1 (one) minute, insulation resistance and functional test should be conducted.

**23.13 Auxiliary Switches**

All the auxiliary switches shall be fully type tested as per relevant IS.

The following type test reports on auxiliary switches shall be submitted:

(a) Electrical endurance test - A minimum of 2000 operation for 2A D. C. with a time constant greater than or equal to 20 millisecond with a subsequent examination of mV drop/visual defects/temperature rise test.

- (b) Mechanical endurance test. A minimum of 1,00,000 operations with a subsequent checking of contact pressure test/visual examination.
- (c) Heat run test on contacts.
- (d) IR/HV test etc.

## **24.0 TERMINAL BLOCKS AND WIRING**

- 24.1** Control and instrument leads from the switchboards or from other equipment will be brought to terminal boxes or control cabinets in conduits. All interphase and external connections to equipment or to control cubicles will be made through terminal blocks.
- 24.2** Terminal blocks shall be 1100 V grade and have continuous rating to carry the maximum expected current on the terminals. These shall be of moulded piece, complete with insulated/barriers stud type terminals, washers, nuts and lock nuts. Screw clamp, overall insulated, insertion type, rail mounted terminals can be used in place of stud type terminals. But preferably the terminal blocks shall be non-disconnecting stud type of Elmex type CATM4, phoenix cage clamp type or equivalent. The insulating material of terminal block shall be nylon 6.6 which shall be free of halogens, fluorocarbons etc.
- 24.3** Terminal blocks for current transformer and voltage transformer secondary leads shall be provided with test links and isolating facilities. The current transformer secondary leads shall also be provided with short circuiting and earthing facilities.
- 24.4** The terminals shall be such that maximum contact area is achieved when a cable is terminated. The terminal shall have a locking characteristic to prevent cable from escaping from the terminal clamp unless it is done intentionally.
- 24.5** The conducting part in contact with cable shall preferably be tinned or silver plated, however Nickel plated copper or zinc plated steel shall also be acceptable.
- 24.6** The terminal blocks shall be of extensible design.
- 24.7** The terminal blocks shall have locking arrangement to prevent its escape from the mounting rails.
- 24.8** The terminal blocks shall be fully enclosed with removable covers of transparent, non-deterioration type plastic material. Insulating barriers shall be provided between the terminal blocks. These barriers shall not hinder the operator from carrying out the wiring without removing the barriers.
- 24.9** Unless otherwise specified terminal blocks shall be suitable for connecting the following conductors on each side.
- |    |                                 |                                                 |
|----|---------------------------------|-------------------------------------------------|
| a) | All circuits except CT circuits | Minimum of 2 nos. of 2.5 sq. mm copper flexible |
| b) | All CT circuits                 | Minimum of 4 nos. of 2.5 sq.mm copper flexible  |
- 24.10** The arrangements shall be in such a manner so that it is possible to safely connect or disconnect terminals on live circuits and replace fuse links when the cabinet is live.

- 24.11** At least 20% spare terminals shall be provided on each panel/cubicle/box and these spare terminals shall be uniformly distributed on all terminal rows.
- 24.12** There shall be minimum clearance of 250 mm between the first bottom row of terminal block and the associated cable gland plate. Also the clearance between two rows of terminal blocks shall be a minimum of 150 mm.
- 24.13** The Bidder shall furnish all wire, conduits and terminals for the necessary interphase electrical connections (where applicable) as well as between phases and common terminal boxes or control cabinets.
- 24.14** All input and output terminals of each control cubicle shall be tested for surge withstand capability in accordance with the relevant IEC Publications, in both longitudinal and transverse modes. The Bidder shall also provide necessary filtering, surge protection, interface relays and any other measures necessary to achieve an impulse withstand level at the cable interfaces of the equipment.

## **25.0 LAMPS AND SOCKETS**

### **25.1 Lamps**

All incandescent lamps shall use a socket base as per IS-1258, except in the case of signal lamps.

### **25.2 Sockets**

All sockets (convenience outlets) shall be suitable to accept both 5 Amp & 15 Amp pin round Standard Indian plugs. They shall be switched sockets with shutters.

### **25.3 Hand Lamp**

A 240 Volts, single Phase, 50 Hz AC plug point shall be provided in the interior of each cubicle with ON- OFF Switch for connection of hand lamps.

### **25.4 Switches and Fuses**

Each panel shall be provided with necessary arrangements for receiving, distributing, isolating and fusing of DC and AC supplies for various control, signalling, lighting and space heater circuits. The incoming and sub-circuits shall be separately provided with miniature circuit breaker/ switchfuse units. Selection of the main and Sub-circuit fuse ratings shall be such as to ensure selective clearance of sub-circuit faults. Potential circuits for relaying and metering shall be protected by HRC fuses.

All fuses shall be of HRC cartridge type conforming to IS-9228 mounted on plug-in type fuse bases. Miniature circuit breakers with thermal protection and alarm contacts will also be accepted. All accessible live connection to fuse bases shall be adequately shrouded. Fuses shall have operation indicators for indicating blown fuse condition. Fuse carrier base shall have imprints to the fuse rating and voltage. All control switches shall be of rotary type. Toggle piano switches shall not be accepted.

**26.0 BUSHINGS, HOLLOW COLUMN INSULATORS, SUPPORT INSULATORS**

**26.1** Bushings shall be manufactured and tested in accordance with IS: 2099 & IEC-60137 while hollow column insulators shall be manufactured and tested in accordance with IEC-62155/IS:5621. The support insulators shall be manufactured and tested as per IS:2544/IEC-60168 and IEC-60273. The insulators shall also conform to IEC-60815 as applicable.

The bidder may also offer composite silicon rubber insulator, conforming to IEC-61462.

**26.2** Support insulators, bushings and hollow column insulators shall be manufactured from high quality porcelain. Porcelain used shall be homogeneous, free from laminations, cavities and other flaws or imperfections that might affect the mechanical or dielectric quality and shall be thoroughly vitrified tough and impervious to moisture.

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

**26.4** Support insulators/bushings/hollow column insulators shall be designed to have ample insulation, mechanical strength and rigidity for the conditions under which they will be used.

**26.5** When operating at normal rated voltage there shall be no electric discharge between the conductors and bushing which would cause corrosion or injury to conductors, insulators or supports by the formation of substances produced by chemical action. No radio interference shall be caused by the insulators/bushings when operating at the normal rated voltage.

**26.6** Bushing porcelain shall be robust and capable of withstanding the internal pressures likely to occur in service. The design and location of clamps and the shape and the strength of the porcelain flange securing the bushing to the tank shall be such that there is no risk of fracture. All portions of the assembled porcelain enclosures and supports other than gaskets, which may in any way be exposed to the atmosphere shall be composed of completely non hygroscopic material such as metal or glazed porcelain.

**26.7** All iron parts shall be hot dip galvanised and all joints shall be air tight. Surface of joints shall be trued up porcelain parts by grinding and metal parts by machining. Insulator/bushing design shall be such as to ensure a uniform compressive pressure on the joints.

**26.8 Tests**

In bushing, hollow column insulators and support insulators shall conform to type tests and shall be subjected to routine tests in accordance with IS: 2099 & IS: 2544 & IS : 5621.

**27.0 MOTORS**

Motors shall be "Squirrel Cage" three phase induction motors of sufficient size capable of satisfactory operation for the application and duty as required for the driven equipment and shall be subjected to routine tests as per applicable standards. The motors shall be of approved make.

**27.1 Enclosures**

- a) Motors to be installed outdoor without enclosure shall have hose proof enclosure equivalent to IP-55 as per IS: 4691. For motors to be installed indoor i.e. inside a box, the motor enclosure, shall be dust proof equivalent to IP-44 as per IS: 4691.
- b) Two independent earthing points shall be provided on opposite sides of the motor for bolted connection of earthing conductor.
- c) Motors shall have drain plugs so located that they will drain water resulting from condensation or other causes from all pockets in the motor casing.
- d) Motors weighing more than 25 Kg. shall be provided with eyebolts, lugs or other means to facilitate lifting.

## **27.2 Operational Features**

- a) Continuous motor rating (name plate rating) shall be at least ten (10) percent above the maximum load demand of the driven equipment at design duty point and the motor shall not be over loaded at any operating point of driven equipment that will rise in service.
- b) Motor shall be capable at giving rated output without reduction in the expected life span when operated continuously in the system.

## **27.3 Starting Requirements**

- a) All induction motors shall be suitable for full voltage direct-on-line starting. These shall be capable of starting and accelerating to the rated speed alongwith the driven equipment without exceeding the acceptable winding temperature even when the supply voltage drops down to 80% of the rated voltage.
- b) Motors shall be capable of withstanding the electrodynamic stresses and heating imposed if it is started at a voltage of 110% of the rated value.
- c) The locked rotor current shall not exceed six (6) times the rated full load current for all motors, subject to tolerance as given in IS:325.
- d) Motors when started with the driven equipment imposing full starting torque under the supply voltage conditions specified, shall be capable of withstanding atleast two successive starts from cold condition at room temperature and one start from hot condition without injurious heating of winding. The motors shall also be suitable for three equally spread starts per hour under the above referred supply condition.
- e) The locked rotor withstand time under hot condition at 110% of rated voltage shall be more than starting time with the driven equipment of minimum permissible voltage by at least two seconds or 15% of the accelerating time whichever is greater. In case it is not possible to meet the above requirement, the Bidder shall offer centrifugal type speed switch mounted on the motor shaft which shall remain closed for speed lower than 20% and open for speeds above 20% of the rated speed. The speed switch shall be capable of withstanding 120% of the rated speed in either direction of rotation.

## **27.4 Running Requirements**

- a) The maximum permissible temperature rise over the ambient temperature of 50 degree C shall be within the limits specified in IS:325 (for 3 - phase induction motors) after adjustment due to increased ambient temperature specified.
- b) The double amplitude of motor vibration shall be within the limits specified in IS: 4729.

Vibration shall also be within the limits specified by the relevant standard for the driven equipment when measured at the motor bearings.

- c) All the induction motors shall be capable of running at 80% of rated voltage for a period of 5 minutes with rated load commencing from hot condition.

## 27.5 TESTING AND COMMISSIONING

The Bidder shall conduct following tests alongwith list of instruments and calibration certificates to the Purchaser. If any additional test is required the same shall be conducted without any extra cost to the Purchaser.

- (a) Insulation resistance.
- (b) Phase sequence and proper direction of rotation.
- (c) Any motor operating incorrectly shall be checked to determine the cause and the conditions corrected.

## 28.0 TECHNICAL REQUIREMENT OF EQUIPMENTS

### 28.1 Circuit Breakers (Applicable for 400kV, 220kV & 132 kV)

- 28.1.(i) The manufacturer(s) whose SF6 Circuit Breaker are offered should have designed, manufactured tested as per IEC/IS or equivalent standard supplied the same for the specified system voltage and **40kA/ 50kA fault level or above class** which are in satisfactory operation for at least 2 (two) years as on the date of bid opening

Or

- 28.1.(ii)(a) The manufacturer(s) whose SF6 Circuit Breaker are offered who have recently established production line in India for the specified system voltage or above class, based on technological support of a parent company or collaborator for the respective equipment(s) can also be considered provided the parent company (Principal) or collaborator meets qualifying requirements stipulated under clause no 28.1.(i) given above.

And

- 28.1.(ii)(b) Furnishes (jointly with parent company or collaborator) a legally enforceable undertaking to guarantee quality, timely supply, performance and warranty obligations as specified for the equipment(s)

And

- 28.1.(ii)(c) Furnishes a confirmation letter from the parent company or collaborator along with the bid stating that parent company or collaborator shall furnish performance guarantee for an amount of 10% of the cost of such equipment(s). This performance guarantee shall be in addition to contract performance guarantee to be submitted by the Bidder

### 28.2 Isolators (Applicable for 400kV, 220kV & 132kV)

- 28.2.(i) The manufacturer whose isolator are offered, should have designed, manufactured & tested as per IS/IEC or equivalent standard and supplied the isolator for the specified system voltage and **40kA/ 50kA fault level or above class** and should be in satisfactory operation for at least 2 (two) years as on the date of bid opening

Or

- 28.2.(ii)(a) The manufacturer(s) whose Isolator are offered who have recently established production line in India for the specified system voltage or above class, based on technological support of a

parent company or collaborator for the respective equipment(s) can also be considered provided the parent company (Principal) or collaborator meets qualifying requirements stipulated under clause no 28.2.(i) given above.

And

- 28.2.(ii)(b) Furnishes (jointly with parent company or collaborator) a legally enforceable undertaking to guarantee quality, timely supply, performance and warranty obligations as specified for the equipment(s)

And

- 28.2.(ii)(c) Furnishes a confirmation letter from the parent company or collaborator along with the bid stating that parent company or collaborator shall furnish performance guarantee for an amount of 10% of the cost of such equipment(s). This performance guarantee shall be in addition to contract performance guarantee to be submitted by the Bidder

### **28.3 Instrument Transformers (Applicable for 400kV, 220kV & 132kV)**

- 28.3.(i) The manufacturer whose instrument transformers are offered, should have designed, manufactured & tested as per IS/IEC or equivalent standard and supplied the same for the specified system voltage for CT & VT and 40kA/ 50kA fault level or above class. These equipment should be in satisfactory operation for at least 2 (two) years as on the date of bid opening

Or

- 28.3.(ii)(a) The manufacturer(s) whose Instrument Transformer are offered who have recently established production line in India for the specified system voltage or above class, based on technological support of a parent company or collaborator for the respective equipment(s) can also be considered provided the parent company (Principal) or collaborator meets qualifying requirements stipulated under clause no 28.3.(i) given above.

And

- 28.3.(ii)(b) Furnishes (jointly with parent company or collaborator) a legally enforceable undertaking to guarantee quality, timely supply, performance and warranty obligations as specified for the equipment(s)

And

- 28.3.(ii)(c) Furnishes a confirmation letter from the parent company or collaborator alongwith the bid stating that parent company or collaborator shall furnish performance guarantee for an amount of 10% of the cost of such equipment(s). This performance guarantee shall be in addition to contract performance guarantee to be submitted by the Bidder

### **28.4 Surge Arresters (Applicable for 400kV, 220kV & 132kV)**

- (a) The manufacturer whose Surge Arresters are offered should have designed, manufactured and tested as per IEC/IS or equivalent standard and supplied the Surge Arrester for the specified energy capability with rated system voltage and which are in satisfactory operation for at least 2 (two) years as on the date of bid opening.

Or

- (b) The manufacturer(s) whose Surge Arrestors are offered who have recently established production line in India for the specified system voltage or above class, based on technological support of a parent company or collaborator for the respective equipment(s) can also be considered provided the parent company (Principal) or collaborator meets qualifying requirements stipulated under clause no (a) given above.

And

Furnishes (jointly with parent company or collaborator) a legally enforceable undertaking to

guarantee quality, timely supply, performance and warranty obligations as specified for the equipment(s)

And

Furnishes a confirmation letter from the parent company or collaborator alongwith the bid stating that parent company or collaborator shall furnish performance guarantee for an amount of 10% of the cost of such equipment(s). This performance guarantee shall be in addition to contract performance guarantee to be submitted by the Bidder.

#### **28.5 220 kV Grade XLPE Power Cables**

The cable shall be from the manufacturer who must have designed, manufactured, type tested and supplied in a single contract at least 15 (fifteen) km of single core, 220kV or higher grade XLPE insulated cable which must be in operation for at least 2 (two) years as on the date of bid opening.

#### **28.6 132 kV Grade XLPE Power Cables**

The cable shall be from the manufacturer who must have designed, manufactured, type tested and supplied in a single contract at least 15 (fifteen) km of single core, 132kV or higher grade XLPE insulated cable which must be in operation for at least 2 (two) years as on the date of bid opening.

#### **28.7 33 kV Grade XLPE Power Cables**

The cable shall be from the manufacturer who must have designed, manufactured, type tested and supplied in a single contract at least 15 (fifteen) km of single core, 33kV or higher grade XLPE insulated cable which must be in operation for at least 2 (two) years as on the date of bid opening.

#### **28.8 1.1 kV Grade Power & Control Cables**

##### **28.8.1 Applicable for PVC Control Cable**

The manufacturers, whose PVC control cables are offered, should have designed, manufactured, tested and supplied in a single contract at least 100 kms of 1.1 kV grade PVC insulated control cables as on the date of bid opening. Further the manufacturer should also have designed, manufactured, tested and supplied at least 1 km of 27C x 2.5 Sq.mm or higher size as on the date of bid opening.

##### **28.8.2 Applicable for PVC Power Cable**

The manufacturer, whose PVC Power Cables are offered, should have designed, manufactured, tested and supplied in a single contract atleast 100 kms of 1.1 kV or higher grade PVC insulated power cables as on the date of bid opening. Further the manufacturer should also have designed, manufactured, tested and supplied at least 1 km of 1C x 150 Sq. mm or higher size as on the date of bid opening.

##### **28.8.3 Applicable for XLPE Power Cables**

The Manufacturer, whose XLPE Power cables are offered, should have designed, manufactured,



tested and supplied in a single contract atleast 25 kms of 1.1 kV or higher grade XLPE insulated power cables as on the date of bid opening. Further the manufacturer should also have designed, manufactured, tested and supplied at least 1 km of 1C x 630 Sq. mm or higher size as on the date of bid opening.

## **28.9 LT Switchgear**

28.9.1 The Manufacturer whose LT Switchgear are offered, should be a manufacturer of LT Switchboards of the type and rating being offered. He should have designed, manufactured, tested and supplied at least 50 nos. draw out circuit breaker panels, out of which at least 5 nos. should have been with relay and protection schemes with current transformer. He should have also manufactured at least 50 nos. MCC panels comprising of MCCBs (ie Moulded Case Circuit Breakers) modules of the type offered which should be in successful operation as on date of bid opening.

28.9.2 The Switchgear items (such as circuit breakers, fuse switch units, contactors etc.), may be of his own make or shall be procured from reputed manufacturers and of proven design. At least one hundred circuit breakers of the make and type being offered shall be operating satisfactory as on date of bid opening.

## **28.10 Battery and Battery Charger**

### **28.10.1 Requirements for Battery Manufacturers**

The manufacturer whose Batteries are offered should have designed, manufactured and supplied DC Batteries of the type specified and being offered, having a capacity of at least 600 AH and these shall be operating satisfactorily for two years in power sector and/or industrial installations as on date of bid opening.

### **28.10.2 Requirements for Battery Charger Manufacturers**

The manufacturer, whose Battery Chargers are offered, should have designed, manufactured and supplied Battery Chargers generally of the type offered, with static automatic voltage regulators and having a continuous output of at least ten (10) kW and these should be in successful as on the date of bid opening.

## **28.11 LT Transformers**

The manufacturer, whose transformers are offered should have designed, manufactured, type tested including short circuit test as per IEC/IS or equivalent standards and supplied transformers of at least 33 kV class of 800 kVA or higher. The transformer should have been in successful operation for at least 2 years as on the date of bid opening.

## **28.12 Fire Fighting System**

The bidder or his sub-vendor should have designed, supplied, tested, erected and commissioned at least one number fire protection system of the each type described in (i), (ii), (iii) and (iv) below in installations such as power plants, substations, refineries, fertilizer plants or other industrial or commercial installations. Such systems must have been designed to the recommendations of Tariff Advisory Committee of India or any other international reputed

authority like (FOC, London or NFPA, USA etc.) executed during last ten (10) years and should have been in successful operation for at least 2 (two) years as on the date of bid opening.

- i) Nitrogen Injection Fire Prevention cum Extinguishing System
- ii) Portable Fire Extinguishers
- iii) GI Buckets – 9.0 liters capacity and Steel stand for Buckets
- iv) Fire Detection and Alarm System

In case bidder himself do not meet the requirement of design, he can engage a consultant(s) who must have designed the above system, which must be in successful operation for at least two years as on the date of bid opening.

#### **28.13 Control and Relay Panels ( 400 kV, 220 kV, 132 kV & 33 kV)**

The manufacturer whose Control, Relay & Protection System (Control & protection Intelligent Electronic Devices (IEDs)), and Sub-station Automation System (If applicable) are offered should have designed, manufactured, tested, installed and commissioned Control, Relay & Protection system along with Sub-station Automation System which must be in satisfactory operation on specified voltage level or above for atleast 2 (two) years on the date of bid opening.

AND

The Manufacturer or their joint venture or subsidiary company must have established repair, testing and integration (for at least 4 bays) facilities for Control, Relay & Protection System and Sub-station Automation System in India.

## **CORONA AND RADIO INTERFERENCE VOLTAGE (RIV) TEST**

### **1.0 General**

Unless otherwise stipulated, all equipment together with its associated connectors, where applicable, shall be tested for external corona (for 400 kV & above) both by observing the voltage level for the extinction of visible corona under falling power frequency voltage and by measurement of radio interference voltage (RIV) for 132 kV above.

### **2.0 Test Levels**

The test voltage levels for measurement of external RIV and for corona extinction voltage are listed under the relevant clauses of the specification.

### **3.0 Test Methods for RIV**

3.1 RIV tests shall be made according to measuring circuit as per International Special-Committee on Radio Interference (CISPR) Publication 16-1(1993) Part -1. The measuring circuit shall preferably be tuned to frequency with 10% of 0.5 MHz but other frequencies in the range of 0.5 MHz to 2 MHz may be used, the measuring frequency being recorded. The results shall be in microvolts.

3.2 Alternatively, RIV tests shall be in accordance with NEMA standard Publication No. 107-1964, except otherwise noted herein.

3.3 In measurement of, RIV, temporary additional external corona shielding may be provided. In measurements of RIV only standard fittings of identical type supplied with the equipment and a simulation of the connections as used in the actual installation will be permitted in the vicinity within 3.5 meters of terminals.

3.4 Ambient noise shall be measured before and after each series of tests to ensure that there is no variation in ambient noise level. If variation is present, the lowest ambient noise level will form basis for the measurements. RIV levels shall be measured at increasing and decreasing voltages of 85%, 100%, and 110% of the specified RIV test voltage for all equipment unless otherwise specified. The specified RIV test voltage for 400kV, 220kV, 132kV is listed in the detailed specification together with maximum permissible RIV level in microvolts.

3.5 The metering instruments shall be as per CISPR recommendation or equivalent device so long as it has been used by other testing authorities.

3.6 The RIV measurement may be made with a noise meter. A calibration procedure of the frequency to which noise meter shall be tuned shall establish the ratio of voltage at the high voltage terminal to voltage read by noise meter.

### **4.0 Test Methods for Visible Corona**

The purpose of this test is to determine the corona extinction voltage of apparatus, connectors etc. The test shall be carried out in the same manner as RIV test described above with the exception that RIV measurements are not required during test and a search technique shall be used near the onset and extinction voltage, when the test voltage is raised

and lowered to determine their precise values. The test voltage shall be raised to 110% of specified corona extinction voltage and maintained there for five minutes. In case corona inception does not take place at 110%, test shall be stopped, otherwise test shall be continued and the voltage will then be decreased slowly until all visible corona disappears. The procedure shall be repeated at least 4 times with corona inception and extinction voltage recorded each time. The corona extinction voltage for purposes of determining compliance with the specification shall be the lowest of the four values at which visible corona (negative or positive polarity) disappears. Photographs with laboratory in complete darkness shall be taken under test conditions, at all voltage steps i.e. 85%, 100%, and 110%. Additional photographs shall be taken at corona inception and extinction voltages. At least two views shall be photographed in each case using Panchromatic film with an ASA daylight rating of 400 with an exposure of two minutes at a lens aperture of f/5.6 or equivalent. The photographic process shall be such that prints are available for inspection and comparison with conditions as determined from direct observation. Photographs shall be taken from above and below the level of connector so as to show corona on bushing, insulators and all parts of energised connectors. The photographs shall be framed such that test object essentially, fills the frame with no cut-off.

For recording purpose, modern devices utilizing UV recording methods such as image intensifier may also be used.

- 4.1 The test shall be recorded on each photograph. Additional photograph shall be taken from each camera position with lights on to show the relative position of test object to facilitate precise corona location from the photographic evidence.
- 4.2 In addition to photographs of the test object preferably four photographs shall be taken of the complete test assembly showing relative positions of all the test equipment and test objects. These four photographs shall be taken from four points equally spaced around the test arrangement to show its features from all sides. Drawings of the laboratory and test set up locations shall be provided to indicate camera positions and angles. The precise location of camera shall be approved by Purchaser's inspector, after determining the best camera locations by trial energisation of test object at a voltage which results in corona.
- 4.3 The test to determine the visible corona extinction voltage need not be carried out simultaneously with test to determine RIV levels.
- 4.4 However, both test shall be carried out with the same test set up and as little time duration between tests as possible. No modification on treatment of the sample between tests will be allowed. Simultaneous RIV and visible corona extinction voltage testing may be permitted at the discretion of Purchaser's inspector if, in his opinion, it will not prejudice other test.

## **5.0 Test Records**

In addition to the information previously mentioned and the requirements specified as per CISPR or NEMA 107-1964 the following data shall be included in test report:

- a) Background noise before and after test.
- b) Detailed procedure of application of test voltage.
- c) Measurements of RIV levels expressed in micro volts at each level.

- d) Results and observations with regard to location and type of interference sources detected at each step.
- e) Test voltage shall be recorded when measured RIV passes through 100 microvolts in each direction.
- f) Onset and extinction of visual corona for each of the four tests required shall be recorded.

**ANNEXURE – B**

**SEISMIC WITHSTAND TEST PROCEDURE**

The seismic withstanding test on the complete equipment (for 132 kV and above) shall be carried out alongwith supporting structure.

The Bidder shall arrange to transport the structure from his Contractor's premises/UPPTCL sites for the purpose of seismic withstand test only.

The seismic level specified shall be applied at the base of the structure. The accelerometers shall be provided at the Terminal Pad of the equipment and any other point as agreed by the Purchaser. The seismic test shall be carried out in all possible combinations of the equipment. The seismic test procedure shall be furnished for approval of the Purchaser.

**ANNEXURE – C****LIST OF SPECIFICATIONS****GENERAL STANDARDS AND CODES**

India Electricity Rules

Indian Electricity Act

Indian Electricity (Supply) Act

Indian Factories Act

|                               |   |                                                                                           |
|-------------------------------|---|-------------------------------------------------------------------------------------------|
| IS-5,                         | - | Colors for Ready Mixed Paints and Enamels.                                                |
| IS-335,                       | - | New Insulating Oils.                                                                      |
| IS-617,                       | - | Aluminium and Aluminium Alloy Ingots and Castings for General Engineering Purposes        |
| IS-1448 (P1 to P 145)         | - | Methods of Test for Petroleum and its Products.                                           |
| IS-2071 (P1 to P3)            | - | Methods of High Voltage Testing.                                                          |
| IS-12063                      | - | Classification of degrees of protection provided by enclosures of electrical equipment.   |
| IS-2165<br>P1:1997<br>P2:1983 | - | Insulation Coordination.                                                                  |
| IS-3043                       | - | Code of Practice for Earthing                                                             |
| IS-6103                       | - | Method of Test for Specific Resistance (Resistivity) of Electrical Insulating Liquids     |
| IS-6104                       | - | Method of Test for Interfacial Tension of Oil against Water by the Ring Method            |
| IS-6262                       | - | Method of test for Power factor & Dielectric Constant of Electrical Insulating Liquids.   |
| IS-6792                       | - | Method for determination of electric strength of insulating oils.                         |
| IS-5578                       | - | Guide for marking of insulated conductors.                                                |
| IS-11353                      | - | Guide for uniform system of marking & identification of conductors & apparatus terminals. |
| IS-8263                       | - | Methods for Radio Interference Test on High voltage Insulators.                           |
| IS-9224 (Part 1,2&4)          | - | Low Voltage Fuses                                                                         |
| IEC-60060 (Part 1 to P4)      | - | High Voltage Test Techniques                                                              |
| IEC 60068                     | - | Environmental Test                                                                        |

|                     |   |                                                                                                           |
|---------------------|---|-----------------------------------------------------------------------------------------------------------|
| IEC-60117           | - | Graphical Symbols                                                                                         |
| IEC-60156,          | - | Method for the Determination of the Electrical Strength of Insulation Oils.                               |
| IEC-60270,          | - | Partial Discharge Measurements.                                                                           |
| IEC-60376           | - | Specification and Acceptance of New Sulphur Hexafluoride                                                  |
| IEC-60437           | - | Radio Interference Test on High Voltage Insulators.                                                       |
| IEC-60507           | - | Artificial Pollution Tests on High Voltage Insulators to be used on AC Systems.                           |
| IEC-62271-1         | - | Common Specification for High Voltage Switchgear & Controlgear Standards.                                 |
| IEC-60815           | - | Guide for the Selection of Insulators in respect of Polluted Conditions.                                  |
| IEC-60865 (P1 & P2) | - | Short Circuit Current - Calculation of effects.                                                           |
| ANSI-C.1/NFPA.70    | - | National Electrical Code                                                                                  |
| ANSI-C37.90A        | - | Guide for Surge Withstand Capability (SWC) Tests                                                          |
| ANSI-C63.21,        | - | Specification for Electromagnetic Noise and                                                               |
| C63.3               | - | Field Strength Instrumentation 10 KHz to 1 GHz                                                            |
| C36.4ANSI-C68.1     | - | Techniques for Dielectric Tests                                                                           |
| ANSI-C76.1/IEEE21   | - | Standard General Requirements and Test Procedure for Outdoor Apparatus Bushings.                          |
| ANSI-SI-4           | - | Specification for Sound Level Meters                                                                      |
| ANSI-Y32-2/C337.2   | - | Drawing Symbols                                                                                           |
| ANSI-Z55.11         | - | Gray Finishes for Industrial Apparatus and Equipment No. 61 Light Gray                                    |
| NEMA-107T           | - | Methods of Measurements of RIV of High Voltage Apparatus                                                  |
| NEMA-ICS-II         | - | General Standards for Industrial Control and Systems Part ICSI-109                                        |
| CISPR-1             | - | Specification for CISPR Radio Interference Measuring Apparatus for the frequency range 0.15 MHz to 30 MHz |
| CSA-Z299.1-1978h    | - | Quality Assurance Program Requirements                                                                    |
| CSA-Z299.2-1979h    | - | Quality Control Program Requirements                                                                      |
| CSA-Z299.3-1979h    | - | Quality Verification Program Requirements                                                                 |

CSA-Z299.4-1979h - Inspection Program Requirements

## **TRANSFORMERS AND REACTORS**

|                            |   |                                                                                                                     |
|----------------------------|---|---------------------------------------------------------------------------------------------------------------------|
| IS:10028 (Part 2 & 3)      | - | Code of practice for selection, installation & maintenance of Transformers (P1:1993), (P2:1991), (P3:1991)          |
| IS-2026 (P1 to P4)         | - | Power Transformers                                                                                                  |
| IS-3347 (part 1 to Part 8) | - | Dimensions for Porcelain transformer Bushings for use in lightly polluted atmospheres.                              |
| IS-3639                    | - | Fittings and Accessories for Power Transformers                                                                     |
| IS-6600                    | - | Guide for Loading of Oil immersed Transformers.                                                                     |
| IEC-60076 (Part 1 to 5)    | - | Power Transformers                                                                                                  |
| IEC-60214                  | - | On-Load Tap-Changers.                                                                                               |
| IEC-60289                  | - | Reactors.                                                                                                           |
| IEC- 60354                 | - | Loading Guide for Oil - Immersed power transformers                                                                 |
| IEC-60076-10               | - | Determination of Transformer and Reactor Sound Levels                                                               |
| ANSI-C571280               | - | General requirements for Distribution, Power and Regulating Transformers                                            |
| ANSI-C571290               | - | Test Code for Distribution, Power and Regulation Transformers                                                       |
| ANSI-C5716                 | - | Terminology & Test Code for Current Limiting Reactors                                                               |
| ANSI-C5721                 | - | Requirements, Terminology and Test Code for Shunt Reactors Rated Over 500 KVA                                       |
| ANSI-C5792                 | - | Guide for Loading Oil-Immersed Power Transformers upto and including 100 MVA with 55 deg C or 65 deg C Winding Rise |
| ANSI-CG,1EEE-4             | - | Standard Techniques for High Voltage Testing                                                                        |

## **CIRCUIT BREAKERS**

|               |   |                                                                                          |
|---------------|---|------------------------------------------------------------------------------------------|
| IEC-62271-100 | - | High-voltage switchgear and controlgear - Part 100: Alternating current circuit-breakers |
| IEC-62271-101 | - | High-voltage switchgear and controlgear - Part 101:                                      |



**Synthetic testing**

- |               |   |                                                                                                                                           |
|---------------|---|-------------------------------------------------------------------------------------------------------------------------------------------|
| IEC-62155     | - | Hollow pressurized and unpressurized ceramic and glass insulators for use in electrical equipment with rated voltages greater than 1000 V |
| IEC-62271-110 | - | High-voltage switchgear and controlgear - Part 110: Inductive load switching                                                              |
| IEC-62271-109 | - | High-voltage switchgear and controlgear - Part 110: Inductive load switching                                                              |

**CURRENT TRANSFORMERS, VOLTAGE TRANSFORMERS AND COUPLING****CAPACITOR VOLTAGE TRANSFORMERS**

- |                     |   |                                                                  |
|---------------------|---|------------------------------------------------------------------|
| IS-2705- (P1 to P4) | - | Current Transformers.                                            |
| IS:3156- (P1 to P4) | - | Voltage Transformers.                                            |
| IS-4379             | - | Identification of the Contents of Industrial Gas Cylinders       |
| IEC-60044-1         | - | Current transformers.                                            |
| IEC-60044-2         | - | Inductive Voltage Transformers.                                  |
| IEC-60044-4         | - | Instrument Transformes : Measurement of Partial Discharges       |
| IEC-60044-5         | - | Instrument transformers - Part 5: Capacitor voltage transformers |
| IEC-60358           | - | Coupling capacitors and capacitor dividers.                      |
| IEC-60481           | - | Coupling Devices for power Line Carrier Systems.                 |
| ANSI-C5713          | - | Requirements for Instrument transformers                         |
| ANSIC92.2           | - | Power Line Coupling voltage Transformers                         |
| ANSI-C93.1          | - | Requirements for Power Line Carrier Coupling Capacitors          |

**BUSHING**

- |           |   |                                                         |
|-----------|---|---------------------------------------------------------|
| IS-2099   | - | Bushings for Alternating Voltages above 1000V           |
| IEC-60137 | - | Insulated Bushings for Alternating Voltages above 1000V |

**SURGE ARRESTERS**

- |                 |   |                                                     |
|-----------------|---|-----------------------------------------------------|
| IS-3070 (PART2) | - | Lightning arresters for alternating current systems |
|-----------------|---|-----------------------------------------------------|

: Metal oxide lightning arrestors without gaps.

|             |   |                                              |
|-------------|---|----------------------------------------------|
| IEC-60099-4 | - | Metal oxide surge arrestors without gaps     |
| IEC-60099-5 | - | Selection and application recommendation     |
| ANSI-C62.1  | - | IEEE Standards for S A for AC Power Circuits |
| NEMA-LA 1   | - | Surge Arresters                              |

## **CUBICLES AND PANELS & OTHER RELATED EQUIPMENTS**

|                                         |   |                                                                            |
|-----------------------------------------|---|----------------------------------------------------------------------------|
| IS-722, IS-1248,<br>IS-3231, 3231 (P-3) | - | Electrical relays for power system protection                              |
| IS:5039                                 | - | Distributed pillars for Voltages not Exceeding 1000 Volts.                 |
| IEC-60068.2.2                           | - | Basic environmental testing procedures Part 2: Test B: Dry heat            |
| IEC-60529                               | - | Degree of Protection provided by enclosures.                               |
| IEC-60947-4-1                           | - | Low voltage switchgear and control gear.                                   |
| IEC-61095                               | - | Electromechanical Contactors for household and similar purposes.           |
| IEC-60439 (P1 & 2)                      | - | Low Voltage Switchgear and control gear assemblies                         |
| ANSI-C37.20                             | - | Switchgear Assemblies, including metal enclosed bus.                       |
| ANSI-C37.50                             | - | Test Procedures for Low Voltage Alternating Current Power Circuit Breakers |
| ANSI-C39                                | - | Electric Measuring instrument                                              |
| ANSI-C83                                | - | Components for Electric Equipment                                          |
| IS: 8623: (Part I to 3)                 | - | Specification for Switchgear & Control Assemblies.                         |
| NEMA-AB                                 | - | Moulded Case Circuit and Systems                                           |
| NEMA-CS                                 | - | Industrial Controls and Systems                                            |
| NEMA-PB-1                               | - | Panel Boards                                                               |
| NEMA-SG-5                               | - | Low voltage Power Circuit breakers                                         |
| NEMA-SG-3                               | - | Power Switchgear Assemblies                                                |
| NEMA-SG-6                               | - | Power switching Equipment                                                  |
| NEMA-5E-3                               | - | Motor Control Centers                                                      |
| 1248 (P1 to P9)                         | - | Direct acting indicating analogue electrical                               |

measuring instruments & their accessories.

### Disconnecting Switches

|                        |   |                                                                                                                                                      |
|------------------------|---|------------------------------------------------------------------------------------------------------------------------------------------------------|
| IEC-62271-102          | - | High-voltage switchgear and controlgear - Part 102: Alternating current disconnectors and earthing switches                                          |
| IEC-60129              | - | Alternating Current Disconnectors (Isolators) and Earthing switches                                                                                  |
| IEC-1129               | - | Alternating Current Earthing Switches Induced Current switching                                                                                      |
| IEC-60265 (Part 1 & 2) | - | High Voltage switches                                                                                                                                |
| ANSI-C37.32            | - | Schedule of preferred Ratings, Manufacturing Specifications and Application Guide for high voltage Air Switches, Bus supports and switch accessories |
| ANSI-C37.34            | - | Test Code for high voltage air switches                                                                                                              |
| NEMA-SG6               | - | Power switching equipment                                                                                                                            |

### PLCC and Line Traps

|           |   |                                                            |
|-----------|---|------------------------------------------------------------|
| IS-8792   | - | Line traps for AC power system.                            |
| IS-8793   | - | Methods of tests for line traps.                           |
| IS-8997   | - | Coupling devices for PLC systems.                          |
| IS-8998   | - | Methods of test for coupling devices for PLC systems.      |
| IEC-60353 | - | Line traps for A.C. power systems.                         |
| IEC-60481 | - | Coupling Devices for power line carrier systems.           |
| IEC-60495 | - | Single sideboard power line carrier terminals              |
| IEC-60683 | - | Planning of (single Side-Band) power line carrier systems. |
| CIGRE     | - | Teleprotection report by Committee 34 & 35.                |
| CIGRE     | - | Guide on power line carrier 1979.                          |
| CCIR      | - | International Radio Consultative Committee                 |
| CCITT     | - | International Telegraph & Telephone Consultative Committee |

EIA - Electric Industries Association

## Protection and Control Equipment

|                          |   |                                                                                                                         |
|--------------------------|---|-------------------------------------------------------------------------------------------------------------------------|
| IEC-60051 : (P1 to P9)   | - | Recommendations for Direct Acting indicating analogue electrical measuring instruments and their accessories.           |
| IEC-60255 (Part 1 to 23) | - | Electrical relays.                                                                                                      |
| IEC-60297<br>(P1 to P4)  | - | Dimensions of mechanical structures of the 482.6mm (19 inches) series.                                                  |
| IEC-60359                | - | Expression of the performance of electrical & electronic measuring equipment.                                           |
| IEC-60387                | - | Symbols for Alternating-Current Electricity meters.                                                                     |
| IEC-60447                | - | Man machine interface (MMI) - Actuating principles.                                                                     |
| IEC-60521                | - | Class 0.5, 1 and 2 alternating current watt hour metres                                                                 |
| IEC-60547                | - | Modular plug-in Unit and standard 19-inch rack mounting unit based on NIM Standard (for electronic nuclear instruments) |
| ANSI-81                  | - | Screw threads                                                                                                           |
| ANSI-B18                 | - | Bolts and Nuts                                                                                                          |
| ANSI-C37.1               | - | Relays, Station Controls etc.                                                                                           |
| ANSI-C37.2               | - | Manual and automatic station control, supervisory and associated telemetering equipment                                 |
| ANSI-C37.2               | - | Relays and relay systems associated with electric power apparatus                                                       |
| ANSI-C39.1               | - | Requirements for electrical analog indicating Instruments                                                               |

## MOTORS

|                        |   |                                                                               |
|------------------------|---|-------------------------------------------------------------------------------|
| IS-325                 | - | Three phase induction motors.                                                 |
| IS-4691                | - | Degree of protection provided by enclosure for rotating electrical machinery. |
| IEC-60034 (P1 to P19:) | - | Rotating electrical machines                                                  |

IEC-Document 2 - Three phase induction motors  
(Central Office) NEMA-MGI Motors and Generators

### **Electronic Equipment and Components**

MIL-21B, MIL-833 & MIL-2750

- IEC-60068 (P1 to P5) - Environmental testing
- IEC-60326 (P1 to P2) - Printed boards  
Material and workmanship standards
- IS-1363 (P1 to P3) - Hexagon headbolts, screws and nuts of product grade C.
- IS-1364 (P1 to P5) - Hexagon head bolts, screws and nuts of products grades A and B.
- IS-3138 - Hexagonal Bolts and Nuts (M42 to M150)
- ISO-898 - Fasteners: Bolts, screws and studs
- ASTM - Specification and tests for materials

### **Clamps & Connectors**

- IS-5561 - Electric power connectors.
- NEMA-CC1 - Electric Power connectors for sub station
- NEMA-CC 3 - Connectors for Use between aluminium or aluminum-Copper Overhead Conductors

### **Bus Hardware and Insulators**

- IS: 2121 - Fittings for Aluminum and steel cored Al conductors for overhead power lines.
- IS-731 - Porcelain insulators for overhead power lines with a nominal voltage greater than 1000 V.
- IS-2486 (P1 to P4) - Insulator fittings for overhead power lines with a nominal voltage greater than 1000 V.
- IEC-60120 - Dimensions of Ball and Socket Couplings of string insulator units.
- IEC-60137 - Insulated bushings for alternating voltages above 1000 V.
- IEC-60168 - Tests on indoor and outdoor post insulators of ceramic material or glass for Systems with Nominal Voltages Greater than 1000 V.

|                       |   |                                                                                                                                                                                            |
|-----------------------|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| IEC-62155             | - | Hollow pressurized and unpressurized ceramic and glass insulators for use in electrical equipment with rated voltages greater than 1 000 V                                                 |
| IEC-60233             | - | Tests on Hollow Insulators for use in electrical equipment.                                                                                                                                |
| IEC-60273             | - | Characteristics of indoor and outdoor post insulators for systems with nominal voltages greater than 1000V.                                                                                |
| IEC-61462             | - | Pressurized and un-pressurized insulator for use in electrical equipment with rated voltage greater than 1000V – Definitions, Test methods, acceptance criteria and design recommendations |
| IEC-60305             | - | Insulators for overhead lines with nominal voltage above 1000V-ceramic or glass insulator units for a.c. systems Characteristics of String Insulator Units of the cap and pintype.         |
| IEC-60372 (1984)      | - | Locking devices for ball and socket couplings of string insulator units : dimensions and tests.                                                                                            |
| IEC-60383 (P1 and P2) | - | Insulators for overhead lines with a nominal voltage above 1000 V.                                                                                                                         |
| IEC-60433             | - | Characteristics of string insulator units of the long rod type.                                                                                                                            |
| IEC-60471             | - | Dimensions of Clevis and tongue couplings of string insulator units.                                                                                                                       |
| ANSI-C29              | - | Wet process procelain insulators                                                                                                                                                           |
| ANSI-C29.1            | - | Test methods for electrical power insulators                                                                                                                                               |
| ANSI-C92.2            | - | For insulators, wet-process porcelain and toughened glass suspension type                                                                                                                  |
| ANSI-C29.8            | - | For wet-process porcelain insulators apparatus, post-type                                                                                                                                  |
| ANSI-G.8              | - | Iron and steel hardware                                                                                                                                                                    |
| CISPR-7B              | - | Recommendations of the CISPR, tolerances of form and of Position, Part 1                                                                                                                   |
| ASTM A-153            | - | Zinc Coating (Hot-Dip) on iron and steel hardware                                                                                                                                          |

### **Strain and Rigid Bus-Conductor**

|         |   |                                                                                    |
|---------|---|------------------------------------------------------------------------------------|
| IS-2678 | - | Dimensions & tolerances for Wrought Aluminum and Aluminum Alloys drawn round tube. |
|---------|---|------------------------------------------------------------------------------------|

|               |   |                                                                                                       |
|---------------|---|-------------------------------------------------------------------------------------------------------|
| IS-5082       | - | Wrought Aluminum and Aluminum Alloy Bars. Rods, Tubes and Sections for Electrical purposes.           |
| ASTM-B 230-82 | - | Aluminum 1350 H19 Wire for electrical purposes                                                        |
| ASTM-B 231-81 | - | Concentric - lay - stranded, aluminum 1350 conductors                                                 |
| ASTM-B 221    | - | Aluminum - Alloy extruded bar, rod, wire, shape                                                       |
| ASTM-B 236-83 | - | Aluminum bars for electrical purpose (Bus-bars)                                                       |
| ASTM-B 317-83 | - | Aluminum-Alloy extruded bar, rod, pipe and structural shapes for electrical purposes (Bus Conductors) |

### **Batteries and Batteries Charger**

#### **Battery**

|                 |   |                                                                                       |
|-----------------|---|---------------------------------------------------------------------------------------|
| IS:1651         | - | Stationary Cells and Batteries, Lead-Acid Type (with Tubular Positive Plates)         |
| IS:1652         | - | Stationary Cells and Batteries, Lead-Acid Type (with Plante Positive Plates)          |
| IS:1146         | - | Rubber and Plastic Containers for Lead-Acid Storage Batteries                         |
| IS:6071         | - | Synthetic Separators for Lead-Acid Batteries                                          |
| IS:266          | - | Specification for Sulphuric Acid                                                      |
| IS:1069         | - | Specification for Water for Storage Batteries                                         |
| IS:3116         | - | Specification for Sealing Compound for Lead-Acid Batteries                            |
| IS:1248         | - | Indicating Instruments                                                                |
| IS:10918        | - | Vented type nickel Cadmium Batteries                                                  |
| IEC:60896-21&22 | - | Lead Acid Batteries Valve Regulated types – Methods of Tests & Requirements           |
| IEC: 60623      | - | Vented type nickel Cadmium Batteries                                                  |
| IEC:60622       | - | Secondary Cells & Batteries – Sealed Ni-Cd rechargeable single cell                   |
| IEC:60623       | - | Secondary Cells & Batteries – Vented Ni-Cd rechargeable single cell                   |
| IEC:60896-11    | - | Stationary Lead Acid Batteries – Vented Type – General requirements & method of tests |
| IEEE-485        | - | Recommended practices for sizing of Lead Acid                                         |

**Batteries**

|           |   |                                                                   |
|-----------|---|-------------------------------------------------------------------|
| IEEE-1115 | - | Sizing of Ni-Cd Batteries                                         |
| IEEE-1187 | - | Recommended practices for design & installation of VRLA Batteries |
| IEEE-1188 | - | Recommended practices for design & installation of VRLA Batteries |
| IEEE-1189 | - | Guide for selection of VRLA Batteries                             |

**Battery Charger**

|                   |   |                                                                                                                                      |
|-------------------|---|--------------------------------------------------------------------------------------------------------------------------------------|
| IS:3895           | - | Mono-crystalline Semiconductor Rectifier Cells and Stacks                                                                            |
| IS:4540           | - | Mono-crystalline Semiconductor Rectifier Assemblies and Equipment.                                                                   |
| IS:6619           | - | Safety Code for Semiconductor Rectifier Equipment                                                                                    |
| IS:2026           | - | Power Transformers                                                                                                                   |
| IS:2959           | - | AC Contactors for Voltages not Exceeding 1000 Volts                                                                                  |
| IS:1248           | - | Indicating Instruments                                                                                                               |
| IS:2208           | - | HRC Fuses                                                                                                                            |
| IS:13947 (Part-3) | - | Air break switches, air break disconnectors & fuse combination units for voltage not exceeding 1000V AC or 1200V DC                  |
| IS:2147           | - | Degree of protection provided by enclosures for low voltage switchgear and controlgear.                                              |
| IS:6005           | - | Code of practice for phosphating of Iron and Steel                                                                                   |
| IS:3231           | - | Electrical relays for power system protection                                                                                        |
| IS:3842           | - | Electrical relay for AC Systems                                                                                                      |
| IS:5              | - | Colours for ready mix paint                                                                                                          |
| IEEE-484          | - | Recommended Design for installation design and installation of large lead storage batteries for generating stations and substations. |
| IEEE-485          | - | Sizing large lead storage batteries for generating stations and substations                                                          |

**Wires and Cables**



|                          |   |                                                                                                                |
|--------------------------|---|----------------------------------------------------------------------------------------------------------------|
| ASTMD-2863               | - | Measuring the minimum oxygen concentration to support candle like combustion of plastics (oxygen index)        |
| IS-694                   | - | PVC insulated cables for working voltages upto and including 1100 Volts.                                       |
| IS-1255                  | - | Code of practice for installation and maintenance of power cables, upto and including 33 kV rating             |
| IS-1554 (P1 and P2)      | - | PVC insulated (heavy duty) electric cables (part 1) for working voltage upto and including 1100 V.             |
|                          | - | Part (2) for working voltage from 3.3 kV upto and including 11kV.                                              |
| IS:1753                  | - | Aluminium conductor for insulated cables                                                                       |
| IS:2982                  | - | Copper Conductor in insulated cables.                                                                          |
| IS-3961 (P1 to P5)       | - | Recommended current ratings for cables.                                                                        |
| IS-3975                  | - | Mild steel wires, formed wires and tapes for armouring of cables.                                              |
| IS-5831                  | - | PVC insulating and sheath of electric cables.                                                                  |
| IS-6380                  | - | Elastometric insulating and sheath of electric cables.                                                         |
| IS-7098                  | - | Cross linked polyethylene insulated PVC sheathed cables for working voltage upto and including 1100 volts.     |
| IS-7098                  | - | Cross-linked polyethyle insulated PVC sheathed cables for working voltage from 3.3kV upto and including 33 kV. |
| IS-8130                  | - | Conductors for insulated electrical cables and flexible cords.                                                 |
| IS-1753                  | - | Aluminum Conductors for insulated cables.                                                                      |
| IS-10418                 | - | Specification for drums for electric cables.                                                                   |
| IEC-60096 (part 0 to p4) | - | Radio Frequency cables.                                                                                        |
| IEC-60183                | - | Guide to the Selection of High Voltage Cables.                                                                 |
| IEC-60189 (P1 to P7)     | - | Low frequency cables and wires with PVC insulation and PVC sheath.                                             |
| IEC-60227 (P1 to P7)     | - | Polyvinyl Chloride insulated cables of rated voltages up to and including 450/750V.                            |
| IEC-60228                | - | Conductors of insulated cables                                                                                 |
| IEC-60230                | - | Impulse tests on cables and their accessories.                                                                 |

|                      |   |                                                                                             |
|----------------------|---|---------------------------------------------------------------------------------------------|
| IEC-60287 (P1 to P3) | - | Calculation of the continuous current rating of cables (100% load factor).                  |
| IEC-60304            | - | Standard colours for insulation for low-frequency cables and wires.                         |
| IEC-60331            | - | Fire resisting characteristics of Electric cables.                                          |
| IEC-60332 (P1 to P3) | - | Tests on electric cables under fire conditions.                                             |
| IEC-60502            | - | Extruded solid dielectric insulated power cables for rated voltages from 1 kV upto to 30 kV |
| IEC-754 (P1 and P2)  | - | Tests on gases evolved during combustion of electric cables.                                |

### **Air Conditioning and Ventilation**

|                |   |                                                                                               |
|----------------|---|-----------------------------------------------------------------------------------------------|
| IS-659         | - | Safety code for air conditioning                                                              |
| IS-660         | - | Safety code for Mechanical Refrigeration                                                      |
| ARI:520        | - | Standard for Positive Displacement Refrigeration Compressor and Condensing Units              |
| IS:4503        | - | Shell and tube type heat exchanger                                                            |
| ASHRAE-24      | - | Method of testing for rating of liquid coolers                                                |
| ANSI-B-31.5    | - | Refrigeration Piping                                                                          |
| IS:2062        | - | Steel for general structural purposes                                                         |
| IS:655         | - | Specification for Metal Air Dust                                                              |
| IS:277         | - | Specification for Galvanised Steel Sheets                                                     |
| IS-737         | - | Specification for Wrought Aluminium and Aluminium Sheet & Strip                               |
| IS-1079        | - | Hot rolled cast steel sheet & strip                                                           |
| IS-3588        | - | Specification for Electrical Axial Flow Fans                                                  |
| IS-2312        | - | Propeller Type AC Ventilation Fans                                                            |
| BS-848         | - | Methods of Performance Test for Fans                                                          |
| BS-6540 Part-I | - | Air Filters used in Air Conditioning and General Ventilation                                  |
| BS-3928        | - | Sodium Flame Test for Air Filters (Other than for Air Supply to I.C. Engines and Compressors) |
| US-PED-2098    | - | Method of cold DOP & hot DOP test                                                             |
| MIL-STD-282    | - | DOP smoke penetration method                                                                  |
| ASHRAE-52      | - | Air cleaning device used in general ventilation for                                           |

|                      |   |                                                                                                 |
|----------------------|---|-------------------------------------------------------------------------------------------------|
|                      |   | removing particle matter                                                                        |
| IS:3069              | - | Glossary of Terms, Symbols and Units Relating to Thermal Insulation Materials.                  |
| IS:4671              | - | Expanded Polystyrene for Thermal Insulation Purposes                                            |
| IS:8183              | - | Bonded Mineral Wool                                                                             |
| IS:3346              | - | Evaluation of Thermal Conductivity properties by means of guarded hot plate method              |
| ASTM-C-591-69        | - | Standard specification for rigid preformed cellular urethane thermal insulation                 |
| IS:4894              | - | Centrifugal Fans                                                                                |
| BS:848<br>Fans       | - | Method of Performance Test for Centrifugal Fans                                                 |
| IS:325               | - | Induction motors, three-phase                                                                   |
| IS:4722              | - | Rotating electrical machines                                                                    |
| IS:1231              | - | Three phase foot mounted Induction motors, dimensions of                                        |
| IS:2233              | - | Designations of types of construction and mounting arrangements of rotating electrical machines |
| IS:2254              | - | Vertical shaft motors for pumps, dimensions of                                                  |
| IS:7816              | - | Guide for testing insulation resistance of rotating machines                                    |
| IS:4029              | - | Guide for testing three phase induction motors                                                  |
| IS:4729              | - | Rotating electrical machines, vibration of, Measurement and evaluation of                       |
| IS:4691              | - | Degree of protection provided by enclosures for rotating electrical machinery                   |
| IS:7572              | - | Guide for testing single-phase a.c. motors                                                      |
| IS:2148              | - | Flame proof enclosure for electrical apparatus                                                  |
| BS:4999<br>(Part-51) | - | Noise levels                                                                                    |

## Galvanizing

|         |   |                                              |
|---------|---|----------------------------------------------|
| IS-209  | - | Zinc Ingot                                   |
| IS-2629 | - | Recommended Practice for Hot-Dip galvanizing |

on iron and steel.

|               |   |                                                                                                                                                  |
|---------------|---|--------------------------------------------------------------------------------------------------------------------------------------------------|
| IS-2633       | - | Methods for testing uniformity of coating of zinc coated articles.                                                                               |
| ASTM-A-123    | - | Specification for zinc (Hot Galvanizing) Coatings, on products Fabricated from rolled, pressed and forged steel shapes, plates, bars and strips. |
| ASTM-A-121-77 | - | Zinc-coated (Galvanized) steel barbed wire                                                                                                       |

### **Painting**

|           |   |                                                      |
|-----------|---|------------------------------------------------------|
| IS-6005   | - | Code of practice for phosphating of iron and steel.  |
| ANSI-Z551 | - | Gray finishes for industrial apparatus and equipment |
| SSPEC     | - | Steel structure painting council                     |

### **Fire Protection System**

Fire protection manual issued by tariff advisory committee (TAC) of India

### **HORIZONTAL CENTRIFUGAL PUMPS**

|         |   |                                                              |
|---------|---|--------------------------------------------------------------|
| IS:1520 | - | Horizontal centrifugal pumps for clear, cold and fresh water |
| IS:9137 | - | Code for acceptance test for centrifugal & axial pumps       |
| IS:5120 | - | Technical requirement - Rotodynamic special purpose pumps    |
| API-610 | - | Centrifugal pumps for general services                       |
|         | - | Hydraulic Institutes Standards                               |
| BS:599  | - | Methods of testing pumps                                     |
| PTC-8.2 | - | Power Test Codes - Centrifugal pumps                         |

### **DIESEL ENGINES**

|          |   |                                                  |
|----------|---|--------------------------------------------------|
| IS:10000 | - | Methods of tests for internal combustion engines |
| IS:10002 | - | Specification for performance requirements for   |

|                      |   |                                                                                                                          |
|----------------------|---|--------------------------------------------------------------------------------------------------------------------------|
|                      |   | constant speed compression ignition engines for general purposes (above 20 kW)                                           |
| BS:5514              | - | The performance of reciprocating compression ignition (Diesel) engines, utilising liquid fuel only, for general purposes |
| ISO:3046             | - | Reciprocating internal combustion engines performance                                                                    |
| IS:554               | - | Dimensions for pipe threads where pressure tight joints are required on threads                                          |
| ASME Power Test Code | - | Internal combustion engine PTC-17                                                                                        |
|                      | - | Codes of Diesel Engine Manufacturer's Association, USA                                                                   |

### PIPING VALVES & SPECIALITIES

|         |   |                                                                                  |
|---------|---|----------------------------------------------------------------------------------|
| IS:636  | - | Non percolating flexible fire fighting delivery hose                             |
| IS:638  | - | Sheet rubber jointing and rubber inserting jointing                              |
| IS:778  | - | Gun metal gate, globe and check valves for general purpose                       |
| IS:780  | - | Sluice valves for water works purposes (50 to 300 mm)                            |
| IS:901  | - | Couplings, double male and double female instantaneous pattern for fire fighting |
| IS:902  | - | Suction hose couplings for fire fighting purposes                                |
| IS:903  | - | Fire hose delivery couplings branch pipe nozzles and nozzle spanner              |
| IS:1538 | - | Cast iron fittings for pressure pipes for water, gas and sewage                  |
| IS:1903 | - | Ball valve (horizontal plunger type) including floats for water supply purposes  |
| IS:2062 | - | SP for weldable structural steel                                                 |
| IS:2379 | - | Colour Code for the identification of pipelines                                  |
| IS:2643 | - | Dimensions of pipe threads for fastening purposes                                |
| IS:2685 | - | Code of Practice for selection, installation and maintenance of sluice valves    |
| IS:2906 | - | Sluice valves for water-works purposes (350 to 1200 mm size)                     |

|          |   |                                                                                             |
|----------|---|---------------------------------------------------------------------------------------------|
| IS:3582  | - | Basket strainers for fire fighting purposes (cylindrical type)                              |
| IS:3589  | - | Electrically welded steel pipes for water, gas and sewage (150 to 2000 mm nominal diameter) |
| IS:4038  | - | Foot valves for water works purposes                                                        |
| IS:4927  | - | Unlined flax canvas hose for fire fighting                                                  |
| IS:5290  | - | Landing valves (internal hydrant)                                                           |
| IS:5312  | - | Swing check type reflex (non-return) valves                                                 |
| (Part-I) |   |                                                                                             |
| IS:5306  | - | Code of practice for fire extinguishing installations and equipment on premises             |
| Part-I   | - | Hydrant systems, hose reels and foam inlets                                                 |
| Part-II  | - | Sprinkler systems                                                                           |
| BS:5150  | - | Specification for cast iron gate valves                                                     |

## **MOTORS & ANNUNCIATION PANELS**

|         |   |                                                                                                  |
|---------|---|--------------------------------------------------------------------------------------------------|
| IS:325  | - | Three phase induction motors                                                                     |
| IS:900  | - | Code of practice for installation and maintenance of induction motors                            |
| IS:996  | - | Single phase small AC and universal electric motors                                              |
| IS:1231 | - | Dimensions of three phase foot mounted induction motors                                          |
| IS:2148 | - | Flame proof enclosure of electrical apparatus                                                    |
| IS:2223 | - | Dimensions of flange mounted AC induction motors                                                 |
| IS:2253 | - | Designations for types of construction and mounting arrangements of rotating electrical machines |
| IS:2254 | - | Dimensions of vertical shaft motors for pumps                                                    |
| IS:3202 | - | Code of practice for climate proofing of electrical equipment                                    |
| IS:4029 | - | Guide for testing three phase induction motors                                                   |
| IS:4691 | - | Degree of protection provided by enclosure for rotating electrical machinery                     |
| IS:4722 | - | Rotating electrical machines                                                                     |

|                                        |   |                                                                                                          |
|----------------------------------------|---|----------------------------------------------------------------------------------------------------------|
| IS:4729                                | - | Measurement and evaluation of vibration of rotating electrical machines                                  |
| IS:5572                                | - | Classification of hazardous areas for electrical (Part-I) installations (Areas having gases and vapours) |
| IS:6362                                | - | Designation of methods of cooling for rotating electrical machines                                       |
| IS:6381                                | - | Construction and testing of electrical apparatus with type of protection 'e'                             |
| IS:7816                                | - | Guide for testing insulation for rotating machine                                                        |
| IS:4064                                | - | Air break switches                                                                                       |
| IEC DOCUMENT 2<br>(Control Office) 432 | - | Three Phase Induction Motor                                                                              |
| VDE 0530 Part I/66                     | - | Three Phase Induction Motor                                                                              |
| IS:9224<br>(Part-II)                   | - | HRC Fuses                                                                                                |
| IS:6875                                | - | Push Button and Control Switches                                                                         |
| IS:694                                 | - | PVC Insulated cables                                                                                     |
| IS:1248                                | - | Indicating instruments                                                                                   |
| IS:375                                 | - | Auxiliary wiring & busbar markings                                                                       |
| IS:2147                                | - | Degree of protection                                                                                     |
| IS:5                                   | - | Colour Relay and timers                                                                                  |
| IS:2959                                | - | Contactors                                                                                               |

### **PG Test Procedures**

|                                                                  |   |                                                               |
|------------------------------------------------------------------|---|---------------------------------------------------------------|
| NFPA-13                                                          | - | Standard for the installation of sprinkler system             |
| NFPA-15                                                          | - | Standard for water spray fixed system for the fire protection |
| NFPA-12A                                                         | - | Standard for Halong 1301 Fire Extinguishing System            |
| NFPA-72E                                                         | - | Standard on Automatic Fire Detectors                          |
| Fire Protection Manual by TAC (Latest Edition)                   |   |                                                               |
| NFPA-12                                                          | - | Standard on Carbon dioxide extinguisher systems               |
| IS:3034                                                          | - | Fire of industrial building:                                  |
| Electrical generating and distributing stations code of practice |   |                                                               |

|         |   |                                        |
|---------|---|----------------------------------------|
| IS:2878 | - | CO2 (Carbon dioxide) Type Extinguisher |
| IS:2171 | - | DC (Dry Chemical Powder) type          |
| IS:940  | - | Pressurised Water Type                 |

#### **D.G. SET**

|          |   |                                                                                                                         |
|----------|---|-------------------------------------------------------------------------------------------------------------------------|
| IS:10002 | - | Specification for performance requirements for constant speed compression ignition (diesel engine) for general purposes |
| IS:10000 | - | Method of tests for internal combustion engines                                                                         |
| IS:4722  | - | Rotating electrical machines-specification                                                                              |
| IS:12063 | - | Degree of protection provided by enclosures                                                                             |
| IS:12065 | - | Permissible limit of noise levels for rotating electrical machines.                                                     |
|          | - | Indian Explosive Act 1932                                                                                               |

#### **Steel Structures**

|                   |   |                                                                                                    |
|-------------------|---|----------------------------------------------------------------------------------------------------|
| IS-228 (1992)     | - | Method of Chemical Analysis of pig iron, cast iron and plain carbon and low alloy steels.          |
| IS-802 (P1 to 3:) | - | Code of practice for use of structural steel in overhead transmission line towers.                 |
| IS-806            | - | Code of practice for use of steel tubes in general building construction                           |
| IS-808            | - | Dimensions for hot rolled steel beam, column channel and angle sections.                           |
| IS-814            | - | Covered electrodes for manual arc welding of carbon of carbon manganese steel.                     |
| IS-816            | - | Code of Practice for use of metal arc welding for general construction in Mild steel               |
| IS-817            | - | Code of practice for training and testing of metal arc welders. Part 1 : Manual Metal arc welding. |
| IS-875 (P1 to P4) | - | Code of practice for design loads (other than earthquake) for buildings and structures.            |
| IS-1161           | - | Steel tubes for structural purposes.                                                               |
| IS-1182           | - | Recommended practice for radiographic examination of fusion welded butt joints in steel            |



|                     |   |                                                                                                                                  |
|---------------------|---|----------------------------------------------------------------------------------------------------------------------------------|
|                     |   | plates.                                                                                                                          |
| IS-1363 (P1 to P3)  | - | Hexagonal head bolts, screws & nuts of products grade C.                                                                         |
| IS-1364             | - | Hexagon headbolts, screws and nuts of product grades A and B.                                                                    |
| IS-1367 (P1 to P18) | - | Technical supply condition for threaded steel fasteners.                                                                         |
| IS-1599             | - | Methods for bend test.                                                                                                           |
| IS-1608             | - | Method for tensile testing of steel products.                                                                                    |
| IS-1893             | - | Criteria for earthquake resistant design of structures.                                                                          |
| IS-1978             | - | Line Pipe.                                                                                                                       |
| IS-2062             | - | Steel for general structural purposes.                                                                                           |
| IS-2595             | - | Code of practice for Radiographic testing.                                                                                       |
| IS-3063             | - | Single coil rectangular section spring washers for bolts, nuts and screws.                                                       |
| IS-3664             | - | Code of practice for ultrasonic pulse echo testing by contact and immersion methods.                                             |
| IS-7205             | - | Safety code for erection of structural steel work.                                                                               |
| IS-9595             | - | Recommendations for metal arc welding of carbon and carbon manganese steels.                                                     |
| ANSI-B18.2.1        | - | Inch series square and Hexagonal bolts and screws                                                                                |
| ANSI-B18.2.2        | - | Square and hexagonal nuts                                                                                                        |
| ANSI-G8.14          | - | Round head bolts                                                                                                                 |
| ASTM-A6             | - | Specification for General Requirements for rolled steel plates, shapes, sheet piling and bars of structural use                  |
| ASTM-A36            | - | Specifications of structural steel                                                                                               |
| ASTM-A47            | - | Specification for malleable iron castings                                                                                        |
| ASTM-A143           | - | Practice for safeguarding against embilement of Hot Galvanized structural steel products and procedure for detaching embrilement |
| ASTM-A242           | - | Specification for high strength low alloy structural steel                                                                       |
| ASTM-A283           | - | Specification for low and intermediate tensile strength carbon steel plates of structural quality                                |
| ASTM-A394           | - | Specification for Galvanized steel transmission                                                                                  |

tower bolts and nuts

|           |   |                                                                                          |
|-----------|---|------------------------------------------------------------------------------------------|
| ASTM-441  | - | Specification for High strength low alloy structural manganese vanadium steel.           |
| ASTM-A572 | - | Specification for High strength low alloy columbium-Vanadium steel of structural quality |
| AWS D1-0  | - | Code for welding in building construction welding inspection                             |
| AWS D1-1  | - | Structural welding code                                                                  |
| AISC      | - | American institute of steel construction                                                 |
| NEMA-CG1  | - | Manufactured graphite electrodes                                                         |

### Piping and Pressure Vessels

|                                 |   |                                                                                                                              |
|---------------------------------|---|------------------------------------------------------------------------------------------------------------------------------|
| IS-1239 (Part 1 and 2)<br>steel | - | Mild steel tubes, tubulars and other wrought fittings                                                                        |
| IS-3589                         | - | Seamless Electrically welded steel pipes for water, gas and sewage.                                                          |
| IS-6392                         | - | Steel pipe flanges                                                                                                           |
| ASME                            | - | Boiler and pressure vessel code                                                                                              |
| ASTM-A120                       | - | Specification for pipe steel, black and hot dipped, zinc-coated (Galvanized) welded and seamless steel pipe for ordinary use |
| ASTM-A53                        | - | Specification for pipe, steel, black, and hotdipped, zinc coated welded and seamless                                         |
| ASTM-A106                       | - | Seamless carbon steel pipe for high temperature service                                                                      |
| ASTM-A284                       | - | Low and intermediate tensile strength carbon silicon steel plates for machine parts and general construction.                |
| ASTM-A234                       | - | Pipe fittings of wrought carbon steel and alloy steel for moderate and elevated temperatures                                 |
| ASTM-S181                       | - | Specification for forgings, carbon steel for general purpose piping                                                          |
| ASTM-A105                       | - | Forgings, carbon steel for piping components                                                                                 |
| ASTM-A307                       | - | Carbon steel externally threaded standard fasteners                                                                          |
| ASTM-A193                       | - | Alloy steel and stainless steel bolting materials for                                                                        |

|               |   |                                                                                |
|---------------|---|--------------------------------------------------------------------------------|
|               |   | high temperature service                                                       |
| ASTM-A345     | - | Flat rolled electrical steel for magnetic applications                         |
| ASTM-A197     | - | Cupola malleable iron                                                          |
| ANSI-B2.1     | - | Pipe threads (Except dry seal)                                                 |
| ANSI-B16.1    | - | Cast iron pipe flanges and flanged fitting. Class 25, 125, 250 and 800         |
| ANSI-B16.1    | - | Malleable iron threaded fittings, class 150 and 300                            |
| ANSI-B16.5    | - | Pipe flanges and flanged fittings, steel nickel alloy and other special alloys |
| ANSI-B16.9    | - | Factory-made wrought steel butt welding fittings                               |
| ANSI-B16.11   | - | Forged steel fittings, socket-welding and threaded                             |
| ANSI-B16.14   | - | Ferrous pipe plug, bushings and locknuts with pipe threads                     |
| ANSI-B16.25   | - | Butt welding ends                                                              |
| ANSI-B18.1.1  | - | Fire hose couplings screw thread.                                              |
| ANSI-B18.2.1  | - | Inch series square and hexagonal bolts and screws                              |
| ANSI-B18.2.2  | - | Square and hexagonal nuts                                                      |
| ANSI-B18.21.1 | - | Lock washers                                                                   |
| ANSI-B18.21.2 | - | Plain washers                                                                  |
| ANSI-B31.1    | - | Power piping                                                                   |
| ANSI-B36.10   | - | Welded and seamless wrought steel pipe                                         |
| ANSI-B36.9    | - | Stainless steel pipe                                                           |

### Other Civil Works Standards

|                    |   |                                                                                                |
|--------------------|---|------------------------------------------------------------------------------------------------|
| IS-269             | - | 33 grade ordinary portland cement.                                                             |
| IS2721             | - | Galvanized steel chain link fence fabric                                                       |
| IS-278             | - | Galvanized steel barbed wire for fencing.                                                      |
| IS-383             | - | Coarse and fine aggregates from natural sources for concrete.                                  |
| IS-432 (P1 and P2) | - | Mild steel and medium tensile steel bars and hard-drawn steel wire for concrete reinforcement. |
| IS-456             | - | Code of practice for plain and reinforced concrete.                                            |

|                             |   |                                                                                                     |
|-----------------------------|---|-----------------------------------------------------------------------------------------------------|
| IS-516                      | - | Method of test for strength of concrete.                                                            |
| IS-800                      | - | Code of practice for general construction in steel.                                                 |
| IS-806                      | - | Steel tubes for structural purposes.                                                                |
| IS-1172                     | - | Basic requirements for water supply, drainage and sanitation.                                       |
| IS-1199                     | - | Methods of sampling and analysis of concrete.                                                       |
| IS-1566                     | - | Hard-drawn steel wire fabric for concrete reinforcement.                                            |
| IS-1742                     | - | Code of Practice for Building drainage.                                                             |
| IS-1785                     | - | Plain hard-drawn steel wire for prestressed concrete.                                               |
| IS-1786                     | - | High strength deformed Steel Bars and wires for concrete reinforcement.                             |
| IS-1811                     | - | Methods of sampling Foundry sands.                                                                  |
| IS-1893                     | - | Criteria for earthquake resistant design of structures.                                             |
| IS-2062                     | - | Steel for general structural purposes.                                                              |
| IS-2064                     | - | Selection, installation and maintenance of sanitary appliances-code of practices.                   |
| IS-2065                     | - | Code of practice for water supply in buildings.                                                     |
| IS-2090                     | - | High tension steel bars used in prestressed concrete.                                               |
| IS-2140                     | - | Standard Galvanized steel wire for fencing.                                                         |
| IS-2470 (P1 & P2)           | - | Code of practice for installation of septic tanks.                                                  |
| IS-2514                     | - | Concrete vibrating tables.                                                                          |
| IS-2645                     | - | Integral cement waterproofing compounds.                                                            |
| IS-3025 (Part 1 to Part 48) | - | Methods of sampling and test (Physical and chemical) for water and waste water.                     |
| IS-4091                     | - | Code of practice for design and construction of foundations for transmission line towers and poles. |
| IS-4111 (Part 1 to P5)      | - | Code of practice for ancillary structures in sewerage system.                                       |
| IS-4990                     | - | Plywood for concrete shuttering work.                                                               |
| IS-5600                     | - | Sewage and drainage pumps.                                                                          |

**National Buiding Code of India 1970**

|               |   |                                                                                                       |
|---------------|---|-------------------------------------------------------------------------------------------------------|
| USBR E12      | - | Earth Manual by United States Department of the interior Bureau of Reclamation                        |
| ASTM-A392-81  | - | Zinc/Coated steel chain link fence fabric                                                             |
| ASTM-D1557-80 | - | test for moisture-density relation of soils using 10-lb (4.5 kg) rame land 18-in. (457 mm) Drop.      |
| ASTM-D1586    | - | Penetration Test and Split-Barrel                                                                     |
| (1967)        | - | Sampling of Soils                                                                                     |
| ASTM-D2049-69 | - | Test Method for Relative Density of Cohesionless Soils                                                |
| ASTM-D2435    | - | Test method for Unconsolidated, (1982) Undrained Strengths of Cohesive Soils in Triaxial Compression. |
| BS-5075       | - | Specification for accelerating Part I Admixtures, Retarding Admixtures and Water Reducing Admixtures. |
| CPWD          | - | Latest CPWD specifications                                                                            |

**ACSR MOOSE CONDUCTOR**

|                 |                                                                                                            |
|-----------------|------------------------------------------------------------------------------------------------------------|
| IS:6745         | Methods for Determination of BS:443-1969<br>Mass of zinc coating on zinc<br>coated Iron and Steel Articles |
| IS:8263         | Methods for Radio Interference                                                                             |
| IEC:437-1973    | Test on High Voltage Insulators NEMA:107-1964<br>CISPR                                                     |
| IS:209          | Zinc Ingot BS:3436-1961                                                                                    |
| IS:398          | Aluminum Conductors for IEC:209-1966                                                                       |
| Part - V        | Overhead Transmission Purposes                                                                             |
| BS:215(Part-II) | Aluminium Conductors galvanized IEC:209-1966 steel<br>reinforced extra high                                |
| BS:215(Part-II) | voltage (400 kV and above)                                                                                 |
| IS:1778         | Reels and Drums forBS:1559-1949<br>Bare Conductors                                                         |
| IS:1521         | Method for Tensile Testing ISO/R89-1959of steel wire                                                       |

|         |                                                                   |
|---------|-------------------------------------------------------------------|
| IS:2629 | Recommended practice for Hot dip Galvanising on Iron and Steel.   |
| IS:2633 | Method for Testing Uniformity of coating of zinc Coated Articles. |
| IS:4826 | Hot dip galvanised coatings on round steel wires ASTM-A-472-729   |

## **GALVANISED STEEL EARTHWIRE**

|                              |                                                                                                      |
|------------------------------|------------------------------------------------------------------------------------------------------|
| IS:1521                      | Method for Tensile Testing ISO/R:89-1959 of Steel Wire                                               |
| IS:1778                      | Reels and Drums for Bare Conductors                                                                  |
| IS:2629                      | Recommended practice for Hot Dip Galvanising on Iron and Steel.                                      |
| IS:2633<br>Coated            | Methods for testing Uniformity of Coating of Zinc Articles.                                          |
| IS:4826                      | Hot dip Galvanised Coatings ASTM:A 475-72a on Round Steel Wires BS:443-1969                          |
| IS:6745                      | Method for Determination BS:443-1969 of mass of Zinc Coating on Zinc coated Iron and Steel Articles. |
| IS:209                       | Zinc ingot BS:3463-1961                                                                              |
| IS:398 (Pt. I to<br>P5:1992) | Aluminum Conductors for BS:215 (Part-II) overhead transmission purposes.                             |

## **Lighting Fixtures and Accessories**

|                  |                                                                 |
|------------------|-----------------------------------------------------------------|
| IS:1913          | General and safety requirements for electric lighting fittings. |
| IS:3528          | Water proof electric lighting fittings.                         |
| IS:4012          | Dust proof electric lighting fittings.                          |
| IS:4013          | Dust tight proof electric lighting fittings.                    |
| IS:10322         | Industrial lighting fittings with metal reflectors.             |
| IS:10322         | Industrial lighting fittings with plastic reflectors.           |
| IS:2206<br>mines | Well glass lighting fittings for use under ground in            |

|          |                                                                |
|----------|----------------------------------------------------------------|
|          | (non-flameproof type).                                         |
| IS:10322 | Specification for flood light.                                 |
| IS:10322 | Specification for decorative lighting outfits.                 |
| IS:10322 | Luminaries for street lighting                                 |
| IS:2418  | Tubular fluorescent lamps                                      |
| IS:9900  | High pressure mercury vapour lamps.                            |
| IS:1258  | Specification for Bayonet lamp fluorescent lamp.               |
| IS:3323  | Bi-pin lamp holder tubular fluorescent lamps.                  |
| IS:1534  | Ballasts for use in fluorescent lighting fittings.<br>(Part-I) |
| IS:1569  | Capacitors for use in fluorescent lighting fittings.           |
| IS:2215  | Starters for fluorescent lamps.                                |
| IS:3324  | Holders for starters for tubular fluorescent lamps             |
| IS:418   | GLS lamps                                                      |
| IS:3553  | Water tight electric fittings                                  |
| IS:2713  | Tubular steel poles                                            |
| IS:280   | MS wire for general engg. Purposes                             |

### **Conduits, Accessories and Junction Boxes**

|         |                                                            |
|---------|------------------------------------------------------------|
| IS:9537 | Rigid steel conduits for electrical wiring                 |
| IS:3480 | Flexible steel conduits for electrical wiring              |
| IS:2667 | Fittings for rigid steel conduits for electrical wiring    |
| IS:3837 | Accessories for rigid steel conduits for electrical wiring |
| IS:4649 | Adaptors for flexible steel conduits.                      |
| IS:5133 | Steel and Cast Iron Boxes                                  |
| IS:2629 | Hot dip galvanising of Iron & Steel.                       |

### **Lighting Panels**

|          |                                                                |
|----------|----------------------------------------------------------------|
| IS:13947 | LV Switchgear and Control gear(Part 1 to 5)                    |
| IS:8828  | Circuit breakers for over current protection for house<br>hold |
|          | and similar installations.                                     |
| IS:5     | Ready mix paints                                               |

|                              |                                                                                                                                                         |
|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| IS:2551                      | Danger notice plates                                                                                                                                    |
| IS:2705                      | Current transformers                                                                                                                                    |
| IS:9224<br>(7)IS:5082<br>and | HRC Cartridge fuse links for voltage above 650V(Part-2)<br>Wrought aluminium and Al. alloys, bars, rods, tubes<br><br>sections for electrical purposes. |
| (8)IS:8623<br>Gear           | Factory built Assemblies of Switchgear and Control<br><br>for voltages upto and including 1000V AC and 1200V<br>DC.                                     |
| (9)IS:1248                   | Direct Acting electrical indicating instruments                                                                                                         |

## Electrical Installation

|                      |                                                                                              |
|----------------------|----------------------------------------------------------------------------------------------|
| IS:1293 3            | pin plug                                                                                     |
| IS:371               | Two to three ceiling roses                                                                   |
| IS:3854              | Switches for domestic and similar purposes                                                   |
| IS:5216              | Guide for safety procedures and practices in electrical<br>work.                             |
| IS:732<br>(system    | Code of practice for electrical wiring installation<br><br>voltage not exceeding 650 Volts.) |
| IS:3043              | Code of practice for earthing.                                                               |
| IS:3646              | Code of practice of interior illumination part II & III.                                     |
| IS:1944              | Code of practice for lighting of public through fares.                                       |
| IS:5571<br>hazardous | Guide for selection of electrical equipment for<br><br>areas.                                |
| IS:800               | Code of practice for use of structural steel in general<br>building construction.            |
| IS:2633<br>coated    | Methods of Testing uniformity of coating on zinc<br><br>articles.                            |
| IS:6005              | Code of practice for phosphating iron and steel.                                             |
|                      | INDIAN ELECTRICITY ACT                                                                       |
|                      | INDIAN ELECTRICITY RULES                                                                     |

## LT SWITCHGEAR



|                            |                                                                                                                                             |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| IS:8623 (Part-I)<br>gear   | Specification for low voltage switchgear and control assemblies                                                                             |
| IS:13947 (Part-I)<br>gear, | Specification for low voltage switchgear and control<br><br>Part 1 General Rules                                                            |
| IS:13947 (part-2)<br>gear, | Specification for low voltage switchgear and control<br><br>Part 2 circuit breakers.                                                        |
| IS:13947 (part-3)<br>gear. | Specification for low voltage switchgear and control<br><br>Part 3 Switches, Disconnectors, Switch-disconnectors and fuse combination units |
| IS:13947 (part-4)<br>gear. | Specification for low voltage switchgear and control<br><br>Part 4 Contactors and motors starters.                                          |
| IS:13947 (part-5)<br>gear. | Specification for low voltage switchgear and control<br><br>Part 5 Control-circuit devices and switching elements                           |
| IS:13947 (part-6)<br>gear. | Specification for low voltage switchgear and control<br><br>Part 6 Multiple function switching devices.                                     |
| IS:13947 (part-7)<br>gear. | Specification for low voltage switchgear and control<br><br>Part 7 Ancillary equipments                                                     |
| IS:12063                   | Degree of protection provided by enclosures                                                                                                 |
| IS:2705                    | Current Transformers                                                                                                                        |
| IS:3156                    | Voltage Transformers                                                                                                                        |
| IS:3231                    | Electrical relays for power system protection                                                                                               |
| IS:1248                    | Electrical indicating instruments                                                                                                           |
| IS:722                     | AC Electricity meters                                                                                                                       |
| IS:5578                    | Guide for Marking of insulated conductors of apparatus terminals                                                                            |
| IS:13703 (part 1)<br>or    | Low voltage fuses for voltage not exceeding 1000V AC<br><br>1500V DC Part 1 General Requirements                                            |
| IS:13703 (part 2)<br>or    | Low voltage fuses for voltage not exceeding 1000V AC<br><br>1500V DC Part 2 Fuses for use of authorized persons                             |

|         |                                                              |
|---------|--------------------------------------------------------------|
| IS:6005 | Code of practice of phosphating iron and steel               |
| IS:5082 | Wrought Aluminum and Aluminum alloys for electrical purposes |
| IS:2633 | Hot dip galvanising                                          |

## SECTION-3

## PROJECT DETAILS &amp; GENERAL SPECIFICATION

## SITE INFORMATION

|                        | Particular                                 | Details                                                                                               |
|------------------------|--------------------------------------------|-------------------------------------------------------------------------------------------------------|
| a)                     | Owner                                      | UPPTCL                                                                                                |
| b)                     | Customer                                   | UPPTCL                                                                                                |
| c)                     | Project Title                              | 400/220/132 kV GIS at Rasra, Ballia                                                                   |
| d)                     | Location                                   | Uttar Pradesh                                                                                         |
| e)                     | Transport Facilities                       | Nearest rail head - Ballia                                                                            |
| <b>SITE CONDITIONS</b> |                                            |                                                                                                       |
| a)                     | Max. ambient air temp.                     | 50°C                                                                                                  |
| b)                     | Min. ambient air temp.                     | 0°C                                                                                                   |
| c)                     | Max. design ambient emp.                   | 50°C                                                                                                  |
| d)                     | Design reference temp.                     | 50°C                                                                                                  |
| e)                     | Average Humidity                           | Max. 100%                                                                                             |
| f)                     | Special corrosion conditions               | No                                                                                                    |
| g)                     | Solar Radiation                            |                                                                                                       |
| h)                     | Atmospheric UV radiation                   | High                                                                                                  |
| i)                     | Altitude above sea level                   | Less than 1000meter                                                                                   |
| j)                     | Pollution Severity                         | High Pollution level                                                                                  |
| k)                     | Seismic Zone                               | As per the seismic zone defined in the relevant BIS / IEC-62271-300 but not less than 0.3g horizontal |
| <b>WIND DATA</b>       |                                            |                                                                                                       |
|                        | Wind load                                  | 195kg/sqm                                                                                             |
|                        | Average No. of thunderstorm days per annum | As per IS                                                                                             |

## 1. GENERAL

This Chapter covers Technical Requirements and requirements of auxiliary items.

- 1.1 Equipments furnished shall be complete in every respect with all mountings, fittings, fixtures and standard accessories specified &/or normally provided with such equipment and/ or needed for erection, completion and safe operation of the equipment as required by applicable codes though they may not have been specifically detailed in the Technical Specifications.

Materials and components not specifically stated in the specification but which are necessary for commissioning and satisfactory operation of the substation unless specifically excluded shall be deemed to be included in the scope of the specification and shall be supplied without any extra cost All similar standard components/ parts of similar standard equipment provided, shall be inter-changeable with one another.

- 1.2 The Bidder shall supply type tested (including special test as per technical specification) equipments and materials. The test reports/details shall be furnished by the Bidder in the bid.

In the event of any discrepancy in the test reports i.e. any test report not acceptable due to any design/manufacturing changes or due to non-compliance with the requirement stipulated in the Technical Specification and/or IEC/ IS, same, shall be carried out without any additional cost implication to the Purchaser. The Purchaser reserves the right to get any or all type tests conducted/ repeated.

The reports for all type tests and additional type tests as per technical specification furnished by the Bidder shall be of the tests conducted within last 05(five) years prior to the date of bid opening. The type tests conducted should have either been conducted in accredited laboratory (accredited based on ISO/ IEC Guide 25/ 17025 or EN 45001 by the national accreditation body of the country where laboratory is located) or witnessed by UPPTCL or representative authorized by UPPTCL or Utility or representative of accredited test lab or reputed consultant.

## 2. SYSTEM PARTICULARS

|     |                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-----|------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|     | Rated System voltage                                                                           | 420 kV, 245kV, 145kV, 36kV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|     | System frequency                                                                               | 50 Hz, This may vary by $\pm 5\%$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|     | Number of phases                                                                               | Three                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|     | Neutral                                                                                        | Effectively Earthed                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|     | Auxiliary power supply:-                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|     | Auxiliary electrical equipment shall be suitable for operation on the following supply system: |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| (a) | Power device (Like drive motors)                                                               | 400V, 3Phase, 4Wire 50Hz<br>Effectively earthed AC system.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| (b) | Lighting fixtures, space heaters, fractional Horse Power motors and control devices.           | 250V, 2wire, 50Hz,<br>AC supply with one point grounded.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| (c) | DC alarm, Control and Protective Devices from sub station batteries as under                   | 2 wire ungrounded DC supplies<br>(i) 400 kV S/S : 220V DC<br>(ii) 220/132kV S/S : 110V DC<br>(iii) Communication : 48 V DC<br>The above supply voltage is subject to variation as follows:<br><br>All devices must be suitable for a continuous operation over the entire range of voltage variations :<br>(i) AC Voltage may vary by $\pm 10\%$ .<br>Frequency by $\pm 5\%$<br>Combined Voltage & frequency by $\pm 10\%$ .<br>(ii) DC<br>a) 220 V may vary between 187 & 242 V<br>b) 110 V may vary between 93 & 121 V<br>c) 48 V may vary between 41 & 53 V |

**3. System parameters**

| Sl. No. | Description of Parameters                                                                                                                                                                                                 | 400 kV System                       | 220 kV System        | 132 kV System        | 33 kV System         |
|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|----------------------|----------------------|----------------------|
| 1       | Nominal system voltage                                                                                                                                                                                                    | 4000kV                              | 220kV                | 132kV                | 33kV                 |
| 2       | Maximum operating voltage of the system(rms)                                                                                                                                                                              | 420kV                               | 245kV                | 145kV                | 36kV                 |
| 3       | Rated frequency                                                                                                                                                                                                           | 50Hz                                | 50Hz                 | 50Hz                 | 50Hz                 |
| 4       | No. of phase                                                                                                                                                                                                              | 3                                   | 3                    | 3                    | 3                    |
| 5       | Rated short time current                                                                                                                                                                                                  | 50 kA for 3 Sec.                    | 40 kA for 3 SEC      | 40 kA for 3 SEC      | 25 kA for 3 SEC      |
| 6       | Dry and wet one minute power frequency withstand voltage                                                                                                                                                                  | 680 kV                              | 460 kV               | 275 kV               | 95 kV                |
| 7       | Dry and wet impulse withstand voltage positive and negative                                                                                                                                                               | 1550 kVp                            | 1050 kVp             | 650 kVp              | 250 kVp              |
| 8       | Corona extinction voltage                                                                                                                                                                                                 | 320 kV                              | 156 kV               | 105 kV               | -                    |
| 9       | Max. Radio interference voltage for frequency between 0.5 MHz and 2 MHz at 508 kV rms for 765kV, 320kV rms for 400kV system and 156kV rms for 220kV system & 92kV rms for 132kV system system & 92kV rms for 132kV system | 1000 microvolt                      | 1000 microvolt       | 500 microvolt        | -                    |
| 10      | Minimum total creepage                                                                                                                                                                                                    | 25mm/kV<br>(10500 mm)               | 25mm/kV<br>(6125 mm) | 25mm/kV<br>(3625 mm) | 25mm/kV<br>(1300 mm) |
| 11      | Min. clearances                                                                                                                                                                                                           |                                     |                      |                      |                      |
|         | i. Phase to phase                                                                                                                                                                                                         | 4000mm<br>(for Conductor-conductor) | 2100 mm              | 1300 mm              | 320 mm               |
|         |                                                                                                                                                                                                                           | 4200mm<br>(for rod - Conductor)     |                      |                      |                      |
|         | ii. Phase to earth                                                                                                                                                                                                        | 3500 mm                             | 2100 mm              | 1300 mm              | 320 mm               |
|         | iii) Sectional clearances                                                                                                                                                                                                 | 6500 mm                             | 5000 mm              | 4000 mm              | 3000 mm              |
| 12.     | System neutral earthing                                                                                                                                                                                                   | Effectively Earthed                 |                      |                      |                      |

**4. SERVICES TO BE PERFORMED BY THE EQUIPMENT BEING FURNISHED**

- 4.1** All equipments shall perform satisfactorily under various electrical, electromechanical and meteorological conditions of the installation site.
- 4.2** All equipment shall be able to withstand all external and internal mechanical thermal and electromechanical forces due to various factors like wind load temperature variation, ice & snow (wherever applicable) short circuit etc for the equipment.

- 
- 4.3 The Bidder shall design the various forces which the terminal connectors of the equipment are required to withstand.
- 4.4 All outdoor EHV equipments except marshalling kiosks shall be suitable for hot line washing.
- 4.5 To facilitate erection of equipment, all items to be assembled at site shall be "matchmarked".

**5. SUPPORT STRUCTURES (If in the scope of Bidder)**

The base design of all the equipments, to be installed on auxiliary structures, shall conform to the standard auxiliary structure designs presently being used in UPPTCL at 400/220/132/33kV Substations.

All equipment support structures shall be supplied along with brackets, angles, stools etc. for attaching the operating mechanism, control cabinets and marshalling box (wherever applicable) etc. The support structures should be hot dip galvanised with minimum 610 gram/sq.m net of zinc.

**6. STANDARDS**

- 6.1 **Except** as modified by this Bid specification, all material and equipment shall conform to the requirement of the latest editions of relevant ISS/ IEC and other applicable standards. The equipments/ works shall be designed, engineered, manufactured, built, tested and commissioned shall be carried out in accordance with the Acts, Rules, Laws and Regulations in force in India.
- 6.2 In addition to meeting the specific requirements called for in the respective sections of the Technical Specification, the equipment shall also conform to the general requirement of the relevant standards which shall form an integral part of the specification. When the specific requirements stipulated in the specifications exceed or differ than those required by the applicable standards, the stipulation of the specification shall take precedence.
- 6.3 In the event of the Bidder offering equipment conforming to standards other than ISS/IES standards, which ensure equivalent or better performance than that specified in the standards, the salient point of comparison between the standards adopted and relevant ISS/ IEC standards shall be indicated clearly in the proposal, along with English language version of such standard or relevant extract of the same. The equipment conforming to standards other than IS/IEC shall be subject to Purchaser's approval.
- 6.4 The standards mentioned in the respective equipment specifications are not mutually exclusive or complete in themselves. The equipment &/or work shall also conform to any other applicable standard, even if not specifically mentioned in these specifications.
- 6.5 Should the Bidder wish to depart from the provisions of the specifications, either on accounts of manufacturing practices or for any other reason, he shall clearly mention the departure and submit complete justification supported by information, drawings etc. as will enable to assess the suitability of equipment(s) offered. In the event of the Bidder's specifications, drawings, forms and tables etc. being found to disagree with the

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requirement of the Bid specifications at any stage, Bid specifications shall be binding, unless the departures have been duly approved in writing by the purchaser.

## 6.6 R E F E R E N C E O F S T A N D A R S

| Reference | Abbreviation                                                 | Name and Address                                                                                           |
|-----------|--------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|
| BS        | British Standards,                                           | British Standards Institution, 101, Pentonville Road,<br>N-19-ND UK                                        |
| ISO       | International Organization                                   | Danish Board of Standardization Danish Standardising<br>Sraat, Aurehoegvej-12, DK-2900, Heelstrup, DENMARK |
| NEMA      | For Standardization, National Electric Manufacture Associate | 115, East 44th Street, New York NY 10017 U.S.A                                                             |
| BS        | British Standards,                                           | British Standards Institution, 101, Pentonville Road,<br>N-19-ND UK                                        |
| ISO       | International Organization                                   | Danish Board of Standardization Danish Standardising<br>Sraat, Aurehoegvej-12, DK-2900, Heelstrup, DENMARK |
| NEMA      | For Standardization, National Electric Manufacture Associate | 115, East 44th Street, New York NY 10017 U.S.A                                                             |

## 7. ENGINEERING DATA AND DRAWINGS

### 7.1 SUBMISSION AND APPROVAL OF DRAWINGS/ DOCUMENTS

- 7.1.1 The Bidder shall follow a well-defined coding system for proper and quick identification of all systems/ sub-systems/ equipments/ assemblies/ sub-assemblies/ accessories/ other plant material/ spare parts/ special tools and plants and drawings for the execution of the plant and later for its operation and maintenance.

Copies of coding documents defining the above shall be supplied along with drawings to understand the system.

- 7.1.2 All drawings submitted by the Bidder shall be in sufficient details to indicate the type, size arrangement, weight of each component, details for packing and shipment, the external connections, fixing arrangements, dimensions required for installation arrangement, dimensions required for installation and interconnections with other equipment and other information specifically, as called for in the drawing schedules. All the equipments tapping points etc. shall be numbered according to pre-determined scheme/ system which shall be subject to approval of Purchaser.

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7.1.3 Each drawing shall be clearly marked with the name of the Purchaser, unit designation, UPPTCL's Contract No. and the name of the project. If standard catalogue pages are submitted the applicable items shall be indicated therein. All titles, noting, markings and writings on the drawings shall be in English. All the dimensions should be in metric units.

7.1.4 If any dimension figures on a drawing or a plan differs from those obtained by scaling the drawing or plan, the dimensions as mentioned in figures on the drawing or plan shall be taken as correct.

**7.2 Submission and distribution of drawings/ documents**

All the drawings which do not require approval shall be submitted along with reproducible in required number and those requiring approval shall be initially submitted for comments/ approval before submitting along with reproducible as per "Document Distribution Schedule".

**7.3 APPROVAL OF DRAWINGS**

7.3.1 The Purchaser shall return to the Bidder one set of drawings, plans and technical data requiring approval after marking them with their comments/ corrections, if any, either (a) marked 'Approved' or (b) marked 'Approved subject to incorporation of comments' or (c) marked 'Not Approved' with comments requiring resubmission of drawings etc. in 14 days or (d) marked 'Approval not required', where drawing is for information only. In case of (a) no further revision of drawings will be required. In case of (b) Bidder can proceed with the work but will resubmit the drawings incorporating the corrections as per comments only within fourteen (14) days. In case of (c) Bidder can proceed with the work only after resubmitting the drawings within fourteen (14) days and getting approval under (a) or (b) categories above. In case of (d) the Bidder drawing is deemed to have been received only for information purpose.

7.3.2 The Purchaser shall have the right to ask the Bidder to make any change in the design/ drawing which may be necessary to make equipment conform to the provisions and intent of the contract, without any extra cost to the Purchaser.

The drawings submitted shall be re-viewed by the Purchaser and shall be modified by the Bidder as required. The Bidder shall incorporate such modifications and/or corrections and submit the final drawings for approval/ reference.

7.3.3 No deviation from the approved drawings shall be permitted without the written approval of the Engineer.

7.3.4 The review of drawings/ data by the Purchaser will cover only general conformance of the data of the specifications and document, interfaces with the equipment provided under the specifications, external connections and the dimensions which might effect substation layout.

This review by the Purchaser may not indicate thorough review of all dimensions, quantities and details of the equipment, wiring, materials, any devices or items indicated or the accuracy of the information submitted. This review and/ or approval by the purchaser shall not be considered by the Bidder, as limiting any of his responsibilities specified under these specifications and documents.



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Approval/ comments conveyed as above shall neither relieve the Bidder of his contractual obligations and his responsibilities for correctness of dimensions, material of construction, quantities, design details, assembly fits, performance particulars, guarantees and conformity of the supplies with the specifications, schemes, systems and statutory laws, nor does it limit the Purchasers right under the contract.

- 7.3.5 Should any minor revision be made after 'approval', at the time of erection/ commissioning the Bidder shall redistribute prints and reproducible, clearly certifying the changes incorporated in the drawing and marking it in a block. Every revision shall be marked by a revision number, date and subject, in a revision block provided in the drawing, clearly marking the changes incorporated.
- 7.3.6 The Bidder shall be responsible for and shall pay for any alterations of the work due to any discrepancies, errors and omissions in the drawings or other particulars supplied by him, whether such drawings or particulars have been approved by Engineer or not.

No extension of delivery periods shall be granted on this account.

#### **7.3.7 As- build drawings**

Drawings of all equipments as detailed in technical specifications of respective equipments necessarily including schematic drawings and terminal block drawings wherever applicable whether mentioned in respective technical specifications or not.

### **8. NAME PLATE, MARKING OF PARTS, LABELS**

- 8.1 All equipment shall have metal name plates fixed in suitable position with full particulars engraved legibly thereon and not painted.
- 8.2 Each main and auxiliary item of plant is to have permanently attached to it in a conspicuous position, a rating plate of non corrosive material upon which is to be engraved identifying manufacturer's name, equipment type or serial number, rating together with details of the loading/ operating conditions under which the item or plant in question has been designed to operate and such diagram plates as may be required by the Engineer.
- 8.3 Each item of plant is to be provided with a name plate or label designating the service of the particular equipment. These inscriptions are to be approved by the Engineer or as detailed in the appropriate sections of the technical specifications.
- 8.4 Such name plates or labels are to be white non hygroscopic material with engraved block lettering or, alternatively, in the case of indoor equipments of transparent plastic material with suitably colored lettering engraved on the back
- 8.5 Each bay module in GIS room will have a clear marking showing the name of bay, identification, name and rating plate marking for each individual equipment like circuit breaker, disconnectors grounding switches, current transformer, voltage transformers and bushings etc. as per relevant IEC to facilitate identification during routine operation/ maintenance.
- 8.6 All such name plates, instruction plates, lubrication charts etc. shall be bilingual with Hindi inscription first followed by English. Provisions shall be made to fit in name plates, lubrication/ connection diagram plates etc.
- 8.7 In order to facilitate identification, the parts of the equipment shall be suitably marked.

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## 9. INSTRUCTION MANUALS

- 9.1 The Bidder shall submit to the Engineer 'Descriptive Manuals', i.e. system design concept, detailed catalogues of equipment and typical equipment instructions for this project, for all major systems and equipment, covered under this contract along with dispatch of equipment.  
These initial copies of descriptive manuals shall be in sufficient details, bringing out detailed internal construction, characteristics, performance parameters, principles of operation, maintenance requirements, replacement and renewals needed, erection and overhauling procedure, testing and operation procedure etc. for various equipment.
- 9.2 The integrated instruction manuals, fully defining the interfaces between various systems and complete in all respects shall be submitted by the Bidder one month before scheduled date of commissioning. The instruction manuals shall contain full details of designation and drawings of all the equipment furnished, the erection procedure, testing procedure, operation and maintenance procedure of the equipment, single line diagrams, and schematics. After the commissioning and initial operation of the plant, modifications/ additions/ changes, wherever required shall be incorporated in the instruction manuals and drawings shall be submitted by the Bidder to the Purchaser.
- 9.3 The manuals shall be specific to the equipment supplied and not of general nature.

## 10. DOCUMENTS AND ERECTION DRAWINGS

The Bidder shall submit within a reasonable time but at least four (4) weeks before dispatch of equipment (as per distribution schedule) the following drawings/ documents and instruction manuals etc. to the consignee and the Engineer.

- I. List of item-wise equipment as proposed to be dispatched by the Bidder.
- II. Erection drawings along with reproducible prints of each drawings.
- III. Instruction books for proper handling/ checking of material on receipt at site/storage,
- IV. erection and assembly of all equipment and necessary instruction for checking and
- V. recording proper assembly of the plant.
- VI. Instruction sheets for proper balancing, alignment, adjustment, checking and calibrations
- VII. as may be necessary.
- VIII. Descriptive literature and drawings to illustrate the working principals, methods of
- IX. assembly and dismantling of plants and equipment.
- X. Testing/commissioning format for recording data during erection/testing/
- XI. commissioning and trial run. These formats/data sheets shall clearly indicate the results
- XII. obtained during shop tests and permissible deviations.

## 11. QUALITY CONTROL PROGRAMME

To ensure that the equipment construction work and the services covered under this job are in accordance with the specifications and conform to the high standard of workmanship. It is obligatory on the part of the Bidder to adopt a suitable quality control program. Such a program shall include suitable hold point for check for major equipments during manufacture at supplier's work, during erection at site and during the construction

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stage such that material checks for attaining proper strength and dimensional checks for attaining close tolerances required for equipment installation can be obtained.

In order to attain the above objectives, the Bidder shall draw out a plan listing all quality control checks in detail, including all hold points at which the quality checks shall be applied, also specifically mentioning those hold points where the Purchaser shall also participate in the quality check to assure him of the quality of the products supplied. Such a program shall be outlined by the Bidder for the acceptance by the Purchaser. The Bidder shall furnish detailed information regarding his quality control program and its strict implementation. Following information shall be included in the proposal along with others regarding quality control program:

- I. The quality control organizations and the proposal of its implementation.
- II. The system for controlling drawings and documents for correctness.
- III. The system of quality control for raw materials, process control and maintaining tolerances during manufacturing, assembly and fabrication.
- IV. Quality control during purchase of components, sub-systems and assemblies.
- V. Methods for ensuring selection of proper vendors/ sub-vendors.
- VI. Inspection of testing at shop after assembly.
- VII. Control of accuracy during calibration of measuring and testing equipments.
- VIII. Preservation and quality control during the transit.
- IX. Procedure for inspection before erection and quality control during erection.
- X. System for storage and delivery.

Bidder shall be wholly responsible for the quality control and quality assurance for the manufacture, supply, erection, testing and commissioning etc.

During inspection, destructive testing and non destructive test evaluation shall be done wherever applicable, in presence of Purchaser's representative in accordance with established norms. Directions of Purchaser shall be rigorously followed.

## 12. INSPECTION

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## TESTING

- 12.1** The Purchaser reserves the right to inspect any machinery and material to ensure that approved Q.A.P. is being strictly implemented by the Bidder or his Sub Bidder/ Supplier under this contract and to reject any item found defective in workmanship or design or otherwise unsuitable for the use and purpose intended or which is not in accordance with the intent of this contract. The Bidder should on demand by the Purchaser, rectify or replace such defective or unsuitable equipment, or the Purchaser may at the Bidder's expense, rectify or replace such defective or unsuitable equipment whether before or after supply.
- 12.2** That Bidder shall, for purpose of clause 15 of the annexed conditions of contract Form-A inform to the Purchaser places of manufacture, testing and inspection of various equipment offered by him. Unless specifically provided otherwise, all tests shall be carried out at the Bidder's work or for bought out items at sub-vendors works before dispatch.
- 12.3** The Bidder shall advise the Purchaser at least 4 weeks in advance as to when the equipment will be ready for stage/ final inspection at the Bidder's works or at his Sub-

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Bidder's works.

### **PENAL CHARGES**

In case the equipment is not available for inspection at the time of arrival of inspection officers, the Bidder shall pay to UPPTCL towards futile journey a sum decided by Chief Engineer (765 KV DU), UPPTCL and demanded by "Engineer of Contract". This amount shall be paid within 10 days from the date of demand. Further action for inspection of the material shall be taken only after the said amount is deposited.

- 12.4 During inspection, the Purchaser's Inspecting Engineers at all times have access to all part of shops where the equipment is being manufactured and also shall be provided with all reasonable inspection facilities by the Bidder and/ or sub-Bidders. Even without scheduled inspection, the Engineer and/or his duly authorized representative shall have at all reasonable times access to the Bidder's premises, works or site and shall have the power to inspect and examine the materials and workmanship of the works during it's manufacture or erection.

- 12.5 All plants equipment/ parts, sub assemblies/ assemblies shall comply with the requirement of type tests and shall be subjected to the routine/ acceptance tests specified in the set of standards adopted and to such other tests as are stipulated in the respective technical specifications.

The Purchaser reserves to himself the right of having at his own expense any inspection or special test of a reasonable nature at Bidder's premises or at site, in addition to those prescribed in applicable standards and the enclosed technical specifications.

- 12.6 The Engineer shall either depute his representative to witness the tests as applicable and inspect the material or shall waive the inspection. In case of waiver the Bidder or his sub-Bidder shall carryout the all applicable tests in absence of Purchaser's representative. In both the cases i.e. either inspection or waiver the test certificates shall be submitted to Engineer of Contract for approval and issue of dispatch authorization. In case of inspection the test certificates must bear signatures of the Purchaser's inspecting officer.

The Engineer of Contract, within 10 days of receipt of test certificates, shall issue approval/ dispatch authorization, if test certificates are found satisfactory.

In case test certificates are not found satisfactory the Engineer of Contract, within 10 days of receipt of test certificates, shall communicate his objections and actions required to be taken in writing to the Bidder. The Bidder shall take remedial action and shall re-submit the test certificates or re-offer the material for inspection as asked for by the Engineer. Subsequent actions shall follow as in case of fresh offer for inspection. No extension of delivery/ completion period shall be granted on this account.

### **12.7 REJECTON**

Purchaser reserves the right to reject any equipment if during the tests at works or site, the test value achieved do not comply with the respective standard/ specifications and

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exceeds that tolerable limits. Rejection of any equipment will not be held as a valid reason for delay in timely completion of the work.

- 12.8 No equipment to be furnished or used in connection with this contract shall be dispatched, until factory inspection and acceptance test have been carried out satisfactorily and dispatch authorization issued by Engineer of Contract. Such factory inspection of the equipment or approval of acceptance tests shall not however, relieve the Bidder from full responsibility for supplying equipment conforming to the requirements of this contract, nor prejudice any claim, right or privilege which the Purchaser may have because of the use of defective or unsatisfactory equipment. Should Purchaser waive the right to inspect any equipment, such waiver shall not relieve the Bidder in any way from his obligations under this contract. The inspection/waiver by Engineer and/ or approval of test certificates shall in no way limit the liabilities and responsibilities of the Bidder in respect of the agreed quality assurance program, and the desired performance of the equipment.
- 12.9 In all cases where the contract provides for tests whether at the premises or works of the Bidder or of any Sub-Bidder, the Bidder shall provide free of charge such items as labour, materials, electricity, fuel, water, stores, apparatus and instruments as may be reasonably required to carry out effectively, such tests on the equipment in accordance with the contract and shall give facilities to the Engineer or to his authorized representative to accomplish inspection. All the expenses incurred for testing including material consumed in testing shall be to the Bidder's account.
- 12.10 Purchaser will not entertain any request for waiver of inspection on the ground that subvendors are not agreeing for the Purchaser's inspection. It is the responsibility of the Bidder to ensure that all the requirements of the Purchaser as envisaged in the technical specifications are incorporated.
- 12.11 The Bidder is required to record the following certificates on the invoices and challans of each and every consignment:  
"Certified that material being dispatched against the above invoices and challan has been inspected and tested by the representative of Engineer of the contract on (date) and all the test results were satisfactory, as per approved test certificate enclosed."  
  
Or  
Certified that inspection of material being dispatched against the above invoice and challan has been waived off by Engineer of Contract vide letter No.....Dt..... (Copy enclosed) and all the acceptance and routine tests as per relevant standards and those provided in Contract, have been conducted and all the test results were found satisfactory as per test certificates enclosed."
- 12.12 In case the inspection or testing of the material is to be carried out outside India, all the expenditure including boarding and lodging etc. of the inspecting officer/ officers shall be borne by the contractor and information regarding inspection has to given at least 8 weeks in advance.
13. **PACKING**

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- 13.1 All equipment shall be suitably protected, coated, covered or boxed and crated to prevent damage or deterioration during transit, handling and storage at site till the time of erection.  
While packing all the materials, the limitations from the point of view of availability of transportation facilities in India should be taken into account. The Bidder shall be responsible for any loss or damage during transportation, handling and storage.
- 13.2 The Bidder shall include and provide for security protection and packing the plant so as to avoid loss or damage during transport by any mode.
- 13.3 All packing shall allow for easy removal and checking at site. Wherever necessary, proper arrangement for attaching slings for lifting shall be provided. All packages shall be clearly marked for with signs showing 'UP' and 'DOWN' side of boxes, and handling and unpacking instructions as considered necessary. Special precautions shall be taken to prevent rusting of steel and iron parts during transit and storage. Gas seals or other methods proposed to be adopted for protection against moisture during transit shall be to the satisfaction of the engineer.
- 13.4 The cases containing easily damageable material shall be very carefully packed and marked with appropriate caution symbols i.e. FRAGILE, HANDLE WITH CARE, USE NO HOOKS etc.
- 13.5 Each package delivered under the contract shall be marked by the Bidder at his expense and such marking must be distinct (all previous irrelevant marking being carefully obliterated). Such marking shall show the description and quantity of contents, the name of consignee and address, the gross and net weights of the package, the name of Bidder with a distinctive number of mark sufficient for purpose of identification. All markings shall be carried out with such materials as to ensure quickness of drying, fastness and legibility.
- 13.6 Each Package shall contain a note quoting specifically the name of the Bidder, the number and date of contract or order and the name of office placing the contract, nomenclature of the stores and include a schedule of parts for each complete equipment giving the parts number with reference to the General Arrangement/ Assembly drawing and the quantity of each part, drawing number and tag numbers.
- 13.7 All equipment/ material shall be suitably packed for transport, carriage at site and outdoor storage during transit. The Bidder shall be responsible for any damage to the equipment during transit. The contents of each package shall bear marking that can be readily identified from the package list and packing shall provide complete protection from moisture, termites and mechanical shocks etc.
- 13.8 Any material found short inside the packing cases shall be supplied by the Bidder without any extra cost.
- 13.9 Notwithstanding anything stated in this clause the Bidder shall be entirely responsible for any loss, damage or depreciation to the stores.
14. **DESPATCH OF EQUIPMENT**
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- 14.1** Detailed dispatch instructions will be intimated to the Bidder. All materials shall be dispatched by road.
- 14.2** The Bidder shall intimate, at least thirty (30) days in advance to the consignee as well as the concerned Superintending Engineer at site, the probable date when the equipment will be ready for dispatch from the works. Notification of delivery or dispatch in regard to each and every consignment shall be made to the Purchaser immediately after dispatch or delivery. The supplier shall further supply to the consignee a priced invoice and packing account of all stores delivered or dispatched by him. All packages, containers, bundles and loose materials forming parts of each and every consignment shall be described fully in the packing account, and full details of the contents of packages and quantity of material shall be given to enable the consignee to check the stores on arrival at destination.
- 14.3** A list in duplicate containing details of equipment for verification at site shall also be placed inside each package and shall correspond with the advice note. One additional copy of each of the package lists shall also be sent to the consignee.

**15. TYPE TESTING, INSPECTION, TESTING & INSPECTION CERTIFICATE**

The Bidder shall supply type tested (including special test as per technical specification) equipments and materials. The test reports/details shall be furnished by the Bidder in the bid.

In the event of any discrepancy in the test reports i.e. any test report not acceptable due to any design/manufacturing changes or due to non-compliance with the requirement stipulated in the Technical Specification and/or IEC/ IS, same, shall be carried out without any additional cost implication to the Purchaser. The Purchaser reserves the right to get any or all type tests conducted/ repeated.

The reports for all type tests and additional type tests as per technical specification furnished by the Bidder shall be of the tests conducted within last 10(five) years prior to the date of bid opening. The type tests conducted should have either been conducted in accredited laboratory (accredited based on ISO/ IEC Guide 25/ 17025 or EN 45001 by the national accreditation body of the country where laboratory is located) or witnessed by UPPTCL or representative authorized by UPPTCL or Utility or representative of accredited test lab or reputed consultant.

**15.1 Pre-commissioning Tests**

On completion of erection of the equipment and before charging, each item of the equipment shall be thoroughly cleaned and then inspected jointly by the Purchaser and the Contractor for correctness and completeness of installation and acceptability for charging, leading to initial pre-commissioning tests at Site. The list of pre-commissioning tests to be performed are given in respective chapters and shall be included in the Contractor's quality assurance programme.

**15.2 Commissioning Tests**

- 15.2.1** The available instrumentation and control equipment will be used during such tests and the Purchaser will calibrate, all such measuring equipment and devices as far as practicable.

- 15.2.2 Any special equipment, tools and tackles required for the successful completion of the Commissioning Tests shall be provided by the Contractor, free of cost.
- 15.2.3 The specific tests requirement on equipment have been brought out in the respective chapters of the technical specification.
- 15.2.4 The Contractor shall be responsible for obtaining statutory clearances from the concerned authorities for commissioning the equipment and the switchyard. However necessary fee shall be reimbursed by UPPTCL on production of requisite documents.

## **16. MATERIAL WORKMANSHIP**

### **16.1 General Requirement**

Where the specification does not contain references to workmanship, equipment, materials and components of the covered equipment, it is understood that the same must be new, of highest grade of the best quality of their kind, conforming to best engineering practice and suitable for the purpose for which they are intended.

The design of the works shall be such that installation, future expansions, replacements and general maintenance may be undertaken with a minimum of time and expenses. Each component shall be designed to be consistent with its duty and suitable factors of safety, subject to mutual agreements. All joints and fastenings shall be devised, constructed and documented so that the component parts shall be accurately positioned and restrained to fulfil their required function. In general screw threads shall be standard metric threads. The use of other thread forms will only be permitted when prior approval has been obtained from the Purchaser.

Whenever possible, all similar part of the Works shall be made to gauge and shall also be made interchangeable with similar parts. All spare parts shall also be interchangeable and shall be made of the same materials and workmanship as the corresponding parts of the Equipment supplied under the Specification. Where feasible, common component units shall be employed in different pieces of equipment in order to minimize spare parts stocking requirements. All equipment of the same type and rating shall be physically and electrically interchangeable.

All materials and equipment shall be installed in strict accordance with the manufacturer's recommendation(s). Only first-class work in accordance with the best modern practices will be accepted. Installation shall be considered as being the erection of equipment at its permanent location. This, unless otherwise specified, shall include unpacking, cleaning and lifting into position, grouting, leveling, aligning, coupling of or bolting down to previously installed equipment bases/foundations, performing the alignment check and final adjustment prior to initial operation, testing and commissioning in accordance with the manufacturer's tolerances, instructions and the Specification. All factory assembled rotating machinery shall be checked for alignment and adjustments made as necessary to re-establish the manufacturer's limits.

Suitable guards shall be provided for the protection of personnel on all exposed rotating and/ or moving machine parts and shall be designed for easy installation and removal for maintenance purposes. The spare equipment(s) shall be installed at designated locations and tested for healthiness.



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The Bidder shall apply oil and grease of the proper specification to suit the machinery, as is necessary for the installation of the equipment. Lubricants used for installation purposes shall be drained out and the system flushed through where necessary for applying the lubricant required for operation. The Bidder shall apply all operational lubricants to the equipment installed by him.

All oil, grease and other consumables used in the Works/ Equipment shall be purchased in India unless the Bidder has any special requirement for the specific application of a type of oil or grease not available in India. In such is the case he shall declare in the proposal, where such oil or grease is available. He shall help Purchaser in establishing equivalent Indian make and Indian Contractor. The same shall be applicable to other consumables too.

A cast iron or welded steel base plate shall be provided for all rotating equipment which are to be installed on a concrete base unless otherwise agreed to by the Purchaser. Each base plate shall support the unit and its drive assembly, shall be of design with pads for anchoring the units and shall have a raised up all around and shall have threaded in air connections, of so required.

#### **16.2 Provisions For Exposure to Hot and Humid climate**

Outdoor equipment supplied under the specification shall be suitable for service and storage under tropical conditions of high temperature, high humidity, heavy rainfall and environment favourable to the growth of fungi and mildew. The indoor equipments located in non-air conditioned areas shall also be of same type.

#### **16.3 Space Heaters**

The heaters shall be suitable for continuous operation at 240V AC supply. On-off switch and fuse shall be provided for the heater.

One or more adequately rated thermostatically connected heaters shall be supplied to prevent condensation in any compartment. The heaters shall be installed in the lower portion of the compartment and electrical connections shall be made sufficiently away from below the heaters to minimize deterioration of supply wire insulation. The heaters shall be suitable to maintain the compartment temperature to prevent condensation.

The heaters shall be suitably designed to prevent any contact between the heater wire and the air and shall consist of coiled resistance wire centred in a metal sheath and completely encased in a highly compacted powder of magnesium oxide or other material having equal heat conduction and electrical insulation properties, or they shall consist of resistance wire wound on a ceramic and completely covered with a ceramic material to prevent any contact between the wire and the air. Alternatively, they shall consist of a resistance wire mounted into a tubular ceramic body built into an envelope of stainless steel or the resistance wire is wound on a tubular ceramic body and embedded in glaze. The surface temperature of the heaters shall be restricted to a value which will not shorten the life of the heater sheaths or that of insulator wire or other component in the compartments.

#### **16.4 FUNGI STATIC VARNISH**

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Besides the space heaters, special moisture and fungus resistant varnish shall be applied on parts which may be subjected or predisposed to the formation of fungi due to the presence or deposit of nutrient substances. The varnish shall not be applied to any surface of part where the treatment will interface with the operation or performance of the equipment. Such surfaces or parts shall be protected against the application of the varnish.

#### **16.5 Ventilation opening**

In order to ensure adequate ventilation, compartments shall have ventilation openings provided with fine wire mesh of brass to prevent the entry of insects and to reduce to a minimum the entry of dirt and dust. Outdoor compartment openings shall be provided with shutter type blinds and suitable provision shall be made so as to avoid any communication of air/ dust with any part in the enclosures of the Control Cabinets, Junction boxes and Marshalling Boxes, panels etc.

#### **16.6 Degree of Protection**

The enclosures of the Control Cabinets, Junction boxes and Marshalling Boxes, panels etc. to be installed shall provide degree of protection as detailed here under:

- a) Installed out door: IP- 55
- b) Installed indoor in air conditioned area: IP-31
- c) Installed in covered area: IP-52
- d) Installed indoor in non air conditioned area where possibility of entry of water is limited: IP-41.
- e) For LT Switchgear (AC & DC distribution Boards) : IP-52

The degree of protection shall be in accordance with IS:13947 (Part-I) / IEC-60947(Part-I) / IS 12063 / IEC-60529. Type test report for degree of protection test, shall be submitted for approval.

#### **16.7 RATING PLATES, NAME PLATES AND LABELS**

Each main and auxiliary item of substation is to have permanently attached to it in a conspicuous position a rating plate of non-corrosive material upon which is to be engraved manufacturer's name, year of manufacture, equipment name, type or serial number together with details of the loading conditions under which the item of substation in question has been designed to operate, and such diagram plates as may be required by the Purchaser. The rating plate of each equipment shall be according to IEC requirement.

All such nameplates, instructions plates, rating plates CB, CT, VT, SA, Isolators and Relay & Protection panels equipments shall be bilingual with Hindi inscription first followed by English.

Alternatively, two separate plates one with Hindi and the other with English inscriptions may be provided.

#### **16.8 FIRST FILL OF CONSUMABLES, OIL AND LUBRICANTS**

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All the first fill of consumables such as oils, lubricants, filling compounds, touch up paints, soldering/brazing material for all copper piping of circuit breakers and essential chemicals etc. which will be required to put the equipment, covered under the scope of the specifications, into successful operation, shall be furnished by the Bidder unless specifically excluded under the exclusions in these specifications and documents.

**17. Surface finish**

All interiors and exteriors of tanks, control cubicles and other metal parts shall be thoroughly cleaned to remove all rust, scales, corrosion, greases or other adhering foreign matter. All steel surfaces in contact with insulating oil as far as accessible shall be painted with not less than two coats of heat resistant, oil insoluble, insulating paints.

All metal surfaces exposed to atmosphere shall be given two primer coats of zinc chromate and two coats of epoxy paint with epoxy base thinner. All metal parts not accessible for painting shall be made of corrosion resisting material. All machine finished or bright surfaces shall be coated with a suitable preventive compound and suitably wrapped or otherwise protected. All paints shall be carefully selected to withstand tropical heat and extremes of weather within the limit specified. The paint shall not scale off or wrinkle or be removed by abrasion due to normal handling.

All external painting shall be as per shade No. 631 of IS: 5.

**18. HOT DIP GALVANISING**

All ferrous parts including all sizes of nuts, bolts, plain and spring washers, support channels, structures, shall be hot dip galvanized conforming to latest version of IS: 2629 or any other equivalent authoritative standard. However, hardware less than M12 size shall be electrogalvanized.

Minimum weight of zinc coating shall be 610 gm/ sq.mm and minimum thickness of coating shall be 85 microns for all items thicker than 6 mm. For items lower than 6mm thickness, requirement of coating shall be as per relevant ASTM. For surface which shall be embedded in concrete, the zinc coating shall be 610 gm/sq. m minimum.

The galvanized surfaces shall have a continuous and uniform thick coating of zinc, firmly adhering to the surface of steel. The finished surface shall be clean and smooth and shall be free from defects like discoloured patches, bare spots, unevenness of coating, spelter which is loosely attached to the steel globules, spiky deposits, blistered surface, flaking or peeling off, etc. The presence of any of these defects noticed on visual or microscopic inspection shall render the material liable to rejection.

After galvanizing, no drilling or welding shall be performed on the galvanized parts of the equipment excepting that nuts may be threaded after galvanizing. Sodium dichromate treatment shall be provided to avoid formation of white rust after hot dip galvanization.

Galvanised material must be transported properly to ensure that galvanised surfaces are not damaged during transit. Application of zinc rich paint at site shall not be allowed.

**19. PAINTING**

- 19.1 All sheet steel work shall be degreased, pickled, phosphated in accordance with the IS-6005 "Code of practice for phosphating iron and sheet". All surfaces, which will not be easily accessible after shop assembly, shall beforehand be treated and protected for the life of the equipment. The surfaces, which are to be finished painted after installation or require corrosion protection until installation, shall be shop painted with at least two coats of primer. Oil, grease, dirt and swaf shall be thoroughly removed by emulsion cleaning. Rust and scale shall be removed by pickling with dilute acid followed by washing with running water, rinsing with slightly alkaline hot water and drying.
- 19.2 After phosphating, thorough rinsing shall be carried out with clean water followed by final rinsing with dilute dichromate solution and oven drying. The phosphate coating shall be sealed with application of two coats of ready mixed, stoving type zinc chromate primer. The first coat may be "flash dried" while the second coat shall be stoved.
- 19.3 After application of the primer, two coats of finishing synthetic enamel paint shall be applied, each coat followed by stoving. The second finishing coat shall be applied after inspection of first coat of painting.
- 19.4 The exterior and interior colour of the paint in case of new substations shall preferably be RAL 7032 for all equipment, marshalling boxes, junction boxes, control cabinets, panels etc. unless specifically mentioned under respective sections of the equipments. Glossy white colour inside the equipments /boards/panels/junction boxes is also acceptable. The exterior colour for panels shall bematching with the existing panels in case of extension of a substation. Each coatof primer and finishing paint shall be of slightly different shade to enable inspection of the painting. A small quantity of finishing paint shall be supplied for minor touching up required at site after installation of the equipments.
- 19.5 In case the Bidder proposes to follow his own standard surface finish and protection procedures or any other established painting procedures, like electrostatic painting etc., the procedure shall be submitted alongwith the Bids for Purchaser's review & approval.

The colour scheme as given below shall be followed for Fire Protection and Air Conditioning systems

| S.No.                          | PIPE LINE                                | Base colour | Band colour |
|--------------------------------|------------------------------------------|-------------|-------------|
| <b>Fire Protection System</b>  |                                          |             |             |
| 1                              | Hydrant and Emulsifier system pipeline   | FIRE RED    | -           |
| 2                              | Emulsifier system detection line – water | FIRE RED    | Sea Green   |
| 3                              | Emulsifier system detection line – Air   | FIRE RED    | Sky Blue    |
| 4                              | Pylon support pipes                      | FIRE RED    |             |
| <b>Air Conditioning System</b> |                                          |             |             |

|   |                                                    |                      |           |
|---|----------------------------------------------------|----------------------|-----------|
| 5 | Refrigerant gas pipeline – at compressor suction   | Canary Yellow        | -         |
| 6 | Refrigerant gas pipeline – at compressor discharge | Canary Yellow        | Red       |
| 7 | Refrigerant liquid pipeline                        | Dark Admiralty Green | -         |
| 8 | Chilled water pipeline                             | Sea Green            | -         |
| 9 | Condenser water pipeline                           | Sea Green            | Dark Blue |

#### 19.6 COLOUR SCHEME AND CODES FOR PIPE SERVICE

The Bidder shall propose a colour scheme for the those equipments/ items for which the colour scheme has not been specified in the specification. For the approval of

- a) For connecting ACSR/ AAC conductor Aluminum alloy casting conforming to designation A6 of IS:617 and shall be tested for all tests as per IS:617
- b) For connecting equipment terminals made of copper or ACSR conductor Bimetallic connectors made from aluminum alloy casting conforming to designation A6 IS: 617 with 4mm thick cast copper lines and shall be tested as per IS:617
- c) For connecting G.I.Shield wire Malleable iron casting.
- d) Bolts, nuts and plain washers. Hot dip galvanising mild steel
20. e) Spring washers for items 'a' to 'c' Electrogalvanised-suitable for at least 3 service conditions as per IS:3063 & IS:1573
- f) Misc. Mild steel.

#### 21. CLAMPS AND CONNECTORS INCLUDING TERMINAL CONNECTORS

21.1 All power clamps and connectors shall conform to IS:5561 & NEMA CC1 and shall be made of materials listed below:

- ε For connecting ACSR conductors Aluminum alloy casting, conforming to designation A6 of IS:617 and all test shall conform to IS:617

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|       |       |                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                     |
|-------|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|       | t     | For connecting equipment terminals made of copper with ACSR conductors                                                                                                                                                                                                                                                                                                                                        | Bimetallic connectors made from aluminum alloy casting, conforming to designation A6 of IS:617 with 2mm thick bimetallic liner and all test shall conform to IS:617 |
|       | c     | For connecting G.I                                                                                                                                                                                                                                                                                                                                                                                            | Galvanised mild steel shield wire                                                                                                                                   |
|       | d) i) | Bolts, nuts & Plain, washers galvanised.                                                                                                                                                                                                                                                                                                                                                                      | i) Electrogalvanised for sizes below M12, for others hot dip                                                                                                        |
|       | ii)   | Spring washers items 'a' to 'c' IS:1573                                                                                                                                                                                                                                                                                                                                                                       | ii) Electro-galvanised mild for steel suitable for atleast service condition-3 as per                                                                               |
| 21.2  |       | Necessary clamps and connectors shall be supplied for all equipment and connections. The requirement regarding external corona and RIV as specified for any equipment shall include its terminal fittings. If corona rings are required to meet these requirements they shall be considered as part of that equipment and included in the scope of work.                                                      |                                                                                                                                                                     |
| 21.3  |       | Where copper to aluminum connections are required, bi-metallic clamps shall be used, which shall be properly designed to ensure that any deterioration of the connection is kept to a minimum and restricted to parts which are not current carrying or subjected to stress.                                                                                                                                  |                                                                                                                                                                     |
| 21.4  |       | Low voltage connectors, grounding connectors and accessories for grounding allequipment as specified in each particular case, are also included in the scope of Work.                                                                                                                                                                                                                                         |                                                                                                                                                                     |
| 21.5  |       | No current carrying part of any clamp shall be less than 10 mm thick. All ferrous parts shall be hot dip galvanised. Copper alloy liner of minimum 2 mm thickness shall be cast integral with aluminum body or 2 mm thick bi-metallic strips shall be provided for Bi-metallic clamps.                                                                                                                        |                                                                                                                                                                     |
| 21.6  |       | All casting shall be free from blow holes, surface blisters, cracks and cavities. All sharp edges and corners shall be blurred and rounded off.                                                                                                                                                                                                                                                               |                                                                                                                                                                     |
| 21.7  |       | Flexible connectors, braids or laminated straps made for the terminal clamps for bus posts shall be suitable for both expansion or through (fixed/sliding) type connection of 4" IPS AL. tube as required. In both the cases the clamp height (top of the mounting pad to centre line of the tube) should be same.                                                                                            |                                                                                                                                                                     |
| 21.8  |       | Clamp shall be designed to carry the same current as the conductor and the temperature rise shall be equal or less than that of the conductor at the specified ambient temperature. The rated current for which the clamp/connector is designed with respect to the specified reference ambient temperature, shall also be indelibly marked on each component of the clamp/connector, except on the hardware. |                                                                                                                                                                     |
| 21.9  |       | All current carrying parts shall be designed and manufactured to have minimum contact resistance.                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                     |
| 21.10 |       | Clamps and connectors shall be designed to be corona controlled.                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                     |
| 21.11 |       | Tests                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                     |

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Clamps and connectors should be type tested as per IS:5561 and shall also be subjected to routine tests as per IS:5561. Following type test reports shall be submitted for approval as per clause 9.2 above except for sl. no.(ii) & (iii) for which type test once conducted shall be applicable (i.e. the requirement of test conducted within last ten years shall not be applicable).

- I. Temperature rise test (maximum temperature rise allowed is 35°C over 50°C ambient)
- II. Short time current test
- III. Corona (dry) and RIV (dry) test (for 220 KV and above voltage level clamps)
- IV. Resistance test and tensile test

## **22. CONTROL CABINETS, JUNCTION BOXES, TERMINAL BOXES & MARSHALLING BOXES FOR OUTDOOR EQUIPMENT**

- 22.1** All types of boxes, cabinets etc. shall generally conform to and be tested in accordance with IS- 5039/ IS-8623, IEC-60439, as applicable, and the clauses given below.
- 22.2** Control cabinets, junction boxes, marshalling boxes and terminal boxes shall be made of sheet steel or aluminum enclosure and shall be dust, water and vermin proof. Sheet steel used shall be at least 2.0 mm thick cold rolled or 2.5 mm hot rolled. The box shall be properly braced to prevent wobbling. There shall be sufficient reinforcement to provide level surfaces, resistance to vibrations and rigidity during transportation and installation. In case of aluminum enclosed box, the thickness of aluminum shall be such that it provides adequate rigidity and long life as comparable with sheet steel of specified thickness.
- 22.3** Cabinet/boxes shall be free standing floor mounting type, wall mounting type or pedestal mounting type as per requirements. A canopy and sealing arrangements for operating rods shall be provided in marshalling boxes/ Control cabinets to prevent ingress of rain water.
- 22.4** Cabinet/boxes shall be provided with double hinged doors with padlocking arrangements. The distance between two hinges shall be adequate to ensure uniform sealing pressure against atmosphere. The quality of the gasket shall be such that it does not get damaged/cracked during the operation of the equipment.
- 22.5** All doors, removable covers and plates shall be provided gasket all around with suitably profiled EPDM/Neoprene gaskets. The gasket shall be tested in accordance with approved quality plan, IS:11149 and IS:3400. The quality of gasket shall be such that it does not get damaged/cracked during 10(ten) years of operation of the equipment or its major overhaul whichever is earlier.

All gasketed surfaces shall be smooth straight and reinforced if necessary to minimize distortion and to make a tight seal. Ventilating Louvers, if provided, shall have screen and filters, the screen shall be fine wire mesh made of brass.

- 22.6** All boxes/ cabinets shall be designed for the entry of cables from bottom by means of weather proof and dust-proof connections. Boxes and cabinets shall be designed with generous clearances to avoid interference between the wiring entering from below and any terminal blocks or accessories mounted within the box or cabinet. Suitable cable

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gland plate projecting at least 150 mm above the base of the marshalling kiosk/box shall be provided for this purpose along with the proper blanking plates. Necessary number of cable glands shall be supplied and fitted on this gland plate. Gland plate shall have provision for some future glands to be provided later, if required.

22.7 A 240V, single phase, 50 Hz, 15 amp AC plug and socket shall be provided in the cabinet with ON-OFF switch for connection of hand lamps. Plug and socket shall be of industrial grade.

22.8 For illumination, a 20 Watts fluorescent tube or 15 watts CFL/LED bulb shall be provided. The switching of the fittings shall be controlled by the door switch.

For junction boxes of smaller sizes such as lighting junction box, manual operated earth switch mechanism box etc., plug socket, heater and illumination is not required to be provided.

22.9 All control switches shall be of rotary type. Toggle piano switches shall not be accepted.

22.10 Positive earthing of the cabinet shall be ensured by providing two separate earthing pads. The earth wire/ strip shall be terminated on to the earthing pad and secured by the use of self etching washer. Earthing of hinged door shall be done by using a separate earth wire.

22.11 The bay marshalling kiosks shall be provided with danger plate and a diagram showing the numbering/connection/feruling by pasting the same on the inside of the door.

22.12 The following routine tests alongwith the routine tests as per IS: 5039 shall also be conducted:

Check for wiring

Visual and dimension check

The enclosure of bay marshalling kiosk, junction box, terminal box shall be type tested for IP-55 as per IS: 13947. After IP-55 test, 2.5 kVrms for 1 (one) minute, insulation resistance and functional test should be conducted.

#### 22.13 Auxiliary Switches

All the auxiliary switches shall be fully type tested as per relevant IS.

The following type test reports on auxiliary switches shall be submitted:

- a) Electrical endurance test - A minimum of 2000 operation for 2A D. C. with a time constant greater than or equal to 20 millisecond with a subsequent examination of mV drop/visual defects/temperature rise test.
- b) Mechanical endurance test. A minimum of 1,00,000 operations with a subsequent checking of contact pressure test/visual examination.
- c) Heat run test on contacts.
- d) IR/HV test etc.

#### 23. TERMINAL BLOCKS AND WIRING



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- 23.1 Control and instrument leads from the switchboards or from other equipment will be brought to terminal boxes or control cabinets in conduits. All interphase and external connections to equipment or to control cubicles will be made through terminal blocks.
- 23.2 Terminal blocks shall be 1100 V grade and have continuous rating to carry the maximum expected current on the terminals. These shall be of moulded piece, complete with insulated/barriers stud type terminals, washers, nuts and lock nuts. Screw clamp, overall insulated, insertion type, rail mounted terminals can be used in place of stud type terminals.
- 23.3 But preferably the terminal blocks shall be non-disconnecting stud type of Elmex type CATM4, phoenix cage clamp type or equivalent. The insulating material of terminal block shall be nylon which shall be free of halogens, fluorocarbons etc.
- 23.4 Terminal blocks for current transformer and voltage transformer secondary leads shall be provided with test links and isolating facilities. The current transformer secondary leads shall also be provided with short circuiting and earthing facilities.
- 23.5 The terminals shall be such that maximum contact area is achieved when a cable is terminated. The terminal shall have a locking characteristic to prevent cable from escaping from the terminal clamp unless it is done intentionally.
- 23.6 The conducting part in contact with cable shall preferably be tinned or silver plated, however Nickel plated copper or zinc plated steel shall also be acceptable.
- 23.7 The terminal blocks shall be of extensible design.
- 23.8 The terminal blocks shall have locking arrangement to prevent its escape from the mounting rails.
- 23.9 The terminal blocks shall be fully enclosed with removable covers of transparent, non-deterioration type plastic material. Insulating barriers shall be provided between the terminal blocks. These barriers shall not hinder the operator from carrying out the wiring without removing the barriers.
- 23.10 Unless otherwise specified terminal blocks shall be suitable for connecting the following conductors on each side.
- a) All circuits except CT circuits - Minimum of 2 nos. of 2.5 sq. mm copper flexible
  - b) All CT circuits - Minimum of 4 nos. of 2.5 sq.mm copper flexible
- 23.11 The arrangements shall be in such a manner so that it is possible to safely connect or disconnect terminals on live circuits and replace fuse links when the cabinet is live.
- 23.12 At least 20% spare terminals shall be provided on each panel/cubicle/box and these spare terminals shall be uniformly distributed on all terminal rows.
- 23.13 There shall be minimum clearance of 250 mm between the first bottom row of terminal block and the associated cable gland plate. Also the clearance between two rows of terminal blocks shall be a minimum of 150 mm.

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23.14 The Bidder shall furnish all wire, conduits and terminals for the necessary interphase electrical connections (where applicable) as well as between phases and common terminal boxes or control cabinets.

23.15 All input and output terminals of each control cubicle shall be tested for surge withstand capability in accordance with the relevant IEC Publications, in both longitudinal and transverse modes. The Bidder shall also provide necessary filtering, surge protection, interface relays and any other measures necessary to achieve an impulse withstand level at the cable interfaces of the equipment.

#### **24. LAMPS & SOCKETS**

##### **24.1 Lamps**

All incandescent lamps shall use a socket base as per IS-1258, except in the case of signal lamps.

##### **24.2 Sockets**

All sockets (convenience outlets) shall be suitable to accept both 5 Amp & 15 Amp pin round Standard Indian plugs. They shall be switched sockets with shutters.

##### **24.3 Hand Lamp**

A 240 Volts, single Phase, 50 Hz AC plug point shall be provided in the interior of each cubicle with ON- OFF Switch for connection of hand lamps.

##### **24.4 Switches and Fuses**

Each panel shall be provided with necessary arrangements for receiving, distributing, isolating and fusing of DC and AC supplies for various control, signalling, lighting and space heater circuits. The incoming and sub-circuits shall be separately provided with miniature circuit breaker/ switchfuse units. Selection of the main and Sub-circuit fuse ratings shall be such as to ensure selective clearance of sub-circuit faults. Potential circuits for relaying and metering shall be protected by HRC fuses.

All fuses shall be of HRC cartridge type conforming to IS-9228 mounted on plug-in type fuse bases. Miniature circuit breakers with thermal protection and alarm contacts will also be accepted. All accessible live connection to fuse bases shall be adequately shrouded. Fuses shall have operation indicators for indicating blown fuse condition. Fuse carrier base shall have imprints to the fuse rating and voltage. All control switches shall be of rotary type. Toggle piano switches shall not be accepted.

#### **25. Bushings, Hollow Column Insulators, Support Insulators:**

25.1 Bushings shall be manufactured and tested in accordance with IS:2099 & IEC-60137 while hollow column insulators shall be manufactured and tested in accordance with IEC-62155/IS:5621. The support insulators shall be manufactured and tested as per IS:2544/IEC-60168 and IEC-60273. The insulators shall also conform to IEC-60815 as applicable. The bidder may also offer composite hollow insulators, conforming to IEC-61462.

25.2 Support insulators, bushings and hollow column insulators shall be manufactured from high quality porcelain. Porcelain used shall be homogeneous, free from laminations, cavities and other flaws or imperfections that might affect the mechanical or dielectric quality and shall be thoroughly vitrified tough and impervious to

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moisture.

- 25.3** Glazing of the porcelain shall be uniform brown in colour, free from blisters, burrs and similar other defects.
- 25.4** Support insulators/bushings/hollow column insulators shall be designed to have ample insulation, mechanical strength and rigidity for the conditions under which they will be used.
- 25.5** When operating at normal rated voltage there shall be no electric discharge between the conductors and bushing which would cause corrosion or injury to conductors, insulators or supports by the formation of substances produced by chemical action. No radio interference shall be caused by the insulators/bushings when operating at the normal rated voltage.
- 25.6** Bushing porcelain shall be robust and capable of withstanding the internal pressures likely to occur in service. The design and location of clamps and the shape and the strength of the porcelain flange securing the bushing to the tank shall be such that there is no risk of fracture. All portions of the assembled porcelain enclosures and supports other than gaskets, which may in any way be exposed to the atmosphere shall be composed of completely non hygroscopic material such as metal or glazed porcelain.
- 25.7** All iron parts shall be hot dip galvanised and all joints shall be air tight. Surface of joints shall be trued up porcelain parts by grinding and metal parts by machining. Insulator/bushing design shall be such as to ensure a uniform compressive pressure on the joints.

**25.8 Tests**

In bushing, hollow column insulators and support insulators shall conform to type tests and shall be subjected to routine tests in accordance with IS: 2099 & IS:2544 & IS : 5621.

**26. MOTORS**

Motors shall be "Squirrel Cage" three phase induction motors of sufficient size capable of satisfactory operation for the application and duty as required for the driven equipment and shall be subjected to routine tests as per applicable standards. The motors shall be of approved make.

**26.1 Enclosures**

- a) Motors to be installed outdoor without enclosure shall have hose proof enclosure equivalent to IP-55 as per IS: 4691. For motors to be installed indoor i.e. inside a box, the motor enclosure, shall be dust proof equivalent to IP-44 as per IS: 4691.
- b) Two independent earthing points shall be provided on opposite sides of the motor for bolted connection of earthing conductor.
- c) Motors shall have drain plugs so located that they will drain water resulting from condensation or other causes from all pockets in the motor

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casing.

- d) Motors weighing more than 25 Kg. shall be provided with eyebolts, lugs or other means to facilitate lifting.

## 26.2 Operational Features

- a) Continuous motor rating (name plate rating) shall be at least ten (10) percent above the maximum load demand of the driven equipment at design duty point and the motor shall not be over loaded at any operating point of driven equipment that will rise in service.
- b) Motor shall be capable at giving rated output without reduction in the expected life span when operated continuously in the system having the particulars as given in Clause 15.0 of this Section.

## 26.3 Starting Requirements:

- a) All induction motors shall be suitable for full voltage direct-on-line starting. These shall be capable of starting and accelerating to the rated speed alongwith the driven equipment without exceeding the acceptable winding temperature even when the supply voltage drops down to 80% of the rated voltage.
- b) Motors shall be capable of withstanding the electrodynamic stresses and heating imposed if it is started at a voltage of 110% of the rated value.
- c) The locked rotor current shall not exceed six (6) times the rated full load current for all motors, subject to tolerance as given in IS:325.
- d) Motors when started with the driven equipment imposing full starting torque under the supply voltage conditions specified under Clause 15.0 shall be capable of withstanding atleast two successive starts from cold condition at room temperature and one start from hot condition without injurious heating of winding. The motors shall also be suitable for three equally spread starts per hour under the above referred supply condition.
- e) The locked rotor withstand time under hot condition at 110% of rated voltage shall be more than starting time with the driven equipment of minimum permissible voltage by at least two seconds or 15% of the accelerating time whichever is greater. In case it is not possible to meet the above requirement, the Bidder shall offer centrifugal type speed switch mounted on the motor shaft which shall remain closed for speed lower than 20% and open for speeds above 20% of the rated speed. The speed switch shall be capable of withstanding 120% of the rated speed in either direction of rotation.

## 26.4 Running Requirements:

- a) The maximum permissible temperature rise over the ambient temperature of 50 degree C shall be within the limits specified in IS:325 (for 3 - phase induction motors) after adjustment due to increased ambient temperature specified.
- b) The double amplitude of motor vibration shall be within the limits

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specified in IS: 4729. Vibration shall also be within the limits specified by the relevant standard for the driven equipment when measured at the motor bearings.

- c) All the induction motors shall be capable of running at 80% of rated voltage for a period of 5 minutes with rated load commencing from hot condition.

## 26.5 TESTING AND COMMISSIONING

An indicative list of tests is given below. Contractor shall perform any additional test based on specialities of the items as per the field Q.P./Instructions of the equipment Contractor or Purchaser without any extra cost to the Purchaser. The Contractor shall arrange all instruments required for conducting these tests alongwith calibration certificates and shall furnish the list of instruments to the Purchaser for approval.

- (a) Insulation resistance.
  - (b) Phase sequence and proper direction of rotation.
  - (c) Any motor operating incorrectly shall be checked to determine the cause and the conditions corrected.
-



## SCHEDULE OF COMMERCIAL DEVIATION

TENDER ENQUIRY NO. - 48G2000368 dated 19/12/2019

The following are the deviations/ variations exception from the General Terms and Conditions:

| SL.NO. | CLAUSE NO. OF GENERAL<br>TERMS AND CONDITIONS | STATEMENT OF DEVIATION |
|--------|-----------------------------------------------|------------------------|
|        |                                               |                        |

In case, this schedule is not submitted, it will be presumed that the equipment /material to be supplied under this contract is deemed to be in compliance with the General Terms and Conditions.

If there is NIL deviation,even then the format to be filled as NIL DEVIATION.

**Note :** Continuation Sheets of like size and format may be used as per the Bidder's Requirement and shall be annexed to this schedule.

**All deviations must be mentioned in this format only. Deviation(s) to terms mentioned else where will not be considered.**

Place:      é é é é é é  
Date :      é é é é é é .

Signature of the authorised representative of

Bidder's name :é é é é é é é é é é é é  
Designation:é é é é é é é é é é é é ..  
Company Seal:é é é é é é é é é é é é

## SCHEDULE OF TECHNICAL DEVIATION

**TENDER ENQUIRY NO. - 48G2000368 dated 19/12/2019**

**The following are the deviations/ variations exception from the Technical Specifications:**

| SL.NO. | CLAUSE NO. OF GENERAL<br>TERMS AND CONDITIONS | STATEMENT OF DEVIATION |
|--------|-----------------------------------------------|------------------------|
|        |                                               |                        |
|        |                                               |                        |

In case, this schedule is not submitted, it will be presumed that the equipment /material to be supplied under this contract is deemed to be in compliance with the Technical Specifications,

If there is NIL deviation,even then the format to be filled as NIL DEVIATION.

**Note :** Continuation Sheets of like size and format may be used as per the Bidder's Requirement and shall be annexed to this schedule.

**All deviations must be mentioned in this format only. Deviation(s) to terms mentioned else where will not be considered.**

Place:      é é é é é é é  
Date :      é é é é é é é .

Signature of the authorised representative of

Bidder's name :é é é é é é é é é é é é  
Designation:é é é é é é é é é é é é é é ..  
Company Seal:é é é é é é é é é é é é é é



**Annexure for List of Banks ( 32 Nos.)**

| Sr. No. | Name of Bank                                          |
|---------|-------------------------------------------------------|
| 1       | Allahabad Bank                                        |
| 2       | Andhra Bank                                           |
| 3       | Bank of Baroda                                        |
| 4       | Canara Bank                                           |
| 5       | Corporation Bank                                      |
| 6       | Central Bank                                          |
| 7       | Indian Bank                                           |
| 8       | Indian Overseas Bank                                  |
| 9       | Oriental Bank of Commerce                             |
| 10      | Punjab National Bank                                  |
| 11      | Punjab & Sindh Bank                                   |
| 12      | State Bank of India                                   |
| 13      | State Bank of Hyderabad                               |
| 14      | Syndicate Bank                                        |
| 15      | State Bank of Travancore                              |
| 16      | UCO Bank                                              |
| 17      | Union Bank of India                                   |
| 18      | United Bank of India                                  |
| 19      | Vijaya Bank                                           |
| 20      | IDBI                                                  |
| 21      | CITI Bank N. A.                                       |
| 22      | Deutsche Bank AG                                      |
| 23      | The Hongkong and Shanghai Banking Corporation Limited |
| 24      | Standard Chartered Bank                               |
| 25      | J P Morgan                                            |
| 26      | Axis Bank                                             |
| 27      | The Federal Bank Limited                              |
| 28      | HDFC                                                  |
| 29      | Kotak Mahindra Bank                                   |
| 30      | ICICI                                                 |
| 31      | Indusind Bank                                         |
| 32      | Yes Bank                                              |

## Annexure - 2

### **Certificate by Chartered Accountant on letter head**

This is to Certify that M/S .....  
(hereinafter referred to as 'company') having its registered office at .....  
..... is registered under MSMED Act 2006, (Entrepreneur  
Memorandum No (Part-II) ..... dtd:.....,  
Category: ..... (Micro/Small)). (Copy enclosed).

Further verified from the Books of Accounts that the investment of the company as per the latest audited financial year ..... as per MSMED Act 2006 is as follows:

1. **For Manufacturing Enterprises:** Investment in plant and machinery (i.e. original cost excluding land and building and the items specified by the Ministry of Small Scale Industries vide its notification No.S.O.1722(E) dated October 5, 2006 :  
Rs.....Lacs
2. **For Service Enterprises:** Investment in equipment (original cost excluding land and building and furniture, fittings and other items not directly related to the service rendered or as may be notified under the MSMED Act, 2006:  
Rs.....Lacs

**(Strike off whichever is not applicable)**

The above investment of Rs.....Lacs is within permissible limit of Rs.....Lacs for .....Micro / Small **(Strike off which is not applicable)** Category under MSMED Act 2006.

Or

The company has been graduated from its original category (Micro/ Small) **(Strike off which is not applicable)** and the date of graduation of such enterprise from its original category is ..... (dd/mm/yyyy) which is within the period of 3 years from the date of graduation of such enterprise from its original category as notified vide S.O. No. 3322(E) dated 01.11.2013 published in the gazette notification dated 04.11.2013 by Ministry of MSME.

Date:

(Signature)

Name -

Membership number -

Seal of Chartered Accountant

(Revised Format)

DKM/SS/RK9/18

22  
10/06/15



**BHARAT HEAVY ELECTRICALS LIMITED**  
**TRANSMISSION BUSINESS GROUP**  
**MATERIAL RECEIPT CERTIFICATE**

- a) Site:  
b) LR No. with date:  
c) Vehicle no.:  
d) Date of receipt of material at site:  
e) Material details (as mentioned below):

| S.no. | Item Description | Type of Packages | Unit (MT/KM/ NO.) | Qty as per packing list | Qty Received | Remarks |
|-------|------------------|------------------|-------------------|-------------------------|--------------|---------|
|       |                  |                  |                   |                         |              |         |
|       |                  |                  |                   |                         |              |         |
|       |                  |                  |                   |                         |              |         |
|       |                  |                  |                   |                         |              |         |
|       |                  |                  |                   |                         |              |         |

Other Remarks:

Signature with date: \_\_\_\_\_

Name & Designation: \_\_\_\_\_

(With Seal)

## **INSPECTION REQUEST**

1. Name & Address of Supplier :
2. Project :
3. Purchase Order No., Revision No. & Date :
4. Details of equipment / Material to be Inspected

| Sl. No. | Material offered for Inspection | P.O. Item No. | Total Quantity Ordered | Quantity offered for Inspection | Quantity Already Cleared | P.O. value of offered qty. |
|---------|---------------------------------|---------------|------------------------|---------------------------------|--------------------------|----------------------------|
|         |                                 |               |                        |                                 |                          |                            |

5. For structure, whether BOM & Proto Corrected Drawings approved and available at place of inspection : Yes / No
6. Whether GTP/Drgs approved in Category – 1 available at place of inspection : Yes / No
7. Whether Quality Plan approved in Category – 1 available at place of inspection : Yes / No.
8. Whether all type tests approved by Engineering :Yes / No
9. (a) Place of Inspection & Address :
9. (b) Name & contact No. of Supplier rep. for inspection :
10. Sub – supplier contact person's name & contact No. :
11. Weekly off day : 12. Working Hours :
13. Date on which inspection requested (Inspection call to be raised at least 7 days prior to inspection) :
14. No of road permits required :

It is certified that the above materials shall be completed in all respects and shall have been inspected by us before the date indicated above for inspection. You are requested to please depute your representative for inspection

Signature  
Name :  
Contact No. :  
Date :

**Distribution :**

1. Material Management , BHEL, New Delhi

**Note :**

1. Unsigned inspection request & Inspection requests not given in this format are not accepted.
2. Drawings, Quality Plan should be approved in category – I by BHEL Transmission Business Engineering Management before the inspection date. In case inspection request is given without Category – I approved documents, supplier should be obtain from BHEL Transmission Business Engineering Management in writing to this effect and attach to inspection request.

## BANK GUARANTEE FOR PERFORMANCE SECURITY

Bank Guarantee No:

Date:

To

NAME

& ADDRESSES OF THE BENEFICIARY

Dear Sirs,

In consideration of the Bharat Heavy Electricals Limited <sup>1</sup> (hereinafter referred to as the 'Employer' which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns) incorporated under the Companies Act, 1956 and having its registered office at \_\_\_\_\_ through its Unit at \_\_\_\_\_ (name of the Unit) having awarded to (Name of the Vendor / Contractor / Supplier) having its registered office at \_\_\_\_\_ <sup>2</sup> hereinafter referred to as the 'Contractor/Supplier', which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns), a contract Ref No \_\_\_\_\_ dated \_\_\_\_\_ <sup>3</sup> valued at Rs \_\_\_\_\_ <sup>4</sup> (Rupees -----)/FC \_\_\_\_\_ (in words \_\_\_\_\_) for \_\_\_\_\_ <sup>5</sup> (hereinafter called the 'Contract') and the Contractor having agreed to provide a Contract Performance Guarantee, equivalent to \_\_\_\_\_ % (\_\_\_\_\_ . Percent) of the said value of the Contract to the Employer for the faithful performance of the Contract,

we, \_\_\_\_\_, (hereinafter referred to as the Bank), having registered/Head office at \_\_\_\_\_ and inter alia a branch at \_\_\_\_\_ being the Guarantor under this Guarantee, hereby, irrevocably and unconditionally undertake to forthwith and immediately pay to the Employer a maximum amount Rs ----- (Rupees -----) without any demur, immediately on a demand from the Employer, .

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. \_\_\_\_\_.

We undertake to pay to the Employer any money so demanded notwithstanding any dispute or disputes raised by the Contractor/ Supplier in any suit or proceeding pending before any Court or Tribunal relating thereto our liability under this present being absolute and unequivocal.

The payment so made by us under this Guarantee shall be a valid discharge of our liability for payment thereunder and the contractors/supplier shall have no claim against us for making such payment.

We the é é é é é é é é bank further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said Contract and that it shall continue to be enforceable till all the dues of the Employer under or by virtue of the said Contract have been fully paid and its claims satisfied or discharged.

We é é é é é .. BANK further agree with the Employer that the Employer 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 Contract or to extend time of performance by the said Contractor/Supplier from time to time or to postpone for any time or from time to time any of the powers exercisable by the Employer against the said Contractor/Supplier and to forbear or enforce any of the terms and conditions relating to the said Agreement and we shall not be relieved from our liability by reason of any such variation, or extension being granted to the said Contractor/Supplier or for any forbearance, act or omission on the part of the Employer or any indulgence by the Employer to the said Contractor/Supplier or by any such matter or thing whatsoever which under the law relating to sureties would but for this provision have effect of so relieving us.

The Bank also agrees that the Employer 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 Employer may have in relation to the Contractor's liabilities.

This Guarantee shall remain in force upto and including é é é é é é é é é .. <sup>6</sup> and shall be extended from time to time for such period as may be desired by Employer.

This Guarantee shall not be determined or affected by liquidation or winding up, dissolution or change of constitution or insolvency of the Contractor/Supplier but shall in all respects and for all purposes be binding and operative until payment of all money payable to the Employer in terms thereof.

Unless a demand or claim under this guarantee is made on us in writing on or before the é é é é é é é é é é é .. <sup>7</sup> we shall be discharged from all liabilities under this guarantee thereafter.

We, é é é é é BANK lastly undertake not to revoke this guarantee during its currency except with the previous consent of the Employer in writing.

Notwithstanding anything to the contrary contained hereinabove:

- a) The liability of the Bank under this Guarantee shall not exceed é é é é é é é é é <sup>8</sup>
- b) This Guarantee shall be valid up to é é é é é é <sup>9</sup>
- c) Unless the Bank is served a written claim or demand on or before \_\_\_\_\_ <sup>10</sup> all rights under this guarantee shall be forfeited and the Bank shall be relieved and discharged from all liabilities under this guarantee irrespective of whether or not the original bank guarantee is returned to the Bank.

We, \_\_\_\_\_ Bank, have power to issue this Guarantee under law and the undersigned as a duly authorized person has full powers to sign this Guarantee on behalf of the Bank.

For and on behalf of  
(Name of the Bank)

Dated \_\_\_\_\_ .

Place of Issue \_\_\_\_\_ .

<sup>1</sup> NAME AND ADDRESS OF EMPLOYER I.e Bharat Heavy Electricals Limited

<sup>2</sup> NAME AND ADDRESS OF THE VENDOR /CONTRACTOR / SUPPLIER.

<sup>3</sup> DETAILS ABOUT THE NOTICE OF AWARD/CONTRACT REFERENCE

<sup>4</sup> PROJECT/SUPPLY DETAILS

<sup>5</sup> BG AMOUNT IN FIGURES AND WORDS

<sup>6</sup> VALIDITY DATE

<sup>7</sup> DATE OF EXPIRY OF CLAIM PERIOD

<sup>8</sup> BG AMOUNT IN FIGURES AND WORDS.

<sup>9</sup> VALIDITY DATE

<sup>10</sup> DATE OF EXPIRY OF CLAIM PERIOD