

**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.

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1.	INSTRUCTION TO BIDDERS : 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. 1.2 Bidder must ensure that their bid is submitted / dropped in the tender box on or before 14-00 Hrs. IST on the due date of opening, unless otherwise specified in the NIT, at the address as follows :- Tender Box, Materials Management, Transmission Business Group, Bharat Heavy Electricals Limited, 5th Floor, Tower-A, Advant Navis IT Business Park, Plot-7, Sector-142, Noida Expressway, Noida, Dist. G. B. Nagar, U. P. ñ 201305 1.3 In case tender enquiry is floated though the e-procurement system, offer / bid has to be submitted through the e-procurement system ONLY as per instructions given in the e-procurement portal (https://bheleps.buyjunction.in). 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. 1.5 Bids are to be submitted duly signed with seal in two parts :- a) Techno-commercial Bid (Part-I) ñ To be submitted in 2 sets (original + copy). A copy of Price Bid (Part-II) clearly mentioning all the necessary information as per format without prices ðUn-Priced Bidð is also to be enclosed in Part-I Bid. b) Price Bid (Part-II) ñ 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. 1.6 The Part-I and Part-II Bids are to be sealed in separate envelopes and marked

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	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. 1.7 For any technical clarification, please contact official mentioned in the tender enquiry / NIT. 1.8 For any commercial clarification please contact official issuing tender enquiry / NIT. 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. 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. 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. 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. 1.13 Non-conformities / errors / discrepancies in quoted prices in price bids shall be dealt as follows :- 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. 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. c) If there is a discrepancy between words and figures, the amount in

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	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. d) If there is such discrepancy in an offer as mentioned in (a), (b) & (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. 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 & 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. 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. 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. Note : Representative / official deputed by the bidder to witness tender opening must produce authorization letter for the same.
2.	PRICES : 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. 2.2 Unless specifically indicated in the NIT, the prices shall be on INR basis. 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 :- a) Ex-works Price: Ex-works price including packing & forwarding charges. b) Freight: Freight for door delivery up to destination / site / store are to be quoted separately. c) Insurance: Insurance for door delivery up to destination / site / store are to be quoted separately.

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	d) Type Test Charges: If asked in the technical specification, it is to be quoted separately for each test. e) Charges for Supervision of Erection, Testing & Commissioning (ETC) at Site: To be quoted separately if specified in NIT/Price Schedule. f) Charges for Testing & Commissioning at Site: To be quoted separately if specified in NIT/Price Schedule. g) Charges for Erection, Testing & Commissioning at Site: To be quoted separately if specified in NIT/Price Schedule. h) Training Charges: To be quoted separately if specified in NIT/Price Schedule. 2.4 GST rates 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. Note : i) Unless otherwise specified in the NIT, the purchase order shall be placed on Ex-works basis for Indian bidders. ii) Prices quoted by Indian bidders shall be in Indian Rupees only. iii) In case Supervision of Erection, Testing & Commissioning (ETC) at Site or Testing & Commissioning at Site or Erection, Testing & 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 & conditions of the NIT, if any. iv) Unless otherwise specified in the NIT, Unloading at Site / Destination shall not be in the scope of the supplier. 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 & Duties, charges. Levies, royalty etc. if any, excluding GST.
3.	TERMS OF PAYMENT : 3.1 For Supply only in scope of the supplier 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 : · LR / GR duly endorsed by BHEL Site Official. · Material Receipt Certificate issued by BHEL Site Official. · GST Compliant Tax Invoice · Packing List (Case-wise) · Copy of Transit Insurance Certificate from underwriters. · Material Inspection Clearance Certificate (MICC) issued by BHEL Quality Management · Guarantee Certificate · Copy of Performance Bank Guarantee (PBG) · Certificate of acceptance of Type Test Reports issued by BHEL Engineering Management wherever specifically mentioned in the Purchase Order. 3.2 For Supply where Supervision of Erection, Testing & Commissioning (ETC) at Site is in scope of the supplier or Supply where Testing & Commissioning at Site is in scope of the supplier

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	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 : · LR / GR duly endorsed by BHEL Site Official. · Material Receipt Certificate issued by BHEL Site Official. · GST Compliant Tax Invoice · Packing List (Case-wise) · Copy of Transit Insurance Certificate from underwriters. · Material Inspection Clearance Certificate (MICC) issued by BHEL Quality Management · Guarantee Certificate · Copy of Performance Bank Guarantee (PBG) · Certificate of acceptance of Type Test Reports issued by BHEL Engineering Management wherever specifically mentioned in the Purchase Order. 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 : · Certificate of successful completion of Supervision of Erection, Testing & Commissioning at Site if it is in the scope of the supplier or Certificate of successful completion of Testing & Commissioning at Site if it is in the scope of the supplier. · Certificate of completion of final documentation as per Purchase Order / Technical Specification issued by BHEL Engineering Management 3.3 For Supply where Erection, Testing & Commissioning (ETC) at Site is in scope of the supplier 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 : · LR / GR duly endorsed by BHEL Site Official. · Material Receipt Certificate issued by BHEL Site Official. · GST Compliant Tax Invoice · Packing List (Case-wise) · Copy of Transit Insurance Certificate from underwriters. · Material Inspection Clearance Certificate (MICC) issued by BHEL Quality Management · Guarantee Certificate · Copy of Performance Bank Guarantee (PBG) · Certificate of acceptance of Type Test Reports issued by BHEL Engineering Management wherever specifically mentioned in the Purchase Order 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 : · Certificate of successful completion of Erection, Testing & Commissioning at Site issued by BHEL Site Official / Construction Management · Certificate of completion of final documentation as per Purchase Order / Technical Specification issued by BHEL Engineering Management 3.4 For Type Test Charges 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&I is in scope of

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	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. 3.5 For Charges for Supervision of Erection, Testing & Commissioning at Site 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 & Commissioning at Site issued by BHEL Site Official / Construction Management in 3 sets (Original + 2 copies). 3.6 For Charges for Testing & Commissioning at Site 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 & Commissioning at Site issued by BHEL Site Official / Construction Management in 3 sets (Original + 2 copies). 3.7 For Training Charges 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). Note : i) Supplier has to submit invoice(s) as per PO or approved billing break-up of prices (if applicable as per NIT). ii) In case of supplies for overseas project, Material Receipt Certificate issued by BHEL Authorized Representative shall also be acceptable. 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. iv) Supplier has to ensure commencement of transit insurance from the date not later than LR / GR date. 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 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 & registered as Micro & Small Enterprises based on documents mentioned in the NIT for MSME. vii) Supplier has to submit PBG (as per BHEL format) & Guarantee Certificate as per PO terms. viii) In case any shortages and / or damages in supplies, an amount calculated

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	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. 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. 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. 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.
4.	INTEREST LIABILITY : 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.
5.	GUARANTEE : The equipment / material supplied and services rendered (if applicable) shall be guaranteed to be free from all defects and faults in design & engineering, material, workmanship & manufacture and in full conformity with the Purchase Order / Contract, Technical Specifications & 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. Wherever Erection, Testing & 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. The defective equipment / material / component shall be replaced free of cost at site. Freight & 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. 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

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	Order / Contract or any other Purchase Order / Contract executed by the supplier / contractor. Note : i) In case of Illumination System, items viz. Lamps, Tubes, Ballast, Starters, Capacitors & Fuses will not be under Guarantee after commissioning. ii) In addition to the above guarantee period, Extended Guarantee / Warranty, if any, shall be as per NIT / Technical Specifications. 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.
6.	LATENT DEFECT : 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.
7.	PERFORMANCE BANK GUARANTEE (PBG) : 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 :- <u>Option A</u> 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. 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. <u>Option B</u> 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. <u>Option C</u> 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. Note : 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. 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. iii) Unless otherwise specified in the NIT, deviation taken for non-submission of PBG / Deposit, as applicable, shall not be accepted.

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	iv) Supplier has to confirm one of the applicable options for submission of PBG / Deposit before placement of PO. 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. 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. vii) Value of the Bank Guarantee (at the time of submission) shall remain unchanged for any subsequent variations in Purchase Order value up to $\pm 20\%$. Beyond this variation of $\pm 20\%$, the Supplier shall arrange to enhance or may reduce the value of the Bank Guarantee accordingly for the total variation promptly. 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.
8.	SUBMISSION OF DRAWINGS / DOCUMENTS FOR APPROVAL : 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. In case item(s) offered require any interface details of other item (not in the scope of supplier & 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.
9.	FINAL DOCUMENTATION : 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.
10.	INSPECTION : 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. Supplier shall send inspection call on prescribed format / web site only, with an advance notice of 15 days. Supplier to ensure submission of all routine / acceptance test reports, inspection

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	reports and all other documents related to inspection, immediately to BHEL. 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.
11.	DESPATCH DOCUMENTS : Despatch documents to be immediately sent to BHEL on despatch are as follows :- • Copy of Invoice • Copy of LR / GR in case of Indian suppliers or BL / AWB in case of foreign suppliers • Copy of Packing List (Case-wise) • Copy of Transit Insurance Certificate from underwriters • Copy of Guarantee Certificate
12.	DELIVERY PERIOD : 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. Time required for type test, if applicable, is to be separately indicated. Note : 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.
13.	LIQUIDATED DAMAGES FOR DELAYED DELIVERY: 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 & 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 & insurance as applicable) shall be deducted as Liquidated Damages (LD) along with applicable GST (if any) on LD. 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 & 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 & Insurance as applicable) shall be deducted as Liquidated Damages (LD) along with applicable GST (if any) on LD. Note : 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. 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. iii) However, for indigenous supply, if time period between date of receipt of material at site / destination by Site Official & 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 & 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. 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

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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.
14.	VALIDITY OF OFFER : 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). Prices of Spares, wherever they optional items, shall be valid till two years from the date of placement of PO.
15.	ACCEPTANCE / REJECTION OF TENDER : BHEL reserve the right to reject in full or part, any or all tender without assigning any reason thereof. 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. 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.
16.	DEVIATION : 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.
17.	TENDER EVALUATION : 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 & duties, and other services etc. (if applicable). GST input credit available to BHEL shall be reduced from prices while determining L1 status. In case all bidders are foreign & 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 & insurance are to be quoted separately & the purchase order may be placed on FOB basis with an option for delivery on CIF / CFR basis, if required, later. 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.
18.	LOADING CRITERIA : List of permissible deviations & loading criteria thereof are as follows :- a) Payment Terms 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. b) Liquidated Damages (LD) for Delayed Delivery

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	Loading on LD clause shall be to the extent to which it is not agreed to by the bidder (at offered value). 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 :- i) Port handling / clearing charges: @ 1% of CIF value to arrive at Customs Assessable Value. ii) Custom Duty (including CVD & SAD) as per NIT prevailing on date of price bid opening. iii) Inland Freight & 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. Note : Additional deviations (if considered acceptable by BHEL) & the loading criteria shall be communicated to all the qualified bidders before price bid opening.
19.	ARBITRATION : 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. 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. 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.
20.	LEGAL SETTLEMENT : 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.
21.	SUB-CONTRACTING : 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. 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. Decision of BHEL that legal representatives of deceased Supplier / Contractor or

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	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. Terms and Conditions shall not get affected in case of de-merger / amalgamation / taking-over / re-constitution etc.
22.	RISK PURCHASE : In case the Supplier / Contractor fails to supply or fails to comply with terms & 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. 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. The Supplier / Contractor shall on no account be entitled to any gain on such risk & 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.
23.	ADJUSTMENT OF RECOVERY : 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.
24.	FORCE MAJEURE CONDITION : 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. 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

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	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. 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. 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.
25.	MANUFACTURING QUALITY PLAN (MQP) : Supplier to submit approved MQP in line with requirement of BHEL/customer.
26.	SUPPLIER PERFORMANCE MONITORING AND RATING SYSTEM : 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 www.bhel.com for reference.
27.	DEALING WITH BANNED SUPPLIERS / CONTRACTORS IN BHEL : 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 www.bhel.com for reference.
28.	ORDER OF PRECEDENCE : The order of precedence shall be as follows :- a) Special Terms & Conditions (STC) for Tender Enquiry / Contract, if any b) General Terms & Conditions (GTC) for Tender Enquiry / Contract & Additional General Terms & Conditions (GTC) for Tender Enquiry / Contract for Erection Testing & Commissioning (ETC) at Site, if applicable 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.
29.	PACKING : 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. In case of shipment by sea or air, the packing shall be sea-worthy or air-worthy respectively and of international standards. Different types of spares i.e. start-up / commissioning spares and initial spares (mandatory spares and recommended O&M spares) are to be packed separately. Packing List shall be submitted as per standard format along with advance set of documents for claiming payment which shall also indicate :- a) Case / Packing size (as applicable). b) Gross weight and net weight of each package. c) Detailed contents of the package with quantity of each item separately. Project, Item / Package Description, BHEL's PO No. with date & Case / Packing Mark should also be clearly mentioned on the Case / Packing and Packing List for identification. Also, Packing List must be duly signed & should include respective Invoice No. & LR No. Note : Foreign suppliers to furnish details to arrange inland transportation by BHEL, if applicable, as follows :- i) No. of Packages ii) Size with Weight (Gross & Net) of each Package iii) No. of Containers with type & size required for inland transportation

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	iv) Type of Cargo (Break Bulk / LCL / FCL) v) Customs Tariff No.
30.	COLOUR CODING : 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. Tags should be of the colour as follows :- a) Main equipment : Yellow or White tag b) Start-up / Commissioning spares : Blue tag c) Mandatory spares : Pink or Red tag d) Recommended / O&M spares : Green tag
31.	MICRO, SMALL & MEDIUM ENTERPRISES (MSME) : MSMED Act 2006 as amended from time to time & extant regulations of Govt. of India for MSME will be applicable. Micro & 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. Copy of Udyog Aadhaar Memorandum with Acknowledgement of Ministry of Micro, Small & Medium Enterprises should also be furnished.
32.	BUSINESS ETHICS / SUSPENSION OF BUSINESS DEALINGS WITH SUPPLIERS / CONTRACTORS : 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 (www.bhel.com) on "Supplier Registration" Page.
33.	REVERSE AUCTION : 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. 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. General Terms and Conditions of RA are available at Annexure. Business Rules for

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	RA shall be sent to the bidders before conducting RA. Abridged Version of ‘Common Guidelines for Conducting Reverse Auction’ may also be seen at BHEL website (www.bhel.com) on ‘Supplier Registration’ Page & ‘Tender Notifications’ Page.
34.	INTEGRITY PACT : 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.
35.	TERMINATION OF CONTRACT : 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. 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. 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 & Commissioning (ETC) / Supervision of ETC, if any, would also get cancelled.
36.	SHELF LIFE : 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.
37.	LIMITATION OF LIABILITY : Notwithstanding any other provisions, except in cases of wilful misconduct and / or criminal negligence / acts, 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 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.
38.	SHORTAGES / DAMAGES : a) Against Supply only or Supply where Supervision of Erection, Testing & Commissioning (ETC) at Site or Supply where Testing & Commissioning at Site is in scope of the supplier : 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. b) Against Supply where Erection, Testing & Commissioning (ETC) at Site is in scope of the supplier :

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	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. Note: There shall not be any extension in the contractual delivery time / schedule due to any shortages and / or damages in supplies.
39.	VARIATION OF CONTRACT VALUE / QUANTITY VARIATION : BHEL shall have the right to variation in quantities of items within $\pm 30\%$ 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 <u>Lumpsum</u> 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.
40.	STATUTORY VARIATION : 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. 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. 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. However, any additional tax implication due to delay in delivery, beyond the Contractual Delivery, attributable to supplier shall be borne by supplier.
41.	MODE OF PAYMENT : Payment shall be made directly to the Supplier / Contractor by BHEL through NEFT / RTGS.
42.	CONFIDENTIALITY : Supplier / Contractor shall, at all times, undertake to maintain complete confidentiality of all data, information, software, drawings & 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.
43.	INDEMNIFICATION : 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

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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.	TITLE OF GOODS : 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. 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. 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.
45.	COMPLIANCE OF STATUTORY REQUIREMENTS : 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. 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.
46.	ACCEPTANCE OF ORDER : 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. In case of any discrepancy / typographical error in issue of Purchase Order / Contract, the agreed terms & 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.
47.	FRAUD PREVENTION POLICY : 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 http://www.bhel.com and shall immediately bring to the notice of BHEL Management about any fraud or suspected fraud as soon as it comes to their notice.

Signature of Bidder (Authorized Signatory) with Date & Seal

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

ENQUIRY No. -90Q2000175 dated 10/09/2019

	S.No.	Description of Item	HSN Code	Unit	Quantity	Unit Price	Total Ex-Works (Rs.)	GST @__on Ex Works	Unit Freight & Insurance	Total Freight & Insurance	GST @__ on Freight & Insurance	TOTAL (FOR Destination) PRICE (Rs.)	M- FACTOR (For PVC calculation)
						Ex-works (Rs.)							
	1	SUPPLY- LOW VOLTAGE CABLE : XLPE Insulated, Aluminium Conductor, 3.5 Core x 35sqmm Armoured Aux Power Cable		KM	1								As per Annexure- 1 enclosed as per IEEMA
	2	SUPPLY- LOW VOLTAGE CABLE : XLPE INSULATED ALUMINIUM CONDUCTOR 4 CORE X 65QMM ARMoured AUX POWER CABLE		KM	3.5								
	3	SUPPLY- LOW VOLTAGE CABLE : XLPE INSULATED ALUMINIUM CONDUCTOR 4 CORE X 45QMM ARMoured AUX POWER CABLE		KM	1								
	4	SUPPLY- LOW VOLTAGE CABLE : XLPE INSULATED ALUMINIUM CONDUCTOR 4 CORE X 16SQMM ARMoured AUX POWER CABLE		KM	2								
	5	SUPPLY- LOW VOLTAGE CABLE : XLPE INSULATED ALUMINIUM CONDUCTOR 3.5 CORE X 95SQMM ARMoured AUX POWER CABLE		KM	0.5								
	6	SUPPLY- LOW VOLTAGE CABLE : XLPE INSULATED ALUMINIUM CONDUCTOR 3.5 CORE X 70SQMM ARMoured AUX POWER CABLE		KM	7.5								
	7	SUPPLY- LOW VOLTAGE CABLE : XLPE INSULATED ALUMINIUM CONDUCTOR 3.5 CORE X 300SQMM ARMoured AUX POWER CABLE		KM	3								
	8	SUPPLY- LOW VOLTAGE CABLE : XLPE INSULATED ALUMINIUM CONDUCTOR 2 CORE X 65QMM ARMoured AUX POWER CABLE		KM	3.5								
	9	SUPPLY- LOW VOLTAGE CABLE : HR-PVC INSULATED COPPER (PLAIN) CONDUCTOR 5 CORE X 2.5SQMM ARMoured CONTROL CABLE		KM	20								
	10	SUPPLY- LOW VOLTAGE CABLE : HR-PVC INSULATED COPPER (PLAIN) CONDUCTOR 4 CORE X 10SQMM ARMoured CONTROL CABLE		KM	7								
	11	SUPPLY- LOW VOLTAGE CABLE : HR-PVC INSULATED COPPER (PLAIN) CONDUCTOR 2 CORE X 2.5SQMM ARMoured CONTROL CABLE		KM	9								
	12	SUPPLY- LOW VOLTAGE CABLE : HR-PVC INSULATED COPPER (PLAIN) CONDUCTOR 19 CORE X 2.5SQMM ARMoured CONTROL CABLE		KM	14								
	13	SUPPLY- LOW VOLTAGE CABLE : HR-PVC INSULATED COPPER (PLAIN) CONDUCTOR 14 CORE X 2.5SQMM ARMoured CONTROL CABLE		KM	19								

SCHEDULE OF PRICE (Part III) (UNPRICED COPY)

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

VENDOR NAME / OFFER REF:

MENTION THE WORKS FROM WHICH MATERIAL SHALL BE SUPPLIED -

ENQUIRY No. -90Q2000175 dated 10/09/2019

	14	SUPPLY- LOW VOLTAGE CABLE : HR-PVC INSULATED COPPER (PLAIN) CONDUCTOR 10 CORE X 2.5SQMM ARMoured CONTROL CABLE		KM	34							
		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 PROJECTS ENGINEERING MANAGEMENT

DOCUMENT No.	TB-401-510-E30	Rev. No.	00		Prepared	Checked	Approved
TYPE OF DOC.	TECHNICAL SPECIFICATION			NAME	PC	VK	AG
TITLE 1.1kV AUXILIARY POWER & CONTROL CABLES				SIGN			
				DATE	25/07/19	5/8/19	5/8/19
				GROUP	TBEM	W.O. No	
CUSTOMER	UTTAR PRADESH RAJYA VIDYUT UTPADAN NIGAM LTD. (UPRVUNL)						
CONSULTANT	1. NTPC (Review consultant) 2. DCPL						
PROJECT	400kV Switchyard for Panki Thermal Power Station (1X660MW) Project code : 401						

CONTENTS

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2.	DETAILED TECHNICAL REQUIREMENTS – EQUIPMENT SPECIFICATION	23
3.	PROJECT DETAILS AND GENERAL SPECIFICATION	26
4.	CHECK LIST & LIST OF ENCLOSURES (TO BE FILLED AT TENDER STAGE)	02
5.	ATTACHMENT 3-K	08
NOTE-Offers submitted without Attachment-3K & checklist shall not be evaluated		

Rev No.	Date	Altered	Checked	Approved	REVISION DETAILS			
				Distribution	TBMM	TBQM	TBCM	TBTS
				Copies	2	-	-	-

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SECTION 1

SCOPE, SPECIFIC TECHNICAL REQUIREMENTS AND QUANTITIES

1.0 SCOPE

This technical specification covers the requirements of design, manufacture, testing at works, packing, supply and delivery at site of 1.1kV Control & Aux. Power Cables. This section covers the specific technical requirements of 1.1 kV Aux Power & Control Cables. This constitutes minimum technical parameters for the above item as specified by the customer (UPRVUNL). The offered item shall also comply with the General Specification for the project as detailed under section-3 of this specification

In case of any conflict between the technical details mentioned in this section and the remaining sections of this document, then Section-1 shall prevail and is to be considered as binding requirement

The specification comprise of following sections:

Section-I:	Scope, Specific Technical Requirements & Bill of Quantities
Section-II:	Detailed Technical Requirement - Equipment Specification
Section-III:	Project Details & General Technical Requirements
Section-IV:	Checklist

In case of any conflict between various sections, order of precedence shall be in the same order as listed above.

1.1 The equipment is required for the following Project.

Name of Customer : Uttar Pradesh Rajya Vidyut Utpadan Nigam Ltd (UPRVUNL)

Name of the Project: 400kV Switchyard for Panki Thermal Power Station (1x660MW)

Name of Consultants: NTPC (Review Consultant)
DCPL, Kolkata

Refer Section - III for Project Details and General Specifications.

Note: The terms used in this specification namely, “Employer/Purchaser/Owner” refers to UPRVUNL, “Contractor “refers to BHEL & “Sub-contractor” refers to successful bidder.

2.0 SPECIFIC TECHNICAL PARTICULARS

Bidder shall follow Technical Parameters as specified for Power & Control Cables under Section-II of this Specification.

- a) Strip armoring method (a) mentioned in Table 5, Page-6 of IS: 1554 (Part 1) - 1988 shall not be accepted for any of the cables.
- b) Strip armoring method (a) mentioned in Table 6, Page-6 of IS: 7098 (Part 1) - 1988 shall not be accepted for any of the cables.

2.1 HR-PVC Insulated 1.1kV Control Cable:

The HR-PVC (85°C) insulated 1100V grade Control cables shall be of FRLSH/FS type conforming to IS: 1554 (Part-I) and its amendments read along with this specification and shall be suitable for a steady conductor temperature of 85°C.

S.No	Parameters	Control Cable
1.	Voltage grade of cable	1100 Volts
2.	Material of conductor	Plain (untinned) annealed, High conductivity, Stranded Copper Conductor conforming to Class-II of IS:8130
3.	Strands	7 strands of 0.67sq. mm as per standard technical data in Section-II
4.	Conductor insulation	Extruded HR-PVC compound Type C as per IS 5831/1984 The maximum value of volume resistivity of insulation shall be 3.5×10^{14} ohms-cm at 27°C and 3.5×10^{11} ohms-cm at 85°C
5.	Filler (If required)	Non-hygrosopic, fire retardant.
6.	Inner Sheath	Extruded HR-PVC, FRLSH compound conforming to Type ST-2 as per IS 5831/1984. Non-hygrosopic, fire retardant.
7.	Armour	Galvanised steel round wire for cables upto and inclusive of 7cores and Galvanised steel strip for cables above 7cores as per Cl:4.01.04 of Section-II & conforming IS 3975
8.	Overall sheathing	Extruded HR-PVC, FRLSH, Type ST-2 as per IS 5831,1984 Colour shall be black or any other natural colour (with prior approval of customer) Oxygen Index > 29, Temperature Index > 250°C

2.2 HR-PVC Insulated 1.1kV Power Cable:

The HR-PVC (90°C) insulated 1100V grade Aux. Power cables shall be of FRLSH type, conforming to IS: 7098 (Part-I) and its amendments read along with this specification and shall be suitable for a steady conductor temperature of 90°C.

S.No	Parameters	Aux. Power Cable
1.	Voltage grade of cable	1100 Volts
2.	Material of conductor	Stranded Aluminium, Grade H2
3.	Strands	As per standard IS:8130
4.	Conductor insulation.	Extruded HR-PVC compound Type C as per IS 5831
5.	Filler (If required)	Non-hygrosopic, fire retardant.
6.	Inner Sheath	Extruded HR-PVC, FRLSH compound, Type ST-2 as per IS 5831 Non-hygrosopic, fire retardant.
7.	Armour	Aluminium wire/formed wire (H4 grade) for Single core as per IS 8130 and Galvanised Steel strip/ wire for Multi-core cables as per Cl4.01.04 of Section-II & IS 1554 (Part I)
8.	Overall sheathing	Extruded HR-PVC, FRLSH, Type ST-2 as per IS 5831,1984 Colour shall be black or any other natural colour (with prior approval of customer) Oxygen Index > 29, Temperature Index > 250°C

2.3 XLPE insulated Aux. Power cable:

The XLPE (90°C) insulated cable shall be of FRLSH type conforming to IS: 7098 (Part-I) and its amendments read along with this specification.

S.No	Parameters	Aux. Power cables
1.	Voltage grade of cable	1100 Volts
2.	Material of conductor	Stranded Aluminium; Grade H4
3.	Strands	As per standard IS
4.	Conductor insulation.	Extruded XLPE of natural colour as per IS 7098 Part-I
5.	Filler (If required)	Non-hygroscopic, fire retardant.
6.	Inner Sheath	Extruded HR-PVC, FRLSH compound, Type ST-2 as per IS 5831 Non-hygroscopic, fire retardant
7.	Armour	Aluminium wire for Single core as per IS and Galvanised Steel wire/Strip for Multi-core cables as per Cl4.01.04 of Section-II & IS 7098 Part-I
8.	Overall sheathing	Extruded HR-PVC, FRLSH, Type ST-2 as per IS 5831, 1984 Colour shall be black or any other natural colour (with prior approval of customer) Oxygen Index > 29, Temperature Index > 250°C

2.4 Fire Survival 1.1kV Power/Control Cable:

The heat resistance elastomeric insulated 1100V grade Control/ Aux. Power cables shall conforming to Type IE-2 of IS: 6380-1984 and its amendments read along with this specification and shall be suitable for a steady conductor temperature of 90°C.

S.No	Parameters	Aux. Power Cable	Control Cable
1.	Voltage grade of cable	1100 Volts	
2.	Material of conductor	Annealed, High conductivity, Stranded plain Copper wires conforming to Class-II of IS:8130	Annealed, High conductivity, Stranded tinned Copper wires conforming to IS:8130/1984
3.	Strands	As per standard IS:8130	
4.	Conductor insulation.	Heat resistance elastomeric material (EPR) conforming to Type IE-2 of IS:6380-1984	
5.	Filler (If required)	Non-hygroscopic, fire retardant.	
6.	Inner Sheath	Extruded Halogen free or very low halogen content elastomeric (HOFR) compound of black colour conforming to Type SE-3 of IS-6380/1984 Applicable for single core cables also after providing two layers of plain glass fibre tape.	
7.	Armour	Single layer of round copper wire for Single core cables. Single layer of round galvanized steel wire for multi-core cables and single core of DC	
8.	Overall sheathing	Extruded Halogen free or very low halogen content elastomeric (HOFR) compound comprising of synthetic rubber conforming to Type SE-3 of IS-6380/1984	

3.0 QUALIFYING REQUIREMENTS:

3.1 Applicable for Control Cable:

The manufacturer(s), whose PVC control cables are offered, must have designed, manufactured, tested and supplied in a single contract at least 300 Kms of 1.1 KV grade PVC insulated, PVC sheathed copper conductor control cable prior to the date of bid opening.

Further the manufacturer must also have designed, manufactured, tested and supplied at least 1 km of flame retardant low smoke cable prior to the date of bid opening.

3.2 Applicable for 1.1kV Power Cable:

The manufacturer(s), whose Power Cables are offered, must have designed, manufactured, tested and supplied:

- (i) Atleast 100 Kms of aluminium conductor, XLPE insulated, PVC sheathed power cables of 1.1 kV or higher grade in a single contract prior to the date of bid opening.
- (ii) Atleast 100 Kms of aluminium conductor, PVC insulated, PVC sheathed power cables of 1.1 kV or higher grade in a single contract prior to the date of bid opening.
- (iii) Atleast 1 km of flame retardant low smoke cable prior to the date of bid opening.
- (iv) 1.1kV or higher grade power cable of minimum 630sq mm. conductor size prior to the date of bid opening.

Date of techno-commercial bid opening to be considered as 02.11.15

NOTE: Bidder to fill the Attachment-3K to consider their offer for evaluation.

4.0 BILL OF QUANTITY:

The length of each cable type procured may be subject to a change of +/- 30% at contract stage.

Standard Lengths for each size of Power & Control Cable shall be 1000m, unless otherwise specified. Power cable with conductor cross sectional area 300sqmm and above may be supplied in 500m drums. The cable length per drum shall be subject to a tolerance of +/-5% of the standard drum length. The owner shall have the option of rejecting cable drums with shorter lengths. However the total quantity of cables after taking into consideration of all cable drums for each size shall be within the tolerance of +/- 2%.

The cable type, size and length requirement shall be as per Annexure-I (attached)

5.0 TESTS:

All cables to be supplied of type tested quality. Cables shall conform to type tests including additional type tests as per technical specification and shall be subject to routine & acceptance tests in accordance with requirements stipulated under respective sections. Any other test as per manufacturers standard quality plan (MQP) approved by UPRVUNL is deemed to be included.

The type, acceptance and routine tests may be witnessed by purchaser/ purchaser's representative.

The prices for conducting all tests are deemed to be included in respective cable prices.

6.0 PACKING:

6.1 Cables shall be supplied in non-returnable drums. The drums shall be of heavy construction as per relevant IS. All wooden parts shall be manufactured from seasoned wood. All ferrous parts used shall be treated with suitable rust preventive finish or coating to avoid rusting during transit or storage. Wooden drums shall be treated by immersing in copper nitrate solution.

6.2 Cable shall be wound and packed on drums in such a manner that it will be properly sealed and firmly secured to the drum. The ends of each length shall be sealed before shipment. Heat shrinkable cable seals shall be used for this purpose

6.3 A label shall be securely attached to each end of the reel indicating the length, type, voltage grade, conductor size and number of core of the cable. A tag containing the same information shall be attached to the leading end of the cable inside. An arrow and necessary instructions shall be marked on the drum indicating the direction in which it should be rolled. Drum numbers are to be indicated on cable drums

6.4 The cable drums should carry the following details in printed form (non-returnable):

- a) UPRVUNL & Manufacturer's name or trade make
- b) Type of cable & voltage grade
- c) Year of manufacture
- d) Type of insulation / sheath e.g. XLPE /HRPVC FRLS,IE2/SE3 F.S. as applicable.
- e) No. of core and size of cables
- f) Cable code
- g) Length of cable on drum
- h) Direction of rotation, by arrow
- i) Approx. gross mass.
- j) ISI mark
- i) IS/IEC number

7.0 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.

ANNEXURE-I

Bill of Quantity

HR-PVC insulated 1.1kV Control Cables:

S.No.	Description	Unit	Length
1.	2C x 2.5 sq mm HR-PVC/ Cu. Control Cable	km	09
2.	5C x 2.5 sq mm HR-PVC/ Cu. Control Cable	km	20
3.	10C x 2.5 sq mm HR-PVC/ Cu. Control Cable	km	34
4.	14C x 2.5 sq mm HR-PVC/ Cu. Control Cable	km	19
5.	19C x 2.5 sq mm HR-PVC/ Cu. Control Cable	km	14
6.	4C x 10 sq mm HR-PVC/ Cu. Control Cable	km	07

XLPE insulated 1.1kV Aux Power Cables:

S. No.	Description	Unit	Length
1.	2CX6 sq mm XLPE / Al Aux Power Cable	km	3.5
2.	4CX6 sq mm XLPE / Al Aux Power Cable	km	3.5
3.	4CX16 sq mm XLPE / Al Aux Power Cable	km	02
4.	4CX4 sq mm XLPE / Al Aux Power Cable	km	01
5.	3.5X35 sq mm XLPE / Al Aux Power Cable	km	01
6.	3.5X70 sq mm XLPE / Al Aux Power Cable	km	7.5
7.	3.5X95sq mm XLPE / Al Aux Power Cable	km	0.5
8.	3.5C x 300 sq mm XLPE / Al Aux Power Cable	km	03

LT POWER CABLES

1.00.00 SCOPE OF SUPPLY

The LT Power cables shall be supplied, installed and commissioned in accordance with the following specification.

Other cables including special cables if any which are necessary as per proven engineering practice for satisfactory & trouble free operation of the entire cable system of the power plant shall also be within the scope of supply. These shall include all such cables for electrical integral with mechanical equipment systems and subsystems.

2.00.00 CODES & STANDARDS

All standards, specifications and codes of practice referred to herein shall be the latest editions including all applicable official amendments and revisions as on date of opening of bid. In case of conflict between this specification and those (IS: codes, standards, etc.) referred to herein, the former shall prevail. All the cables shall conform to the requirements of the following standards and codes:

IS:1554 (Part-I)	PVC insulated (heavy duty) electric cables for working voltage up to and including 1100 V.
IS : 3961	Recommended current ratings for cables
IS : 3975	Low carbon galvanized steel wires, formed wires and tapes for armouring of cables.
IS : 4905	Methods for random sampling.
IS : 5831	PVC insulation and sheath of electrical cables.
IS:7098 (Part - I)	Cross linked polyethylene insulated PVC sheathed cables for working voltages up to and including 1100V.
IS : 8130	Conductors for insulated electrical cables and flexible cords.
IS : 10418	Specification for drums for electric cables.
IS : 10810	Methods of tests for cables.
ASTM-D -2843	Standard test method for density of smoke from the burning or decomposition of plastics.
ASTM-D-2863	Standard method for measuring the minimum oxygen concentration to support candle like combustion of plastics.
IEC-754 (Part-I)	Test on gases evolved during combustion of electric cables.
IEEE-383	Standard for type test of Class IE Electric Cables.
IEC -60332	Tests on Electric cables under fire conditions. Part-3 : Tests on bunched wires or cables (category -B)
SS-4241475 classF3	Swedish Chimney test
NES-715-1	Temperature index

3.00.00 DESIGN CRITERIA

3.01.00 The cables will be used for connection of power circuits of the system. Actual cable sizes will be selected by the Contractor. Number of different sizes selected will be kept to a minimum for optimization.

- 3.02.00 Cables shall be generally laid on ladder type cable trays or drawn, through rigid Steel pipe conduits. For interplant connection cables shall be routed along overhead cable bridge.
- 3.03.00 For continuous operation at specified rating, maximum conductor temperature shall be limited to the permissible value as per relevant standard and/or this specification whichever is more stringent.
- 3.04.00 The insulation and sheath materials shall be resistant to oil, acid and alkali and shall be tough enough to withstand mechanical stresses during handling.
- 3.05.00 Armouring shall be single round wire of galvanized steel for multicore cables and aluminum for single core cable for power. For Fire survival power cable, Single core cables to be used in A.C. system, the armouring over inner sheath shall consist of single layer of round copper wire, for multi-core cables to be used in A.C. system and single/two core cables in D.C. System, the armouring over inner sheath shall consist of single layer of round galvanized steel wire.
- 3.06.00 The inner and outer sheath shall have flame retardant low smoke (FRLSH) characteristics or fire survival characteristics as the case may be, and shall meet the requirements of additional tests specified for the purpose.
- 3.07.00 Core identification for multicore cable shall be provided by colour coding.
- 3.08.00 Cables shall be so designed and manufactured that no damage occurs during handling, transit, storage, installation under any operative conditions which they may be subjected to.
- 3.09.00 Minimum value of volume resistivity for XLPE insulation shall be 1.0×10^{14} ohms-cm at 27 deg C and 1.0×10^{12} ohms-cm at 90 deg C.
- 3.10.00 Maximum continuous operating temperature shall be 90 deg C under normal operation and 250 deg C under short circuit condition. The cable cores shall be laid up with fillers between the cores wherever necessary. It shall not stick to insulation and inner sheath. All the cables, other than single core unarmoured cables, shall have distinct extruded PVC inner sheath of black colour as per IS: 5831.

4.00.00 SPECIFIC REQUIREMENTS / CONSTRUCTIONAL REQUIREMENTS

4.01.00 1.1KV Aluminium Conductor Power Cables

1100 volt, 90 Deg.C rating, heavy duty power cables with stranded aluminium conductor, extruded XLPE insulation, extruded HRPVC,FR-LSH inner sheath, aluminium round wire armour for single core cables and galvanized steel strip /wire armour for three (3) core cables, and extruded HRPVC, FR-LSH overall sheath.

Cables shall be manufactured in conformity to IS-7098 part 1 - 1988, amended up to date and bearing ISI mark.

4.01.01 Conductor

Aluminium conductor used in power cables shall have tensile strength of more than 100N/sq.mm. Conductors shall be stranded.



4.01.02 Insulation

Cross linked polyethylene (XLPE) of natural colour, extruded over screened conductor. This shall be conforming to IS: 7098 Part-1 (1988).

4.01.03 Inner Sheath

The laid up insulated cores of twin and multicore power cables shall be provided with an inner sheath of extruded HRPVC, FRLSH compound conforming to Type ST2 of IS:5831. Single core power cables need not be provided with any inner sheath.

4.01.04 Armour

For single core armoured cables, armouring shall be of aluminium wires/formed wires.

For multicore armoured cables, armouring shall be of galvanised steel as follows:

Calculated nominal dia of cable under armour	Size and Type of armour
Upto 13mm	1.4mm dia GS wire.
Above 13 & upto 25mm	0.8mm thick GS formed wire/1.6mm dia GS wire.
Above 25 & upto 40mm	0.8mm thick GS formed wire/2.0mm dia GS wire.
Above 40 & upto 55mm	1.4mm thick GS formed wire/2.5mm dia GS wire.
Above 55 & upto 70mm	1.4mm thick GS formed wire/3.15mm dia GS wire.
Above 70mm	1.4mm thick GS formed wire/4.0mm dia GS wire.

The aluminium used for armouring shall be of H4 grade as per IS:8130 with maximum resistivity of 0.028264 ohm mm² per metre at 20 deg C. The sizes of aluminium armouring shall be same as indicated above for galvanized steel.

The gap between armour wires / formed wires shall not exceed one armour wire/ formed wire space and there shall be no cross over / over-riding of armour wires / formed wires. The minimum area of coverage of armouring shall be 90%. The breaking load of armour joint shall not be less than 95% of that of armour wire / formed wire. Zinc rich paint shall be applied on armour joint surface of GS wires / formed wires.

4.01.05 Overall Sheath

Outer sheath shall be of PVC as per IS:5831 & black in colour. In addition to meeting all the requirements of Indian standards referred to, outer sheath of all the cables shall have the following properties.



- (a) Oxygen index of min. 29 (as per IS 10810 Part-58).
- (b) Acid gas emission of max. 20% (as per IEC-754-1).
- (c) Smoke density rating shall not be more than 60% (as per ASTM-D-2843).

4.02.00 **1.1KV Grade Copper Conductor Fire Survival Power Cables**

1100 volt grade, 90 Deg.C rating, Power cables with stranded Copper conductor, heat resistance elastomeric insulation generally conforming to Type IE-2 of IS:6380-1984, extruded Halogen free or very low Halogen elastomeric inner sheath, generally conforming to Type SE-3 of IS-6380-1984, round wire/strip armour and extruded outer sheath of elastomeric material generally conforming to Type SE-3 of IS:6380-1984.

The cables shall be generally manufactured in conformity to IS-9968 Part-1/1988.

The cables shall be rated for 3 hours fire rating.

4.02.01 **Conductor**

Conductor shall be of stranded construction, consisting of high conductivity annealed plain copper wires conforming to Class-II of IS 8130. A suitable heat barrier tape, preferably glass mica tape shall be provided over the conductor.

4.02.02 **Insulation**

Cores of the cable shall be identified by colouring of insulation. Following colour scheme shall be adopted.

- 1 core - Red, Black, Yellow or Blue
- 2 core - Red & Black
- 3 core - Red, Yellow & Blue
- 4 core - Red, Yellow, Blue & Black

4.02.03 **Laying up of cores (For multi core cables only)**

The core shall be suitably identified in accordance with IS: 9968 (Part-I).

The suitable fire retardant material fillers shall be used for filling in the interstices.

Two layers of plain glass fiber binder tape shall be applied over the laid up cores.

4.02.04 **Inner Sheath**

An inner sheath of extruded special low smoke and very low halogen content (acid gas generation shall be less than 2% by weight) elastomeric (HOFR) compound of black colour conforming to Type SE-3 of IS-6380/1984, amended up to date, shall be provided over the laid up cores. This shall be provided even for single core cables after providing two layers of plain glass fiber tape over the insulation.

4.02.05 **Armour**

For Single core cables to be used in A.C system, the armouring over inner sheath shall consist of single layer of round copper wire.

For multi-core cables to be used in A.C. system and single/two core cables in D.C. System, the armouring over inner sheath shall consist of single layer of round galvanized steel wire.

4.02.06 **Outer Sheath**

The extruded outer sheath shall be of special low smoke and very low Halogen content (Acid gas generation shall be less than 2% by weight) elastomeric HOFR compound comprising of synthetic rubber and shall generally conform to the type SE-3 of IS: 6380 latest revision.

Minimum value of 'Tensile Strength' and 'Percentage elongation rate rupture' shall be 8 Newton/Sq. mm and 250% respectively.

The colour of outer sheath shall be black or any other colour agreed mutually between Owner and Supplier.

4.03.00 **Flexible Trailing Cables**

4.03.01 1100 V Grade flexible trailing cable shall be tinned copper of Class – 5 of IS – 8130, heat resistant electrometric compound based on EPR insulation, inner sheath of heat resistant electrometric compound PCP sheath, nylon cord reinforcement and heat resistant, oil resistant and flame retardant heavy duty electrometric compound FRLS CSP outer sheath.

5.00.00 **CABLE SELECTION & SIZING**

5.01.00 LT Power cables shall be sized based on the considerations mentioned in chapter 1.

5.02.00 Derating Factors

Derating factors for various conditions of installations including the following shall be considered while selecting the cable sizes:

- a) Variation in ambient temperature for cables laid in air
- b) Grouping of cables
- c) Variation in ground temperature and soil resistivity for buried cables.

5.03.00 Cable lengths shall be considered in such a way that straight through cable joints are avoided.

6.00.00 GENERAL REQUIREMENTS**6.01.00 Drum Length & tolerance**

6.01.01 Cable shall be supplied in wooden drums. The standard single length of each drum shall be minimum 500 metres for large size of cable minimum 1000 metre for smaller size of cables.

6.01.02 1.1KV Copper Fire Survival Power cables shall be supplied in wooden drums. Each drum shall be minimum 500 metres single length of cable.

Allowable tolerance on individual drum length is (+)5%.

6.02.00 Non-standard length

Bidder will be required to obtain Owner's approval before packing the non standard length of cables on drums. Non-standard lengths shall not be less than half of the standard packing length in any case.

6.03.00 Cable identification

Cable identification shall be provided by embossing on every meter on the outer sheath the following:

- a) UPRVUNL
- b) Manufacturer's name or trademark
- c) Voltage grade
- d) Year of manufacture
- e) Type of insulation and sheath, e.g. XLPE /HRPVC FRLS,IE2/SE3 F.S. as applicable.
- f) No. of core and size of cables.
- g) Sequential length marking at an interval of 1m through out the length of the cable.
- h) ISI mark
- i) Type of improved fire performance, e.g. FR/FR-LSH/FS.

7.00.00 PACKING

7.01.00 Cables shall be supplied in non-returnable drums. The drums shall be of heavy construction as per relevant IS. All wooden parts shall be manufactured from seasoned wood. All ferrous parts used shall be treated with suitable rust preventive finish or coating to avoid rusting during transit or storage. Wooden drums shall be treated by immersing in copper nitrate solution

7.02.00 Cable shall be wound and packed on drums in such a manner that it will be properly sealed and firmly secured to the drum. The ends of each length shall be sealed before shipment. Heat shrinkable cable seals shall be used for this purpose

7.03.00 A label shall be securely attached to each end of the reel indicating the length, type, voltage grade, conductor size and number of core of the cable. A tag containing the same information shall be attached to the leading end of the cable inside. An arrow and necessary instructions shall be marked on the

drum indicating the direction in which it should be rolled. Drum numbers are to be indicated on cable drums

7.04.00 The cable drums should carry the following details in printed form (non returnable):

- a) UPRVUNL & Manufacturer's name or trade make
- b) Type of cable & voltage grade
- c) Year of manufacture
- d) Type of insulation / sheath e.g. XLPE /HRPVC FRLS,IE2/SE3 F.S. as applicable.
- e) No. of core and size of cables
- f) Cable code
- g) Length of cable on drum
- h) Direction of rotation, by arrow
- i) Approx. gross mass.
- j) ISI mark
- i) IS/IEC number

8.00.00 TESTING PROCEDURE

8.01.00 TESTS DURING MANUFACTURE:-

During the manufacture of cables, manufacturer's standard tests shall be performed and record / test report shall be made available to purchaser's representative during inspection / testing.

8.02.00 TYPE ROUTINE & ACCEPTANCE TESTS:-

After completion of manufacture of cables, type, routine and acceptance tests shall be performed strictly as per relevant IS & other applicable standards amended upto date.

Routine tests shall be carried out on 100% drums.

8.03.00 TYPE TESTS :-

8.03.01 The type test as per applicable standards and as given below shall be conducted on one drum selected on random basis out of every 10 drums or less of each type and size of cable. Size shall mean area of cross section in sq.mm read in conjunction with the number of cores. Type shall mean type of insulation, sheath, volt grade FRLS/FS etc. In case, facilities of any of the type tests are not available at the works of the supplier, then such type tests shall be carried out by the supplier at independent recognized Govt. approved laboratory at the cost of supplier.

1. Tensile test (for aluminium) as per IS:8130
2. Wrapping test (for aluminium) as per IS:8130

Note:- In the case of compacted circular & shaped conductors these tests shall be carried out before compacting/shaping for ensuring use of H2 grade aluminium.

3. Conductor Resistance test as per IS:8130.



4. Test for armour wire/strip as per IS:3975
- 5) Test for thickness of XLPE Insulation and HRPVC,FR-LSH sheath :-
Requirements and methods of tests for the thickness of insulation, inner sheath and outer sheath shall be as per IS: 7098 (Part-2).
- 6) Tensile strength and elongation test for insulation & sheath :-
This test shall be carried out as per IS:7098 Part-2 for XLPE cable.
- 7) Ageing test for insulation and sheath:-
The method of test shall be as per the relevant IS standard. The period of test shall be 168 hours (7 days). At the end of the ageing period, the tensile strength and elongation test shall be carried out as per Sr.No.(6) above. The value obtained must not differ from the corresponding values obtained before ageing by more than + or - 25% in case of XLPE compound.
- 8) Loss of mass test for HRPVC, FR-LSH sheath :-
This test shall be carried out as per IS 583/1984 012 IEC 540 & IEC 502, on cables of all voltage grades. The maximum permissible loss of mass is 2 mg/sq.cm for PVC.
- 9) Shrinkage test for XLPE insulation & HRPVC FR-LSH sheath:-
This shall be carried out as per IS:5831 – 1984 for sheathed and as per IS 7098 (Part 2) 1985 for XLPE insulation.
- 10) Hot deformation test for HRPVC,FR-LSH sheath :-
This shall be carried out as per IS:5831 / 1984.
- 11) Cold Impact test for HRPVC,FR-LSH sheath :-
This shall be carried out as per IS:5831.
- 12) Heat shock test for HRPVC,FR-LSH sheath :-
This test shall be carried out as per IS 5831 / 1984 and IEC 540 and IEC 502 & sheath shall pass the requirements of this test.
- 13) Thermal stability test for HRPVC,FR-LSH sheath :-
This test shall be carried out on cables as per IS 5831 / 1984 and IEC 540 and cables shall pass the minimum requirements of 80 minutes for sheath.
- 14) Hot set test for XLPE Insulation :-
This test shall be carried out as per IS:7098 Part-1 and Part-2 and cable shall pass the requirements given therein.

- 15) Test for bleeding and blooming of Pigments for HRPVC,FR-LSH Sheath :-

This shall be carried out as per IS:5831 / 1984.
- 16) Fire Resistance Test

This test is compulsory and shall comply with the relevant clause of applicable IS.
- 17) Partial Discharge Test for XLPE Cables :-

The partial discharge test for XLPE insulation shall be carried out as per IS:7098 (Part-II).
- 18) Bending Test for XLPE Cables :-

The test method and test requirement shall be as per IS:7098 (Part-II). On completion of this test, the sample shall be subjected to partial discharge measurement and comply with the requirements given in above sub-clause 17.
- 19) Insulation Resistance / Volume resistivity -

As per IS 7098 Part-2 / 1985.
- 20) Dielectric Power Factor Test

As per IS 7098 Part-2 / 1985.
- 21) Heating cycle test for XLPE Cables :-

This test shall be as per IS:7098 (Part-II)
- 22) High Voltage Test

This test shall be performed as per the relevant Indian Standard 7098 Part 2 / 1985.
- 23) Test for Rodent & Termite Repulsion Property of Sheath :-

A few chipping of the PVC compound is slowly ignited on a porcelain dish or cubicle in a muffle furnace at about 60 degree C. The resulting ignited ash is boiled with a little ammonium acetate solution (10%). Place a drop of aqueous sodium sulphide solution on a thick filter paper and allow to soak. Touch the spot with a drop of above extract. A black spot indicates the presence of lead, the anti-termite and rodent compound.
- 24) Impulse Withstand Test

As per IS – 7098 (2) (amended upto date).
- 25) Water Absorption Test

As per IS 7098 Part-2 / 1985.

8.03.02 The normal sequence of the electrical tests shall be as per Clause 16.1.1 of IEC-502/1978 and / or as per IS 7098 Part – 2 / 1985 . All the tests listed herein shall be applied successively to the same sample.

8.03.03 The inner and outer sheath of the XLPE insulated cable shall be subjected to all the tests applicable for PVC sheath as per IS 5831 / 1984.

8.04.00 SPECIAL TESTS ON HRPVC 'FR-LSH' MATERIAL

All the sizes of XLPE power cables of the 'FRLS' HRPVC sheathed type shall pass following special test requirements. Inner sheath wherever applicable shall also be of the 'FR-LSH' type 'HRPVC' to meet these special tests.

i) Oxygen/Temperature Index test on sheath material :-

This test shall be carried out as per American National Std. A STM-D-2863/77.

The minimum oxygen index shall be 29 at room temperature.

For determination of the temp.index, the oxygen index test shall be carried out at different temperature upto 250°C. However, the test shall be carried out by extra-polation method beyond temperature at which the material of sheath may start deformation. The minimum temp. index (i.e. the temperature at which the oxygen index is minimum 21) shall be 250°C generally as per BICC Hand Book Chapter-6.

ii) Acid gas emission test on sheath material :-

This test shall be carried out as per IEC Std. 754-1. The maximum acid gas emission shall be less than 20 by weight.

iii) Smoke density test on sheath material :-

This test shall be carried out as per American National Standard ASTM-D-2843/1977 and also as per UITP method (3M cube test on finished cable sample). The ASTM test method is compulsory. For passing this test, the requirement of light transmission shall be minimum 40% after the test.

iv) Flammability test on finished cable sample :-

This test shall be carried out as per the following method :

Swedish Std.SS:424-14-75 Class-F3. This test known as Swedish Chimney test is compulsory.

IEEE std. 383-1974 – This test known as the vertical tray flame propagation test shall be conducted if insisted by purchaser.

IEC Std: 332-1. – The cable should meet the requirement of all the above standards.

9.00.00 ROUTINE TESTS :

The following tests shall be carried out as Routine tests on each and every drum length of cable, as per IS 7098 (Part 2) / 1985.

- High Voltage Test
- Conductor Resistance Test
- Partial discharge test (for screened cables) – on full drum length.

10.00.00 ACCEPTANCE TEST :

The following test shall be carried out as Acceptance Test in the presence of UPRVUNL Inspecting Engineer on samples taken from the delivery lot. One drum out of every 10 number of drums or less shall be selected at random sampling basis in each lot for the Acceptance Tests which shall be carried out at manufacturer's/supplier's cost.

1. High Voltage Test
2. Conductor Resistance Test
3. Tensile / wrapping test.
4. Partial discharge test (In screened cables).
5. Insulation Resistance/Volume resistivity test
6. Measurement of thickness of insulation and sheath and other dimensions
7. Tensile strength & elongation at break for insulation & sheath.
8. Hot set test on XLPE insulation
9. Flammability test as per Swedish standard SS:424-15-75 Class-F-3 (Swedish Chimney test)
10. Acid gas generation test as per IEC-754-1.
11. Smoke density test as per ASTM-D-2843/1977
12. Oxygen index test as per ASTM-D 2863/1977
13. Temp. index test as per ASTM-2863/77

11.00.00 TEST WITNESS

Tests shall be performed in presence of Owner/Owner's representative. The Contractor shall give atleast fifteen (15) days advance notice of the date on which the tests are to be carried out.

12.00.00 TEST CERTIFICATES

Certified reports of all the tests carried out at the works shall be furnished for approval of the Owner/Purchaser.

Test reports shall be completed with all details and shall also contain IS/IEC specified limit values, wherever applicable, to facilitate review.

The cables shall be dispatched from works only after receipt of Owner/Purchaser's written approval of the test reports.

13.00.00 SITE TESTS

The contractor shall carry out the following commissioning tests and checks after installation at site. In addition the contractor shall carry out all other checks and tests as recommended by the manufacturers.

1. Check for physical damage



2. Ensure that gland plates of single core power cables are of non-magnetic material.
3. Bimetallic lugs are used when connections are made between different materials (i.e. Copper & Aluminum)
4. Meggar test between each case and armour 1 sheath.
- 5.** Continuity check
6. Check connections.
7. Armour of single core cables should be earthed at one end only for multi core cables they are earthed at both ends.
8. Check for provision of correct cable tags, core ferrules, and tightness of connections.

LT CONTROL CABLES**1.00.00 SCOPE OF SUPPLY**

The cables shall be supplied, installed and commissioned in accordance with the following specification.

2.00.00 CODES & STANDARDS

All standards, specifications and codes of practice referred to herein shall be the latest editions including all applicable official amendments and revisions as on date of opening of bid. In case of conflict between this specification and those (IS: codes, standards, etc.) referred to herein, the former shall prevail. All the cables shall conform to the requirements of the following standards and codes:

IS:1554 (Part-I)	PVC insulated (heavy duty) electric cables for working voltage up to and including 1100 V.
IS:3961	Recommended current ratings for cables.
IS:8130	Conductors for insulated electric cables and flexible cords.
IS:5831	PVC insulation and sheath of electric cables.
IS:2982	Copper conductor in insulated cables and cords.
IS:3975	Mild steel wires, strips and tapes for armouring cables
IS:5609	Specification for low frequency wirers and cables with PVC insulation and PVC Sheath.
IS:6380	Spec. of elastomeric insulation of sheath of electric cables.
IS:434(I and II)	Specification for rubber insulation cables
IEC:540	The methods for insulations and sheaths of electric cables and cords (elastomeric and thermoplastic compounds).
IEC:230	Impulse tests on cables and their accessories.
IEC:287	Calculations of the continuous current rating of cables(100% load factor).
IEC:288	Nominal cross-sectional area and composition of conductor of insulated cables.
NEMA-WC-5	Thermoplastic insulated wires and cables for transmission and distribution of electrical energy.
IEEE:383	Standard for type test for class IE electric cables, filled splices and connections for nuclear power generation stations.
IEC: 332-1	Test on electric cables under fire conditions.

ASTM-D-2843	Standard test method for density of smoke from burning/decomposition of plastics
ASTM-D-2863	Test for determination of Oxygen Index.
IEC-754-I	Test method for acid gas generation.
IEC-331	Fire resisting characteristics of electric cables.
SVENSK Standard	SS- 4241475 Class F3

3.00.00 DESIGN CRITERIA

- 3.01.00 The cables will be used for connecting control circuits.
- 3.02.00 Cables shall be generally laid on overhead cable trays/cable trays in cable trenches or drawn through rigid Steel pipe conduits. For interplant connection cables routed along overhead cable bridge.
- 3.03.00 Perforated type cable trays to be used for control cables. Only in cable risers ladder type cable trays can be used for control cables.
- 3.04.00 For continuous operation at specified rating, maximum conductor temperature shall be limited to the permissible value as per relevant standard and/or this specification whichever is more stringent.
- 3.05.00 The insulation and sheath materials shall be resistant to oil acid and alkali and shall be tough enough to withstand mechanical stresses during handling.
- 3.06.00 The inner and outer sheath shall have flame retardant low smoke (FRLSH) characteristics or fire survival characteristics as the case may be, and shall meet the requirements of additional tests specified for the purpose.
- 3.07.00 The cables shall be designed and manufactured in accordance with the best engineering practice and shall be such as has been proven to be suited for the intended purpose.
- 3.08.00 Minimum value of volume resistivity for PVC insulation shall be 3.5×10^{14} ohms-cm at 27°C room temp. and 3.5×10^{11} ohms-cm at 85°C.

For fire survival control cable, the armouring over inner sheath shall consist of single layer of wire/round galvanized steel wire as per IS 975 amended upto date.

4.00.00 SPECIFIC REQUIREMENTS / CONSTRUCTIONAL REQUIREMENTS

4.01.00 1100 V Copper Conductor HRPVC FRLS Control Cables

1100 Volt grade, 85 deg C rating, control cables with stranded copper conductors, HRPVC Insulation, extruded HRPVC, FRLS Inner sheath, round wire/strip armour as specified elsewhere in the specification and extruded HRPVC, FRLS overall sheath. The cables shall be suitable for use in 1100V non-effectively earthed system. Control cable shall generally conform to IS 1554 latest and have ISI mark. Armour shall be GS.



4.01.01 Conductor

Conductor shall be stranded, high conductivity annealed, plain (untinned) copper conductor having 7 strands for 0.67 sq.mm control cables. Conductor shall be generally conforming to Class-II of IS 8130.

4.01.02 Insulation

The conductors shall be insulated with HRPVC compound conforming generally to type-C of IS:5831/1984 amended up to date ,except for the following special properties / parameters, necessary at normal operation and at 85⁰c maximum permissible conductor temperature. The maximum value of volume resistivity of insulation shall be 3.5×10^{14} ohms-cm at 27°C and 3.5×10^{11} ohms-cm at 85 °C.

4.01.03 Inner Sheath

The laid up insulated cores of twin and multicore control cables shall be provided with an inner sheath of extruded HRPVC, FRLSH compound conforming to Type ST2 of IS:5831/1984 amended up to date.

4.01.04 Armouring

For cables up to and inclusive 7 cores, galvanized round steel wire armour shall be provided. However, for control cables above 7 cores, galvanized steel strip armour shall be provided.

The armouring wire/strip shall generally conforming to IS: 3975 amended up to date.

For multicore armoured cables, the armouring shall be of galvanised steel as follows:

Calculated nominal dia of cable under armour**Size and Type of armour**

Upto 13mm	1.4mm dia GS wire.
Above 13 & upto 25mm	0.8mm thick GS formed wire/1.6mm dia GS wire.
Above 25 & upto 40mm	0.8mm thick GS formed wire/2.0mm dia GS wire.
Above 40 & upto 55mm	1.4mm thick GS formed wire/2.5mm dia GS wire.
Above 55 & upto 70mm	1.4mm thick GS formed wire/3.15mm dia GS wire.
Above 70mm	1.4mm thick GS formed wire/4.0mm dia GS wire.

4.01.05 Overall Sheath

A tough overall sheath of extruded HRPVC, FRLSH Compound conforming to type ST2 of IS: 5831/1984 shall be provided over armour. The colour of outer sheath shall be black or any other natural colour (with prior approval of the owner).

4.02.00 1100 V Copper Conductor Fire Survival Control Cables**4.02.01 Conductor**

Conductor shall be of stranded construction, consisting of high conductivity annealed tinned copper conductors conforming to IS 8130/1984 amended up to date.

A suitable heat barrier tape, preferably glass mica tape shall be provided over the conductor.

4.02.02 Insulation

The conductor insulation shall consist of heat resisting elastomeric material EPR (Ethylene Propylene rubber) and shall conform to Type IE-2 of IS:6380/1984 amended up to date.

4.02.03. Laying Up Of Cores (For Multi Core Cables Only)

The core shall be suitably identified in accordance with IS: 9968 (Part-I).

The suitable fire retardant material fillers shall be used for filling in the interstices.

Two layers of plain glass fiber binder tape shall be applied over the laid up cores.

4.02.04. Inner Sheath

An inner sheath of extruded special low smoke and very low halogen content (acid gas generation shall be less than 2% by weight) elastomeric (HOFR) compound of black colour or any other natural colour with prior approval from Owner conforming to Type SE-3 of IS-6380/1984, amended up to date, shall be provided over the laid up cores.

4.02.05. Armour

The armouring over inner sheath shall consist of single layer of wire/round galvanized steel wire as per IS 3975 amended up to date.

4.02.06. Outer Sheath

The outer sheath shall be of special low smoke and very low Halogen content (Acid gas generation shall be less than 2% by weight) elastomeric HOFR compound comprising of synthetic rubber and shall generally conform to the type SE-3 of IS:6380 latest revision.

The colour of outer sheath shall be black or any other natural colour agreed mutually between Owner.

5.00.00 GENERAL REQUIREMENTS**5.01.00 Drum Length & Tolerance**

The cable shall be supplied in wooden drums. Each drum shall be minimum 500 meters single length of cable. For above cable drums, allowable tolerance on individual drum length is +/- 5%.

1.1KV Copper Fire Survival control cables shall be supplied in wooden drums. Each drum shall be minimum 500 metres single length of cable. Allowable tolerance on individual drum length is $\pm 5\%$.

5.02.00 Non-standard length

Bidder will be required to obtain Owner's approval before packing the non standard length of cables on drums. Non-standard lengths shall not be less than half of the standard packing length in any case.

5.03.00 Cable identification

Cable identification shall be provided by embossing on every meter on the outer sheath the following:

- a) UPRVUNL
- b) Manufacturer's name or trademark
- c) Voltage grade
- d) Year of manufacture
- e) Type of insulation and sheath, e.g. HR85 for HR PVC/ FRLS, IE2/SE3/FS as applicable.
- f) No. of core and size of cables.
- g) Sequential length marking at an interval of 1m through out the length of the cable.
- h) ISI mark

Reference standard

Type of improved fire performance eg. FR/FR-LSH-FS

6.00.00 PACKING

6.01.00 Cables shall be supplied in non-returnable drums. The drums shall be of heavy construction as per relevant IS. All wooden parts shall be manufactured from seasoned wood. All ferrous parts used shall be treated with suitable rust preventive finish or coating to avoid rusting during transit or storage.

6.02.00 Cable shall be wound and packed on drums in such a manner that it will be properly sealed and firmly secured to the drum. The ends of each length shall be sealed before shipment.

6.03.00 A label shall be securely attached to each end of the reel indicating the length, type, voltage grade, conductor size and number of core of the cable. A tag containing the same information shall be attached to the leading end of the cable inside. An arrow and necessary instructions shall be marked on the drum indicating the direction in which it should be rolled. Drum numbers shall be indicated on cable drums.

6.04.00 The cable drums should carry the following details in printed form (non returnable):

- a) UPRVUNL & Manufacturer's name or trade make
- b) Type of cable & voltage grade
- c) Year of manufacture
- d) Type of insulation / sheath e.g. HR85 for HRPVC/ FRLS, IE2/SE3/FS. as applicable.
- e) No. of core and size of cables.



- f) Cable code.
- g) Single length of cable on drum
- h) Direction of rotation, by arrow
- i) Approx. gross mass.
- j) ISI mark.

7.00.00 Testing Procedure

7.01.00 1100 V Copper Conductor HR PVC FRLS Control Cables

7.01.01 TYPE TESTS

The type test as per applicable standards as given below shall be conducted on one drum selected on random basis out of every 10 drums or less of each type and size of cable (In presence of UPRVUNL representative). In case, facilities of any of the type tests are not available at the works of the supplier, then such type tests shall be carried out by the supplier at independent recognized Govt. approved laboratory at the cost of supplier.

- 1) Tensile test (for Aluminium) as per IS:8130
- 2) Wrapping test(for Aluminium) as per IS:8130
- 3) Persulphate test (on tinned copper wire) as per IS: 8130.
- 4) Test for armour wire/strip as per IS:3975

5) Test For Thickness Of Insulation And Sheath

Requirements and methods of tests for the thickness of insulation, inner sheath and outer sheath shall be as per IS: 1554 (Part-I) and IS: 5831/1984.

6) Tensile Strength And Elongation Test For Insulation & Sheath

This test shall be carried out as per IS: 5831 for PVC cable.

7) Ageing Test For Insulation And Sheath

This test shall be carried out as per IS: 5831/1984.

8) Loss Of Mass Test For HRPVC,FRISH Sheath

This test shall be carried out as per IS: 5831/1984.

9) Shrinkage Test For Xlpe Insulation & HRPVC,FRISH Sheath

This test shall be carried out as per IS: 5831/1984.

10) Hot Deformation Test For HRPVC,FRISH & Sheath

This shall be carried out as per IS: 5831 / 1984.

i) Cold Bend Test For HRPVC Insulation

This test shall be carried out as per IS: 5831/1984.



12) Cold Impact Test For HRPVC,FRISH Sheath

This test shall be carried out as per IS: 5831/1984.

13) Heat Shock Test For HRPVC Insulation , FRISH Sheath

This test shall be carried out as per IS: 5831/1984 and IEC-540 and IEC-502 and PVC Insulation & sheath shall pass the requirements of this test.

14) Thermal Stability Test For HRPVC Insulation ,FRISH Sheath

This test shall be carried out on cable of all voltage grades as per IS 5831 / 1984 and IEC 540 and cables shall pass the minimum requirements of 100 minutes for insulation and 80 minutes for sheath.

15) Test For Bleeding And Blooming Of Pigments For HRPVC,FRLSH Sheath

This shall be carried out as per IS: 5831 / 1984.

16) Fire Resistance Test

This test is compulsory for all cables and shall comply with the relevant clause of applicable IS.

17) Measurement of Insulation Resistance (Volume Resistivity) For HRPVC Cables

This shall be carried out as per IS: 5831 / 1984 but the values of volume resistivity of HRPVC insulated cables shall be not less than the values given below:

Min. Vol. Resistivity at 27°C temp.3.5 x 10¹⁴ ohm-cm.

Min. Vol. Resistivity at 85°C temp.3.5 x 10¹¹ ohm-cm.

18) High Voltage Test

This test shall be performed as per the relevant Indian Standard 1554.

19) Test For Rodent & Termite Repulsion Property Of Sheath

"A few chipping of the PVC compound is slowly ignited on a porcelain dish or cubicle in a muffle furnace at about 60 degree C. The resulting ignited ash is boiled with a little ammonium acetate solution (10%). Place a drop of aqueous sodium sulphide solution on a thick filter paper and allow to soak. Touch the spot with a drop of above extract. A black spot indicates the presence of lead, the anti-termite and rodent compound."

Or any other chemical method for detecting the presence of lead.

7.01.02 The normal sequence of the electrical tests shall be as per clauses 16.1.1 of IEC-502/1978. All the tests listed herein shall be applied successively to the same sample.

7.01.03 Special Tests On HRPVC 'FRLSH' Material

All the sizes of 1.1 KV Grade HRPVC insulated, HRPVC Control cables of the FRLSH sheathed type shall pass these special test requirements. Inner sheath wherever applicable shall also be of the 'FRLSH' type 'HRPVC' to meet these special tests.

i) Oxygen/Temperature Index Test On Sheath Material

This test shall be carried out as per American National Std. ASTM-D-2863/77. The minimum oxygen index shall be 29 at room temperature.

For determination of the temp index, the oxygen index test shall be carried out at different temperature upto 250°C. However, the test shall be carried out by extrapolation method beyond temperature at which the material of sheath may start deformation. The minimum temp. index (i.e. the temperature at which the oxygen index is minimum 21) shall be 250°C generally as per BICC Hand Book Chapter-6.

ii) Acid Gas Emission Test On Sheath Material

This test shall be carried out as per IEC Std. 754-1. The maximum acid gas emission shall be less than 20% by weight.

iii) Smoke Density Test On Sheath Material

This test shall be carried out as per American National Standard ASTM-D-2843/1977 and also as per UITP method (3M cube test on finished cable sample). **The ASTM test method is compulsory.** For passing this test, the requirement of light transmission shall be minimum 40% after the test (Corresponding to 60 % smoke density).

iv) Flammability Test On Finished Cable Sample

This test shall be carried out as per the following method :

Swedish Std.SS:424-14-75 Class-F3. (This test known as Swedish Chimney test is compulsory).

IEEE std. 383-1974 – This test known as the vertical tray flame propagation test shall be conducted if insisted by purchaser.

IEC Std: 332-1. – The cable should meet the requirement of all the above standards.

7.01.04 Routine Tests

The following tests shall be carried out as Routine tests on each and every drum length of cable, as per IS: 1554 / IS: 8130/1984.

- High Voltage Test.
- Conductor Resistance Test.

7.01.05 Acceptance Test

The following test shall be carried out as Acceptance Test in the presence of Owner's Inspecting Engineer on samples taken from the delivery lot. One drum out of every 10 number of drums or less shall be selected at random sampling basis for the Acceptance Tests.

1. Tensile / wrapping test.
2. High Voltage Test.
3. Conductor Resistance Test
4. Insulation Resistance/Volume resistivity test.
5. Measurement of thickness of insulation and sheath and other dimensions.
6. Tensile strength & elongation at break for insulation & sheath.
7. Flammability test as per Swedish standard SS: 424-15-75 Class-F-3 (Swedish Chimney test).
8. Acid gas generation test as per IEC-754-1.
9. Smoke density test as per ASTM-D-2843/1977.
10. Oxygen index test as per ASTM-D 2863/1977.
11. Temp. index test as per ASTM-2863/77

7.02.00 **1100 V Copper Conductor Fire Survival Control Cables**

7.02.01 **Type Tests**

The type test as per applicable standards as given below shall be conducted on one drum selected on random basis out of every 10 drums or less of each type and size of cable (In presence of UPRVUNL representative). In case, facilities of any of the type tests are not available at the works of the supplier, then such type tests shall be carried out by the supplier at independent recognized Govt. approved laboratory at the cost of supplier.

S No.	Name of Tests	Governing Standard	Special Requirements as per Purchaser's Specification
1	Annealing test (for copper)	IS:8130/1984	--
2	Persulphate test (for tinned copper)	IS:8130/1984	--
3	Conductor Resistance test	IS:8130/1984	--
4	Test for armour wires	IS:8130/1984	--
5	Test for measurement of DC Resistance of armour	---	--
6	Test for Thickness of insulation and sheath and other dimensions	IS:9968(i)	--
7	Tensile strength & elongation at break for insulation	IS:6380/1984	--
8	Tensile strength and elongation for sheath	IS:6380/1984	--
9	Ageing test for insulation		
	Air over	IS:6380/1984	--
	Air-Bomb		
	O ₂ – bomb	IS:6380/1984	--
10	Oil Resistance Test for sheath	IS:6380/1984	--
11	Water absorption test for Insulation (Elect.)	IS:6380/1984	--
12	Hot set test for insulation	IS:6380/1984	--



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S No.	Name of Tests	Governing Standard	Special Requirements as per Purchaser's Specification
13	Measurement of Insulation Resistance constant (K-value)	IS:6380/1984	--
14	High Voltage Test		
	i) Water immersion test	IS:9968(I)	--
	ii) Spark Test		
15	Oxygen index test on inner & outer sheath material	ASTM-D-2863/77	MIN-29
16	Temp. index test on inner & outer sheath material	ATM-D-2863/77 IEC-331	Min 350°C
17	Acid gas emission test on inner & outer sheath material	IEC-754-1	Acid gas generation shall be less than 2% by weight.
18	Smoke density test on inner & outer sheath	ASTMD—2843/77 IEC-331	Max. smoke density in percentage light absorption shall not exceed 20%.
19	Flammability test on finished cable sample as per following method	IS:8130/1984	--
	i) 3 Hour Fire Survival test	IEC-331	--
	ii) Swedish Chimney Test	SS-424-14-75 75 9 (Class F3)	---
	iii) Vertical tray flame propagation test	IEEE383/74	---
	iv) Single Vertical cable fire Resistance Test	IEC-332-1	--

7.02.02 **Routine Tests**

The following test shall be carried out as Routine Tests on each and every delivery length of cable.

1. High Voltage Test - IS: 9968 (I)
2. Conductor Resistance test - IS: 8130/1984

7.02.03 **Acceptance Tests**

Following tests shall be carried out as acceptance tests in the presence of Owner's Inspecting Engineer on samples taken from the delivery lot. One drum out of every 10 drums or less shall be selected on random sampling basis.

1. Annealing Test - IS 9968 (I)
2. High Voltage test - IS 9968 (I)
(Water immersion Test)
3. Conductor resistance test - IS8130/1984
4. Insulation Resistance Test - IS6380/1984
- Measurements of thickness of Insulation and sheath and other dimensions - IS:9968(I)
6. Tensile strength & elongation at - IS 6380/1984



- Break for sheath
7. Tensile strength and elongation at break of sheath - IS 6380/1984 --As per GTP
 8. Oxygen index test on inner & outer Sheath material at room temperature ASTM-D-2863/77 Min. 29
 9. Temp. index test on inner & outer sheath material degC ASTM-D-2863/77 Min 350 IEC-331
 10. Acid gas emission test on inner & generation outer sheath material IEC-754-1 Acid gas shall be less than 2%
 11. Smoke density test on inner & outer density sheath material ASTM-D-2863/77 Max smoke in percentage light
Absorption shall not exceed 20%.
 - Flammability test on finished cable Sample as per following method
 - i) 3 Hour fire Survival Test IEC -331
 - ii) Swedish Chimney Test SS-424-14-75 Class-F3)

9.00.00 SITE TESTS

The contractor shall carry out the following commissioning tests and checks after installation at site. In addition the contractor shall carry out all other checks and tests as recommended by the manufacturers.

1. Check for physical damage
2. Bimetallic lugs are used when connections are made between different materials (i.e. Copper & Aluminum)
3. Continuity check
4. Check connections.
5. Check for provision of correct cable tags, core ferrules, and tightness of connections.

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SECTION- 3

PROJECT DETAILS AND GENERAL SPECIFICATIONS

3.0 GENERAL

This section stipulates the General Technical Requirements 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, equipment and services covered under other sections of tender documents and are not exclusive. However in case of conflict between the requirements specified in this section and requirements specified under other sections, the requirements specified under respective sections shall prevail.

3.1 PROJECT DETAILS

	Particular	Details
a)	Customer	Uttar Pradesh Rajya Vidyut Utpadan Nigam Ltd.
b)	Engineer Consultant	DCPL
c)	Engineer Review Consultant/ Inspector	NTPC Ltd.
d)	Project Title	Panki Thermal Power Project (3x660 MW): 400kV Switchyard
e)	Project Location	Place: Panki District: Kanpur State: Uttar Pradesh
f)	Latitude & Longitude	North N26028'20" East E 80014'32"
g)	Nearest Railway Station	Panki
h)	Distance of project location from the Railway station	5 Km
i)	Nearest Major Town	Kanpur
j)	Distance of the town from the project site	16 Km.
k)	Nearest Highway from the project site	National Highway - 25
l)	Nearest airport	Kanpur – 25 Km Lucknow – 80 Km
m)	Nearest commercial airport	440 Km
n)		
	<u>SITE CONDITIONS</u> (for design purposes)	
a)	Design ambient temperature	50°C
b)	Maximum Relative humidity	85 %
c)	Height above mean sea level	Less than 1000 meters
d)	Pollution Severity	Heavily polluted (With Coal dust & Fly ash) and Highly Corrosive environment.
e)	Criteria for Wind Resistant design of structures and equipment	Standard Applicable - IS 875 (Part 3) 1987
f)	Basic Wind speed “Vb” at ten meters above the mean ground level.	47 m/ sec
g)	Siesmic data	Zone-III as per IS: 1893

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3.1.1 SYSTEM PARAMETERS:

Sl.No.	Parameters	400 kV
1	Highest system voltage	420 kV rms
2	Lightning Impulse voltage	±1425kVp
3	Switching impulse voltage	±1050kVp
4	Power frequency withstand for 1 min (rms)	630 kV(rms)
5	Max. fault level (1 sec.)	50 kA
6	Minimum creepage distance	13020 mm

3.1.2 AUXILIARY POWER:

Sl.No.	Nominal Connection Voltage	Variations in Voltage	Frequency	Phase	Neutral
1	415V	±10%	50 (+5% -5%)	3Phase , 4 Wire	Solidly Earthed
2	240V	±10%	50 (+5% -5%)	1 phase	Solidly Earthed

Combined variation of voltage and frequency shall be + 10%. Design fault level of 415V system shall be restricted to 50kA rms for 1 second & for 25kA for 1 sec. for 220V DC system.

The operational limits for variation of DC voltage are (+) 10% to (-) 15%.

3.1.3 The various minimum heights of the switchyard shall be as given below from plinth level:

Voltage	Equipment /1st Level	Main Bus Level	Jack Bus Level	Peak
400kV	8000mm	15000mm	23000mm	7500mm

The minimum vertical distance from the bottom of the lowest porcelain part of the bushing, porcelain enclosures or support insulators to the bottom of the equipment structure, where it rests on the foundation pad shall be 2550mm.

3.1.4 The minimum clearances for 400kV switchyard shall be as given below:

Phase to earth clearance	3500 mm
Phase to phase clearance	4200 mm
Section clearance	6500 mm

3.2 INSTRUCTION TO BIDDERS

The bidders shall submit the technical requirements, data and information as per the technical data sheets, provided in Section-4.

The bidders shall furnish catalogues, engineering data, technical information, design documents, drawings etc fully in conformity with the technical specification.

It is recognized that the bidders may have standardized on the use of certain components, materials, processes or procedures different than those specified herein. Alternate proposals offering similar equipment based on the manufacturer's standard practice will also be considered provided such proposals meet the specified designs, standard and performance requirements and are acceptable to the Purchaser. Unless brought out clearly, the Bidder shall be deemed to conform to this specification scrupulously. All deviations from the specification shall be clearly brought out in the respective

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schedule of deviations. Any discrepancy between the specification and the catalogues or the bid, if not clearly brought out in the schedule, will not be considered as valid deviation.

Equipment furnished shall be complete in every respect with all mountings, fittings, fixtures and standard accessories 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 unless included in the list of exclusions. Materials and components not specifically stated in the specification but which are necessary for commissioning and satisfactory operation of the switchyard 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 under supply shall be inter-changeable with one another.

‘Make’ of brought-out items are subject to Owner/Purchaser’s approval.

The bidder shall furnish relevant details to the Owner/Purchaser for his concurrence before procurement. Makes approved by owner shall only be acceptable.

The bidder shall supply type tested (including special tests as per tech. specification) equipment and materials. The test reports shall be furnished by the bidder along with equipment/ material drawings. In the event of any discrepancy in the test reports, (i.e., if any test report is not acceptable due to any design/ manufacturing changes or due to non-compliance with the Technical Specification and/ or applicable standard), the tests shall be carried out without any additional cost implication to the BHEL. BHEL reserves the right to get any or all type/tests conducted/repeated.

3.3 CODES AND STANDARDS

The Design, manufacture, erection, testing and performance of items and services provided under this specification shall comply with the latest edition including all applicable official amendments and revisions as on date of award of the following standards. In case of conflict between this specification and code (IS Code, standards, etc.) referred herein, the more stringent of both shall prevail. All work shall be carried out as per the codes and standards listed out in the description of each equipment/item.

Indian Electricity Act and Indian Electricity Rules can be obtained from bureau of Indian Standards.

Equipment complying with other internationally accepted standards such as IEC, BS, USA, VDE etc. will also be considered if they ensure performance and constructional features equivalent or superior to standards listed above. In such a case, the Bidder shall clearly indicate the standard(s) adopted, furnish a copy in English of the latest revision amendments and revision in force on date of opening of bid and shall clearly bring out the salient features for comparison.

The supplier is required to follow local statutory regulations stipulated in the latest amended Electricity Supply Act 1948 and Indian Electricity Rules 1956 (latest), and other local rules and regulations.

3.4 SERVICES TO BE PERFORMED BY THE EQUIPMENT BEING FURNISHED

The 400 kV system is being designed to limit the power frequency over voltage of 1.5 p.u. and the switching surge over voltage to 2.5 p.u. In 400 kV system the initial value of temporary over voltage could be 2.0 p.u. for 1-2 cycles. All the equipment/materials covered in this specification shall perform all its function satisfactorily without undue strain, restrike etc. under such over voltage conditions. All equipment shall also perform satisfactorily under various other electrical, electromechanical and meteorological conditions of the site of installation. All equipment shall be able to withstand all external and internal mechanical, thermal and electromechanical forces due to various factors like

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wind load, temperature variation, ice & snow, (not applicable for this project) short circuit etc for the equipment .

The equipment shall also comply with the following:

- a) All equipments shall be suitable for hot line washing.
- b) To facilitate erection of equipment, all items to be assembled at site shall be "match marked".
- c) Piping, if any, between equipment control cabinet or operating mechanism to marshalling box of the equipment shall bear proper identification to facilitate the connection at site.
- d) All equipment shall be supplied with necessary inter-pole cabling, and its cost shall be included in the cost of equipment.

3.5 ENGINEERING DATA

3.5.1 Drawings

All drawings submitted by the supplier including those submitted at the time of bid shall be in sufficient detail to indicate the type, size, arrangement, material description, Bill of Materials, weight of each component, break-up for packing and shipment, the external connections, fixing arrangement required. The dimensions required for installation and interconnections with other equipment and materials, clearances and spaces required for installation and interconnections between various portions of equipment and any other information specifically requested in the specifications.

Each drawing submitted by the Contractor (including those of sub-vendors) shall bear a title block at the right hand bottom corner with clear mention of the name of the Employer, the system designation, the specifications title, the specification number, the name of the Project, drawing number and revisions. If standard catalogue pages are submitted, the applicable items shall be indicated therein. All titles, noting, markings and writings on the drawing shall be in English. All the dimensions should be in metric units.

After the approval of the drawings, further work by the Contractor shall be in strict accordance with these drawings and no deviation shall be permitted without the written approval of the Purchaser, if so required.

The review of these data by the purchaser will cover only general conformance of the data to the specification and documents, interfaces with the equipment provided under specification, external connections and of the dimensions which might affect plan layout. This review by the purchaser may not indicate a thorough review of the dimensions, quantities and details of the equipment, material, 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 contractor, as limiting any of his responsibilities and liabilities for mistakes and deviations from the requirements, specified under these specifications and documents.

All manufacturing and fabrication work in connection with the equipment prior to the approval of the drawings shall be at the Contractor's risk. The Contractor may make any changes in the design which are necessary to make the equipment conform to the provisions and intent of the Contract and such changes will again be subject to approval by the Purchaser. Approval of Contractor's drawing or work by the Purchaser shall not relieve the contractor of any of his responsibilities and liabilities under the Contract.

All engineering data submitted by the contractor after final process including review and approval by the purchaser shall form part of the contract document and the entire work performed under these specifications shall be performed in strict conformity, unless otherwise expressly requested by the purchaser in writing.

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3.5.2 Approval Procedure

The following procedure for submission and review/approval of the drawings, data, reports, information, etc. shall be followed by Contractor:

- a. All data/information furnished by Vendor in the form of drawings, documents, Catalogues or in any other form for NTPC's information/interface and/or review and approval are referred by the general term "drawings".
- b. The 'Master drawings list' indicating titles, Drawing Number, Date of submission and approval etc. shall be finalised mutually between Contractor and Employer before the award of contract. This list shall be updated if required at suitable interval during detailed engineering.
- c. All drawings (including those of subvendor's) shall bear at the right hand bottom corner the 'title plate' with all relevant information duly filled in. The Contractor shall furnish this format to his subvendor along with his purchase order for subvendor's compliance.
- d. Contractor shall submit all the drawings in five (5) copies for review of Employer. Employer shall forward their comments within four (4) weeks of receipt of drawings.
- e. Upon review of each drawings, depending on the correctness and completeness of the drawings, the same will be categorised and approval accorded in one of the following categories:

CATEGORY I	Approved
CATEGORY II	Approved subject to incorporation of comments/modification as noted. Resubmit revised drawing incorporating the comments
CATEGORY III	Not approved. Resubmit revised drawings for Approval after incorporating comments/modifications as noted
CATEGORY IV	For information and records

- f. Contractor shall resubmit the drawings approved under Category II, III within one (1) week of receipt of comments on the drawings, incorporating all comments. Every revision of the drawing shall bear a revision index wherein such revisions shall be highlighted in the form of description or marked up in the drawing identifying the same with relevant revision number enclosed in a triangle (e.g 1.2.3. etc.).
- g. In case Contractor does not agree with any specific comment, he shall furnish the explanation for the same to Employer consideration. In all such cases Contractor shall necessarily enclose explanations along with the revised drawing (taking care of balance comments) to avoid any delay and/or duplication in review work.
- h. It is the responsibility of the Contractor to get all the drawings approved in the Category I or IV (as the case may be) and complete engineering activities within the agreed schedule. Any delay arising out of submission and modification of drawings shall not alter the contract completion schedule.
- i. Contractor shall not make any changes in the portion of the drawing other than those commented. If changes are required to be made in the portions already approved, the Contractor shall resubmit the drawings identifying the changes (along with reasons for changes) for Employer's review and approval. **Drawings resubmitted shall show clearly the portions where the same are revised marking the relevant revision numbers and Employer shall review only such revised portion of documents.**
- j. Approval of drawings will not in any way relieve the Contractor of his obligations of furnishing the equipment in accordance with the specification and shall not prevent subsequent rejection if such equipment is later found to be defective.

3.5.3 Erection Drawings.

- a. Contractor shall furnish erection drawings for the guidance or commencement of erection or the first shipment, whichever is earlier. These shall generally comprise of fabrication/assembly drawings, various component/part details drawing, assembly, clearance data requirements, etc.

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The drawings shall contain details of components/ equipment with identification number, match marks, bill of materials, assembly procedures etc.

- b. For all major equipment apart from above details, assembly sequence and instructions with check-lists shall be furnished in the form of erection manuals.

3.5.4 Instruction Manual

- a. The Contractor shall submit to the Employer preliminary instruction manuals for all the equipments for review. The final instructions manuals incorporating Employer's comments and complete in all respect shall be submitted at least sixty (60) days before the first shipment of the equipment. The instruction manuals shall contain full details and drawings of all the equipments, the transportation, storage, installation, testing, operation and maintenance procedures, etc. separately for each component/equipment along with log record format. These instruction manuals shall be submitted in five (5) copies for approval.
- b. If after commissioning and initial operation of the plant, the instruction manuals require any modifications/additions/changes, the same shall being corporate and the updated final instruction manuals shall be submitted.
- c. The operating and maintenance instructions together with drawings (other than shop drawings) of the equipment, as completed, shall have sufficient details to enable the Employer to maintain, dismantle, reassemble and adjust all parts of the equipment. They shall give a step by step procedure for all operations likely to be carried out during the life of the plant/equipment, including erection, testing, commissioning, operation, maintenance dismantling and repair. Each manual shall also include a complete set of approved drawings together with performance/rating curves of the equipment and test certificates, wherever applicable. The contract shall not be considered completed for purpose of taking over until such instructions and drawings have been supplied to the Employer.
- d. A separate section of the manual shall be for each size/type of equipment and shall contain a detailed description of construction and operation, together will all relevant pamphlets.
- e. The manuals shall include the following
 - a) List of spare parts along with their drawing and catalogues and procedure for ordering spares.
 - b) Lubrication Schedule including charts showing lubrication checking, testing and replacement procedure to be carried daily, weekly, monthly & at longer intervals to ensure trouble free operation.
- f. A collection of the manufacturer's standard leaflets will not accepted to be taken as a compliance of this clause. The manual shall be specifically compiled for the concerned project.

3.5.5 Operation & Maintenance Manuals

The manual shall be a two rim PVC bound stiff sided binder able to withstand constant usage or where a thicker type is required it shall have locking steel pins, the size of the manual shall not be larger than international size A3. The cover shall be printed with the Project Name, Services covered and Volume / Book number Each section of the manual shall be divided by a stiff divider of the same size as the holder. The dividers shall clearly state the section number and title. All written instructions within the manual not provided by the manufacturers shall be typewritten with a margin on the left hand side.

3.5.6 As Built Drawings

After final acceptance of individual equipment/system by the Owner, the Bidder will update all original drawings and documents for the equipment/ system to "as built" conditions in requisite number.

Drawings must be checked by the Bidder in terms of its completeness, data adequacy and relevance with respect to engineering schedule prior to submission to the Owner. In case drawings are found to be submitted without proper endorsement for checking by the Bidder, the same shall not be reviewed and returned to the Bidder for re-submission. The Bidder shall make a visit to site to see the existing

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facilities and understand the layout completely and collect all necessary data/drawings at site which are needed as an input to the engineering. The Bidder shall do the complete engineering including interfacing and integration of all his equipment, systems & facilities within his scope of work as well as interface engineering & integration of systems, facilities, equipment & works under Owner's scope and submit all necessary drawings/ documents for the same.

3.5.7 Final Submission of drawings and documents:

The Contractor shall furnish the following after approval of all drawings /documents and test reports:

- a. List of drawings bearing the Employer's and Contractor's drawing number.
- b. Two (2) bound sets alongwith 4 CD-ROMs of all drawing.
- c. All documents/designs in two (2) copies as noted above.
- d. Contractor shall also furnish six (6) bound sets of all as-built drawings including the list of all as-built drawings bearing drawing numbers. The Contractor shall also furnish two (2) sets of CD-ROMs/ DVD/Portable hard disk of all as-built drawings as decided by the Employer.
- e. The Contractor shall also furnish four (4) copies of instruction/ operations & maintenance manuals (after approval) for all the equipments.

3.5.8 TEST REPORTS

Four (4) copies of preliminary test results shall be supplied for approval prior to despatch of the equipment. Bound copies of complete test results shall be furnished later, in number of copies as per attached Distribution Schedule. These shall incorporate all tests carried out on the equipment and its auxiliaries as well as characteristic curves of current transformers including reports on the official test waves, failure detection data and copies of final test oscillograms of both voltage and current with calibration.

3.6 MATERIAL /WORKMANSHIP

Where the specification does not contain references to workmanship, equipment, materials and components of the covered equipment, it is essential 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 and shall ensure satisfactory performance throughout the service life.

In case where the equipment, materials or components are indicated in the specification as "similar" to any special standard the purchaser shall decide upon the question of similarity. When required by the specification or when required by the purchaser the contractor shall submit, for approval, all the information concerning the materials or components to be used in manufacture. Machinery, equipment, materials and components supplied, installed or used without such approval shall run the risk of subsequent rejection, it being understood that the cost as well as the time delay associated with the rejection shall be borne by the Contractor.

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

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equipment in order to minimize spare parts stocking requirements. All equipment of the same type and rating shall be physically and electrically interchangeable.

The equipment offered in the bid only shall be accepted for supply, with the minimum modifications as agreed/accepted.

3.7 TROPICAL PROTECTION

All electrical equipment, accessories and wiring shall have fungus protection involving special treatment of insulation and metal against fungus, insects and corrosion.

Fine mesh screen of corrosion resistant material shall be furnished on all ventilating openings to prevent entry of insects.

3.8 SPACE HEATERS

The heaters shall be suitable for continuous operation at 230 V as supply voltage. On –off switch and fuse shall be provided.

One or more adequately rated thermostatically connected heaters shall be supplied to prevent condensation in any compartment. The heaters shall be installed in 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 conducting 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 vitreous 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 insulated wire or other component in the compartments.

3.9 FUNGI STATIC VARNISH

Besides the space heaters, special moisture and fungus resistance 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 interfere with the operation or performance of the equipment. Such surfaces or parts shall be protected against the application of the varnish.

3.10 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.

3.11 DEGREE OF PROTECTION

Degree of protection for various enclosures as per IS: 13947 shall be as follows:

1. LT Switchgear/MCC/DBs/Fuse Boards

- | | | |
|--|---|------|
| i. Compartments and busbar chambers upto 1600A | : | IP52 |
| ii. Compartments and busbar chambers above 1600A | : | IP42 |
| iii. Switchgear located outdoor | : | IP55 |

2. Motors

- | | | |
|--------------------|---|------------------|
| i. Indoor motors | : | IP55 |
| ii. Outdoor motors | : | IP55 with canopy |

3. Transformers

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- | | | |
|---|---|------|
| i. Indoor Transformer | : | IP22 |
| ii. Cable box-indoor area | : | IP52 |
| iii. Cable box-outdoor area | : | IP54 |
| iv. Indoor kiosks and marshalling boxes | : | IP54 |
| v. Outdoor kiosks and marshalling boxes | : | IP55 |
- 4. Push Button Stations and any other kiosk/box/panel/ enclosure**
- | | | |
|---|---|------|
| i. Indoor | : | IP54 |
| ii. Outdoor | : | IP55 |
| iii. In dusty areas, e.g. conveyor galleries, transfer points, crusher house, bunker floor etc. | : | IP65 |
- 5. Junction boxes for cables/wires** : **IP55**
- 6. Outdoor lighting fixtures** : **IP55**

The degree of protection shall be in accordance with IS: 13947 (Part –I) / IEC-947 (Part-I) / IS 12063/IEC 529. Type test report for degree of protection test, on each type of the box shall be submitted for approval.

3.12 PRESERVATIVE SHOP COATING

All exposed metallic surfaces subject to corrosion shall be protected by shop application of suitable coatings. All surfaces which will not be easily accessible after the shop assembly, shall be treated beforehand and protected for the life of the equipment. All surfaces shall be thoroughly cleaned of all mill scales, oxides and other coatings and prepared in the shop. The surfaces that are to be finish-painted after installation or require corrosion protection until installation, shall be shop painted with at least two coats of primer.

Transformers and other electrical equipment if included shall be shop finished with one or more coats of primer and two coats of high grade epoxy. The finished colours shall be as per manufacturer's standards, to be selected and specified by the Owner at a later date.

Shop primer for all steel surfaces which will be exposed to operating temperature below 95 degrees Celsius shall be selected by the Contractor after obtaining specific approval of the Employer regarding the quality of primer proposed to be applied. Special high temperature primer shall be used on surfaces exposed to temperature higher than 95 degrees Celsius and such primer shall also be subject to the approval of the Employer.

All other steel surfaces which are not to be painted shall be coated with suitable rust preventive compound subject to the approval of the Owner.

3.13 RATING PLATES, NAME PLATES AND LABELS

- 3.13.1 Each equipment shall have permanently attached to it in a conspicuous position, a rating plate of non-corrosive material upon which shall be engraved manufacturer's name, equipment, type or serial number together with details of the ratings, service conditions under which the item of plant in question has been designed to operate, and such diagram plates as may be required by the Employer.
- 3.13.2 Such nameplates or labels shall be of white non hygroscopic material with engraved black lettering or alternately, in the case of indoor circuit breakers, starters, etc. of transparent plastic material with suitably coloured lettering engraved on the back.
- 3.13.3 The rated current, extended current rating and rated thermal current shall be clearly indicated in the name plate in case of current transformer.
- 3.13.4 Rated voltage, voltage factor and intermediate voltage shall be clearly indicated on the nameplate in case of capacitor voltage transformer.
- 3.13.5 Each switch shall have a clear inscription identifying its function. Switches shall also have a clear inscription of each position indication.

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- 3.13.6 All segregated phases of conductors or bus ducts, indoor or outdoor, shall be provided with coloured phase plates to clearly identify the phase of the system.
- 3.13.7 All such plates, instruction plates, etc. 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.

3.14 GALVANISING

- 3.14.1 The galvanised surface shall consist of a continuous film adhering to the steel. The finished surface shall be clean and smooth, and shall be free from defects like dissolved patches, base, spot, unevenness of coating, spelter which is loosely attached to the steel globules, spiky deposits, blistered surfaces, flaking or peeling off, etc. The presence of any of these defects shall render the material liable to rejection.
- 3.14.2 All exposed ferrous parts shall be hot dip galvanised as per IS:2629 & IS:2633, Galvanising shall be uniform, smooth continuous and free from acid spots. Should the galvanising of the sample be found defective, the entire batch of steel shall have to be re-galvanised at Contractor's cost. The amount of zinc deposit shall be not less than 610 gms. per sq.m. of surface area and in addition, the thickness of zinc at any spot shall not be less than 85 microns. The Employer reserves the right to measure the thickness of zinc deposit by Elkometer or any other instrument acceptable to Employer and reject any component which shows thickness of zinc at any location less than 85 microns. The testing on the galvanised materials shall be carried out as per IS:2633.
- 3.14.3 The amount of zinc deposit over threaded portion of the bolts, nuts and screws shall not be less than 300 gms. per sq. meter of surface area. The amount of zinc deposit on washers shall not be less than 340 gms. per sq. meter of surface area. The threads having extra deposit of zinc shall be removed by die cutting after the completion of galvanising. The removal of extra zinc shall be carefully done so that threads shall have minimum deposits of zinc on them as specified.

3.15 PAINTING

- 3.15.1 All surfaces to be painted including interior and exteriors of enclosures and other metal parts shall be shot or sand blasted or chemically treated to remove all rust, scale, grease and other adhering foreign matters. If not specified or approved otherwise later, colour of finishing paint shall be RAL 7032 with glossy finish except for panels which shall have matt finish. The paints used shall be epoxy-based or of suitable type to withstand the salty atmosphere prevalent in the coastal areas.
- 3.15.2 All metal parts not accessible for painting shall be made of corrosion resistant materials. All machine finished or bright surfaces shall be coated with a suitable rust preventive compound and wrapped or otherwise protected.
- 3.15.3 Paints shall be carefully selected to withstand tropical heat and extremes of weather specified herein. It shall not scale-off or crinkle or be removed by abrasion due to normal handling.
- 3.15.4 Should finished paint chip-off or crinkle during transit or installation, the Contractor shall arrange for re-painting the equipment at site at his own cost.

3.16 QUALITY ASSURANCE

The Contractor shall follow his standard procedures for quality assurance and control. This shall be in standard format indicating test witness and customer hold point shall be submitted for approval by the successful bidder. A copy of the said standard procedures shall be submitted to the Owner/Purchaser for his reference. However, Owner/Purchaser reserves the right to review the same and give his observations, if any, for compliance.

The procedures shall be in such a form as to clearly delineate the manufacturing sequence, inspection points, tests and test procedures, acceptable ranges/values, reference drawings etc.

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Test shall be performed in presence of Owner/Purchaser's representative so desired by the Owner/Purchaser. The Contractor shall give at least fifteen (15) days advance notice of the date when the tests are to be carried out.

Manufacturing and quality control procedures shall be available for audit to the Owner/Purchaser and/or its representative at the place of manufacture.

The Owner/Purchaser reserves the right to inspect the equipment at the point of manufacture and witness factory and other such tests as may be necessary to ensure conformance to the specification.

The Owner/Purchaser may inspect the Contractor's facilities prior to award of contract.

The Owner/Purchaser may witness any or all of the tests stipulated in the relevant standards and this specification.

The Owner/Purchaser may conduct surveillance of the Contractor's facilities for compliance to his standard procedures of Quality Assurance and Quality Control while work on the specified equipment is in progress.

3.17 QUALITY ASSURANCE PROGRAMME

To ensure that the equipment and services under the scope of contract whether manufactured or performed within the Contractor's works or at his sub-contractor's premises or at the Employer's site or at any other place of work are in accordance with the specifications, the Contractor shall adopt suitable quality assurance program to control such activities at all points, as necessary. Such programs shall be outlined by the Contractor and shall be finally accepted by the Employer/authorised representative after discussions before the award of the contract. The QA program shall be generally in line with ISO-9001/IS-14001. A quality assurance program of the contractor shall generally cover the following:

- i. His organisation structure for the management and implementation of the proposed quality assurance programme
- ii. Quality System Manual
- iii. Design Control System
- iv. Documentation Data Control System
- v. Qualification data for Bidder's key Personnel.
- vi. The procedure for purchase of materials, parts, components and selection of sub-contractor's services including vendor analysis, source inspection, incoming raw-material inspection, verification of materials purchased etc.
- vii. System for shop manufacturing and site erection controls including process, fabrication and assembly.
- viii. Control of non-conforming items and system for corrective actions and resolution of deviations.
- ix. Inspection and test procedure both for manufacture and field activities.
- x. Control of calibration and testing of measuring testing equipments.
- xi. System for Quality Audits.
- xii. System for identification and appraisal of inspection status.
- xiii. System for authorising release of manufactured product to the Employer.
- xiv. System for handling storage and delivery.
- xv. System for maintenance of records, and
- xvi. Furnishing quality plans for manufacturing and field activities detailing out the specific quality control procedure adopted for controlling the quality characteristics relevant to each item of equipment/component as per format enclosed as Annexure-I.

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3.18 GENERAL REQUIREMENTS - QUALITY ASSURANCE

- 13.18.1 All materials, components and equipment covered under this specification shall be procured, manufactured, erected, commissioned and tested at all the stages, as per a comprehensive Quality Assurance Programme. An indicative programme of inspection/tests to be carried out by the contractor for some of the major items is given in the respective technical specification. This is, however, not intended to form a comprehensive programme as it is the contractor's responsibility to draw up and implement such programme duly approved by the Employer. The detailed Quality Plans for manufacturing and field activities should be drawn up by the Bidder and will be submitted to Employer for approval. Schedule of finalisation of such quality plans will be finalised before award.
- 13.18.2 Manufacturing Quality Plan will detail out for all the components and equipment, various tests/inspection, to be carried out as per the requirements of this specification and standards mentioned therein and quality practices and procedures followed by Contractor's/ Sub-contractor's/ sub-supplier's Quality Control Organisation, the relevant reference documents and standards, acceptance norms, inspection documents raised etc., during all stages of materials procurement, manufacture, assembly and final testing/performance testing. The Quality Plan shall be submitted on electronic media e.g. floppy or E-mail in addition to hard copy, for review. Once the same is finalised, hard copies shall be submitted for approval. After approval the same shall be submitted in compiled form on CD ROM.
- 13.18.3 Field Quality Plans will detail out for all the equipment, the quality practices and procedures etc. to be followed by the Contractor's site Quality Control Organisation, during various stages of site activities starting from receipt of materials/equipment at site.
- 13.18.4 The Bidder shall also furnish copies of the reference documents/plant standards/acceptance norms/tests and inspection procedure etc., as referred in Quality Plans along with Quality Plans. These Quality Plans and reference documents/standards etc. will be subject to Employer's approval without which manufacturer shall not proceed.
- 13.18.5 These approved documents shall form a part of the contract. In these approved Quality Plans, Employer shall identify customer hold points (CHP), i.e. test/checks which shall be carried out in presence of the Employer's Project Manager or his authorised representative and beyond which the work will not proceed without consent of Employer/Authorised representative in writing. All deviations to this specification, approved quality plans and applicable standards must be documented and referred to Employer along with technical justification for approval and dispositioning.
- 13.18.6 No material shall be despatched from the manufacturer's works before the same is accepted subsequent to pre-despatch final inspection including verification of records of all previous tests/inspections by Employer's Project Manager/Authorised representative and duly authorised for despatch by issuance of MDCC.
- 13.18.7 All material used for equipment manufacture including casting and forging etc. shall be of tested quality as per relevant codes/standards. Details of results of the tests conducted to determine the mechanical properties, chemical analysis and details of heat treatment procedure recommended and actually followed shall be recorded on certificates and time temperature chart. Tests shall be carried out as per applicable material standards and/or agreed details.
- 13.18.8 All welding and brazing shall be carried out as per procedure drawn and qualified in accordance with requirements of ASME Section IX/BS-4870 or other International equivalent standard acceptable to the Employer.
- 13.18.9 All welding/brazing procedures shall be submitted to the Employer or its authorised representative for approval prior to carrying out the welding/brazing.
- 13.18.10 All brazers, welders and welding operators employed on any part of the contract either in Contractor's/his sub-contractor's works or at site or elsewhere shall be qualified as per ASME Section-IX or BS-4871 or other equivalent International Standards acceptable to the Employer.
- 13.18.11 Test results or qualification tests and specimen testing shall be furnished to the Employer for approval. However, where required by the Employer, tests shall be conducted in presence of Employer/authorised representative.

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- 13.18.12 For all pressure parts and high pressure piping welding, the latest applicable requirements of the IBR (Indian Boiler Regulations) shall also be essentially complied with. Similarly, any other statutory requirements for the equipments/systems shall also be complied with. On all back-gauged welds MPI/LPI shall be carried before seal welding.
- 13.18.13 All the heat treatment results shall be recorded on time temperature charts and verified with recommended regimes.
- 13.18.14 No welding shall be carried out on cast iron components for repair.
- 13.18.15 Unless otherwise proven and specifically agreed with the Employer, welding of dissimilar materials and high alloy materials shall be carried out at shop only.
- 13.18.16 All non-destructive examination shall be performed in accordance with written procedures as per International Standards. The NDT operator shall be qualified as per SNT-TC-IA (of the American Society of non-destructive examination). NDT shall be recorded in a report which includes details of methods and equipment used, result/evaluation, job data and identification of personnel employed and details of co-relation of the test report with the job.
- 13.18.17 In general all plates of thickness greater than 40mm & for pressure parts plates of thickness equal to or greater than 25mm shall be ultrasonically tested otherwise as specified in respective equipment specification. All bar stock/Forging of diameter equal to or greater than 50mm shall be ultrasonically tested.
- 13.18.18 The Contractor shall list out all major items/ equipment/ components to be manufactured in house as well as procured from sub-contractors (BOI). All the subcontractor proposed by the Contractor for procurement of major bought out items including castings, forging, semi-finished and finished components/equipment etc., list of which shall be drawn up by the Contractor and finalised with the Employer, shall be subject to Employer's approval. The contractor's proposal shall include vendor's facilities established at the respective works, the process capability, process stabilization, QC systems followed, experience list, etc. along with his own technical evaluation for identified subcontractors enclosed and shall be submitted to the Employer for approval within the period agreed at the time of pre-awards discussion and identified in "DR" category prior to any procurement. Such vendor approval shall not relieve the contractor from any obligation, duty or responsibility under the contract.
- 13.18.19 For components/equipment procured by the contractors for the purpose of the contract, after obtaining the written approval of the Employer, the contractor's purchase specifications and inquiries shall call for quality plans to be submitted by the suppliers. The quality plans called for from the subcontractor shall set out, during the various stages of manufacture and installation, the quality practices and procedures followed by the vendor's quality control organisation, the relevant reference documents/standards used, acceptance level, inspection of documentation raised, etc.
- 13.18.20 Employer reserves the right to carry out quality audit and quality surveillance of the systems and procedures of the Contractor's or their sub vendor's quality management and control activities. The contractor shall provide all necessary assistance to enable the Employer carry out such audit and surveillance.
- 13.18.21 The contractor shall carry out an inspection and testing programme during manufacture in his work and that of his sub-contractors and at site to ensure the mechanical accuracy of components, compliance with drawings, conformance to functional and performance requirements, identity and acceptability of all materials parts and equipment. Contractor shall carry out all tests/inspection required to establish that the items/equipments conform to requirements of the specification and the relevant codes/standards specified in the specification, in addition to carrying out tests as per the approved quality plan.
- 13.18.22 Quality audit/surveillance/approval of the results of the tests and inspection will not, however, prejudice the right of the Employer to reject the equipment if it does not comply with the specification when erected or does not give complete satisfaction in service and the above shall in no way limit the liabilities and responsibilities of the Contractor in ensuring complete conformance of the materials/equipment supplied to relevant specification, standard, data sheets, drawings, etc.
- 13.18.23 For all spares and replacement items, the quality requirements as agreed for the main equipment supply shall be applicable.

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- 13.18.24 Repair/rectification procedures to be adopted to make the job acceptable shall be subject to the approval of the Employer/ authorised representative.

3.19 Environmental Stress Screening

All solid state electronic system / equipment / sub assembly shall be free from infant mortile components. For establishing the compliance to this requirement, the contractor / sub – contractor should meet the following.

1. The Contractor / Sub – contractor shall furnish the established procedure being followed for eliminating infant mortile components. The procedure followed by the Contractor / Sub – contractor should be substantiated along with the statistical figures to validate the procedure being followed. The necessary details as required under this clause shall be furnished at the stage of QP finalization.
Or
2. In case the Contractor / Sub – contractor do not have any established procedure to eliminate infant mortile components then two or 10% whichever is less, most densely populated Panels shall be tested for Elevated Temperature Cycle Test as per the following procedure.

Elevated Temperature Test Cycle

During the elevated temperature test which shall be for 48 hours, the ambient temperature shall be maintained at 50° C. The equipment shall be interconnected with devices and kept under energized conditions so as to repeatedly perform all operations it is expected to perform in actual service with load on various components being equal to those which will be experienced in actual service.

During the elevated temperature test the cubicle doors shall be closed (or shall be in the position same as they are supposed to be in the field) and inside temperature in the zone of highest heat dissipating components / modules shall be monitored. The temperature rise inside the cubicle should not exceed 10° C above the ambient temperature at 50° C.

In case of any failure during the test cycle, the further course of action should be mutually discussed for demonstrating the intent of the above requirement.

Burn In Test Cycle

The test shall be conducted on all the panels fully assembled and wired including the panels having undergone the above mentioned elevated temperature test.

The period of Burn in Test Cycle shall be 120 hrs and process shall be similar to the elevated temperature test as above except that the temperature shall be reduced to the ambient temperature prevalent at that time.

During the above tests, the process I/O and other load on the system shall be simulated by simulated inputs and in the case of control systems, the process which is to be controlled shall also be simulated. Testing of individual components or modules shall not be acceptable.

During the Burn in Test the cubicle doors shall be closed (or shall be in the position same as they are supposed to be in the field) and inside temperature in the zone of highest heat dissipating components / modules shall be monitored. The temperature rise inside the cubicle should not exceed 10° C above the ambient temperature.

The Contractor / Sub-contractor shall carry out routine test on 100% item at contractor / sub-contractor's works. The quantum of check / test for routine & acceptance test by employer shall be generally as per criteria / sampling plan defined in referred standards. Wherever standards have not

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been mentioned quantum of check / test for routine / acceptance test shall be as agreed during detailed engineering stage.

3.20 QUALITY ASSURANCE DOCUMENTS

The Contractor shall be required to submit two hard copies and two sets on CDROM of the following Quality Assurance Documents as identified in respective quality plan with tick (√) mark.

Each QA Documentation shall have a project specific Cover Sheet bearing name & identification number of equipment and including an index of its contents with page control on each document.

The QA Documentation file shall be progressively completed by the Supplier's sub-supplier to allow regular reviews by all parties during the manufacturing.

The final quality document will be compiled and issued at the final assembly place of equipment before dispatch. However CD-Rom may be issued not later than three weeks.

3.20.1 Typical contents of Quality Assurance Document are as below:-

- i) Quality Plan,
- ii) Material mill test reports on components as specified by the specification and approved Quality Plans.
- iii) Manufacturer / works test reports/results for testing required as per applicable codes and standard referred in the specification and approved Quality Plans.
- iv) Non-destructive examination results /reports including radiography interpretation reports. Sketches/drawings used for indicating the method of traceability of the radiographs to the location on the equipment.
- v) Heat Treatment Certificate/Record (Time- temperature Chart)
- vi) All the accepted Non-conformance Reports (Major/Minor) / deviation, including complete technical details / repair procedure).
- vii) CHP / Inspection reports duly signed by the Inspector of the Employer and Contractor for the agreed Customer Hold Points.
- viii) Certificate of Conformance (COC) whoever applicable.
- ix) MDCC

3.20.2 Similarly, the contractor shall be required to submit two hard copies and two sets on CD ROM of Quality Assurance Documents (in line with above) pertaining to field activities as per Approved Field Quality Plans and other agreed manuals/ procedures, prior to commissioning of individual system.

3.20.3 Before dispatch/ commissioning of any equipment, the Supplier shall make sure that the corresponding quality document or in the case of protracted phased deliveries, the applicable section of the quality document file is completed. The supplier will then notify the Inspector regarding the readiness of the quality document (or applicable section) for review.

- i) If the result of the review carried out by the Inspector of the Quality document (or applicable section) is satisfactory. The Inspector shall stamp the quality document (or applicable section) for release.
- ii) If the quality document is unsatisfactory, the Supplier shall endeavour to correct the incompleteness, thus allowing finalizing the quality document (or applicable section) by time compatible with the requirements as per contract documents. When it is done, the quality document (or applicable section) is stamped by the Inspector.
- i) If a decision is made for dispatch, whereas all outstanding actions cannot be readily cleared for the release of the quality document by that time, the supplier shall immediately, upon shipment of the equipment, send a copy of the quality document Review Status signed by the Supplier

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Representative to the Inspector and notify of the committed date for the completion of all outstanding actions & submission. The Inspector shall stamp the quality document for applicable section when it is effectively completed. The submission of QA documentation package shall not be later than 3 weeks after the dispatch of equipment.

3.21 TRANSMISSION OF QUALITY DOCUMENTS

As a general rule, two hard copies of the quality document and Two CD ROMs shall be issued to the Employer after the delivery date for the corresponding equipment. One set of quality document shall be forwarded to Corporate Quality Assurance Department and other set to respective Site.

For the particular case of phased deliveries, the complete quality document to the Employer shall be issued not later than 1 month after the date of the last delivery similarly as stated above.

3.22 INSPECTION, TESTING & INSPECTION CERTIFICATE

- 3.22.1 The word 'Inspector' shall mean the Project Manager and/or his authorised representative and/or an outside inspection agency acting on behalf of the Employer to inspect and examine the materials and workmanship of the works during its manufacture or erection.
- 3.22.2 The Project Manager or his duly authorised representative and/or an outside inspection agency acting on behalf of the Employer shall have access at all reasonable times to inspect and examine the materials and workmanship of the works during its manufacture or erection and if part of the works is being manufactured or assembled on other premises or works, the Contractor shall obtain for the Project Manager and for his duly authorised representative permission to inspect as if the works were manufactured or assembled on the Contractor's own premises or works.
- 3.22.3 The Contractor shall give the Project Manager/Inspector fifteen (15) days written notice of any material being ready for testing. Such tests shall be to the Contractor's account except for the expenses of the Inspector's. The Project Manager/Inspector, unless the witnessing of the tests is virtually waived, will attend such tests within fifteen (15) days of the date on which the equipment is noticed as being ready for test/inspection failing which the contractor may proceed with test which shall be deemed to have been made in the inspector's presence and he shall forthwith forward to the inspector duly certified copies of test reports in two (2) copies.
- 3.22.4 The Project Manager or Inspector shall within fifteen (15) days from the date of inspection as defined herein give notice in writing to the Contractor, or any objection to any drawings and all or any equipment and workmanship which is in his opinion not in accordance with the contract. The Contractor shall give due consideration to such objections and shall either make modifications that may be necessary to meet the said objections or shall inform in writing to the Project Manager/Inspector giving reasons therein, that no modifications are necessary to comply with the contract.
- 3.22.5 When the factory tests have been completed at the Contractor's or subcontractor's works, the Project Manager /Inspector shall issue a certificate to this effect fifteen (15) days after completion of tests but if the tests are not witnessed by the Project Manager /Inspectors, the certificate shall be issued within fifteen (15) days of the receipt of the Contractor's test certificate by the Project Manager /Inspector. Project Manager /Inspector to issue such a certificate shall not prevent the Contractor from proceeding with the works. The completion of these tests or the issue of the certificates shall not bind the Employer to accept the equipment should it, on further tests after erection be found not to comply with the contract.
- 3.22.6 In all cases where the contract provides for tests whether at the premises or works of the Contractor or any sub-contractor, the Contractor, except where otherwise specified shall provide free of charge such items as labour, material, electricity, fuel, water, stores, apparatus and instruments as may be reasonably demanded by the Project Manager /Inspector or his authorised representatives to carry out effectively such tests on the equipment in accordance with the Contractor and shall give facilities to the Project Manager/Inspector or to his authorised representative to accomplish testing.

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- 3.22.7 The inspection by Project Manager / Inspector and issue of Inspection Certificate thereon shall in no way limit the liabilities and responsibilities of the Contractor in respect of the agreed Quality Assurance Programme forming a part of the contract.
- 3.22.8 To facilitate advance planning of inspection in addition to giving inspection notice, the Contractor shall furnish quarterly inspection programme indicating schedule dates of inspection at Customer Hold Point and final inspection stages. Updated quarterly inspection plans will be made for each three consecutive months and shall be furnished before beginning of each calendar month.
- 3.22.9 All inspection, measuring and test equipment used by contractor shall be calibrated periodically depending on its use and criticality of the test/measurement to be done. The Contractor shall maintain all the relevant records of periodic calibration and instrument identification, and shall produce the same for inspection by customer/consultant. Wherever asked specifically, the contractor shall re-calibrate the measuring/test equipment in the presence of Project Manager / Inspector.

3.23 PACKAGING & TRANSPORTATION

3.24.1 Packing, Marking and shipping

The packing and shipping shall be carried out in accordance with the standard practice of Contractor and with the following additional requirements:

- a) The equipment shall be prepared in such a manner as to protect the equipment from damage or deterioration during shipping or storage. The shipments can be exposed to heavy rains, hot sun, high humidity and sudden extreme changes of temperature. The equipment shall be packed and shipped so as to protect it from all such conditions and any other abnormal conditions, generally expected during shipping & storage. **Packing shall be done by high quality material suitable for at least 1 yr. storage at site.**
- b) The metallic containers, if any, shall be considered as the property of the Contractor and he will be allowed to remove them from site once the contents are unpacked, inspected, documented and placed in temporary storage or in final position.
- c) The equipment shall be shipped in such a manner as to facilitate unloading, handling and storage enroute and at the site. The Contractor shall provide lifting lugs and special lifting devices for proper handling and erection.
- d) The Contractor shall be liable for any damage or loss resulting due to careless, improper, poor or insufficient packing and handling.
- e) Spare parts and spare equipment shall be packed separately in containers adequate for long term storage, plainly marked "Spare Parts Only". They shall be crated individually or in kits to be used in one single renewal or overhaul operation. Other spare part kits shall not be disturbed when using one set or kit.
- f) The Contractor shall at all times protect and preserve from damage, loss, corrosion and all other forms of damage, all parts of the works.

3.24.2 Transportation

- a) The Contractor shall make a careful examination of access rail/roadways to the site in order to confirm the practical maximum transport weight and dimensions as well as a careful examination of the ports of disembarkation particularly with respect to the capacity of the cranes installed and access roads.
- b) All instruments and computer/microprocessor based equipment imported into India from overseas for the purpose of this contract shall be air freighted to the nearest possible point and further by rail/road taking due precautions as per manufacturer's recommendations.

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Employer shall have the right to decide the items that should be air freighted and Employer's decision shall be binding on Contractor.

3.24.3 Insurance

- a) The Contractor shall insure all shipments and works at his own expense for not less than the full replacement cost plus any additional cost for accelerated manufacturing of the replacement parts.
- b) Loss or the damage to equipment during shipping or transportation to the site(s) or otherwise shall not constitute groups for claims for extension in time or for extra payment.

3.24 CLAMPS AND CONNECTORS INCLUDING TERMINAL CONNECTORS

- 3.24.1 The material of clamps and connectors shall be Aluminium alloy casting conforming to designation A6 of IS: 617 for connecting to equipment terminals and conductors of aluminium. In case the terminals are of copper, the same clamps/connectors shall be used with 2mm thick bimetallic liner.
- 3.24.2 The material of clamps and connectors shall be Galvanised mild steel for connecting to shield wire.
- 3.24.3 Bolts, nuts and plain washers shall be hot dip galvanised mild steel for sizes M12 and above. For sizes below M12, they shall be electro-galvanised mild steel. The spring washers shall be electro-galvanised mild steel.
- 3.24.4 All castings shall be free from blow holes, surface blisters, cracks and cavities. All sharp edges and corners shall be rounded off to meet specified corona and radio interference requirements.
- 3.24.5 They shall have same current rating as that of the connected equipment. All current carrying parts shall be at least 10 mm thick. The connectors shall be manufactured to have minimum contact resistance.
- 3.24.6 Flexible connectors, braids or laminated strips shall be made up of copper/aluminium.
- 3.24.7 Current rating and size of terminal/conductor for which connector is suitable shall be put on a suitable sticker on each component which should last atleast till erection time.

3.24.1 BUSHINGS, HOLLOW COLUMN INSULATORS, SUPPORT INSULATORS, AND DISC INSULATORS

- 3.25.1 Bushings shall be manufactured and tested in accordance with IS: 2099 & IEC: 137 while hollow column insulators shall be manufactured and tested in accordance with IEC 233/IS 5284. The support insulators shall be manufactured and tested as per IS: / IEC 168/IEC 273. The insulators shall also conform to IEC 815 as applicable.
- 3.25.2 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.
- 3.25.3 Porcelain used shall be homogenous, 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. Hollow porcelain should be in one integral piece in green & fired stage.
- 3.25.4 Glazing of the porcelain shall be uniform brown in colour, free from blisters, burns and other similar defects.
- 3.25.5 When operating at normal rated voltage there shall be no electric discharge between conductor and insulators which would cause corrosion or injury to conductors or when operating at normal rated voltage.
- 3.25.6 The design of the insulator shall be such that stresses due to expansion and contraction in any part of the insulator shall be lead to deterioration. All ferrous parts shall be hot dip galvanised.
- 3.25.7 Bushing porcelain shall be robust and capable of withstanding the internal pressures likely to occur in service. The design and location of clamps, 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

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- 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.
- 3.25.8 All iron parts shall be hot dip galvanised and all joints shall be air tight. Surface of joints shall be trued, 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.
- 3.25.9 Insulator shall also meet requirement of IEC - 815 as applicable, having alternate long & short sheds.
- 3.25 CONTROL CABINETS, JUNCTION BOXES, TERMINAL BOXES & MARSHALLING BOXES FOR OUTDOOR EQUIPMENT.**
- 3.26.1 All types of control cabinets, junction boxes, marshaling boxes, lighting panels, terminal boxes, operating mechanism boxes, Kiosks etc. shall generally conform to IS:5039, IS:8623 and IEC:439 as applicable.
- 3.26.2 Mechanism Box/ Control Cabinet/ Kiosks: A sheet steel (atleast 2.5 mm thick), dust and vermin proof M.Box/CCC/CMB shall be provided with proper lighting and thermostatically controlled space heaters. The degree of protection shall be IP 55. One dummy terminal block in between each trip wire terminal shall be provided. At least 20% spare terminals shall be provided on each panel. The gasket used shall be of neoprene rubber.
- 3.26.3 Junction Boxes: The junction boxes shall be made of minimum 2 mm thick sheet steel. Gland plates shall be removable type and made of 3 mm thick sheet steel. The boxes shall be provided with detachable cover or hinged door with captive screws. Top of the box shall be arranged to slope towards the rear of the box. The box shall be hot dip galvanised and shall be provided with suitable neoprene gaskets to achieve requisite degree of protection. Adequate spacing shall be provided to terminate the external cables. The boxes shall be suitable for mounting on various types of steel structures. The terminal blocks provided shall be of 650 V grade, rated for 10 A for control cables. Suitable numbering for terminal blocks shall be done. In case of junction box for power cable, the box shall be rated for maximum current carrying capacity. Terminal blocks shall be of one piece, Klippon RSF-1 or ELMEX CSLT-1 type with insulating barriers.
- 3.26.4 The cabinets/boxes/kiosks/panels shall be free standing or wall mounting or pedestal mounting type. They shall have hinged doors with padlocking arrangement. All doors, removable covers and plates shall be gasketed all around with neoprene gaskets.
- 3.26.5 The degree of protection of of all the outdoor boxes shall not be less than IP 55 as per IS 2147.
- 3.26.6 The cable entry shall be from bottom, for which removable gasketed cable gland plates shall be provided.
- 3.26.7 Suitable 240V, single phase, 50Hz ac heaters with thermostats controlled by switch and fuse shall be provided to maintain inside temperature 10deg. above the ambient.
- 3.26.8 The size of enclosure and the layout of equipment inside shall provide generous clearances. Each cabinet/box/kiosk/panel shall be provided with a 15A, 240V ac, 2 pole, 3 pin industrial grade receptacle with switch. For incoming supply, MCB of suitable rating shall be provided. Illumination of each compartment shall be with door operated incandescent lamp. All control switches shall be of rotary switch type.
- 3.26.9 Each cabinet/box/kiosk/panel shall be provided with two earthing pads to receive 75mmx12mm GS flat. The connection shall be bolted type with two bolts per pad. The hinged door shall be connected to body using flexible wire. The cabinets/boxes/kiosks/panels shall also be provided with danger plate, and internal wiring diagram pasted on inside of the door. The front label shall be on a 3mm thick plastic plate with white letters engraved on black background
- 3.26 TERMINAL BLOCKS**

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- 3.27.1 They shall be non-disconnecting stud type of extensible design equivalent to Elmex type CAT-M4.
- 3.27.2 The terminal blocks shall be of 650 V grade, and rated to continuously carry maximum expected current. The conducting part shall be tinned or silver plated.
- 3.27.3 They shall be of moulded, non-inflammable thermosetting plastic. The material shall not deteriorate with varied conditions of temperature and humidity. The terminal blocks shall be fully enclosed with removable covers of transparent, non deteriorating plastic material. Insulating barriers shall be provided between the terminal blocks so that the barriers do not hinder the wiring operation without removing the barriers.
- 3.27.4 The terminals shall be provided with marking tags for wiring identification.
- 3.27.5 Unless otherwise required (expected current rating) or specified, terminal blocks shall be suitable for connecting the following conductors on each side:
 - All CT & VT circuits - Min. four 2.5 sq.mm. copper flexible conductor
 - AC & DC power supply -Two 16 sq.mm. Aluminium conductor
 - Other control circuits - Min. two 2.5 sq.mm. copper flexible conductor.
- 3.27.6 The terminal blocks for CT and VT secondary leads shall be provided with test links and isolating facilities. CT secondary leads shall also be provided with short circuiting and earthing facilities.

3.27 Wiring

- 3.28.1 All wiring shall be carried out with 1100 V grade stranded copper wires. The minimum size of the stranded conductor used for internal wiring shall be as follows:
 - a) All circuits except CT circuits 2.5 sq.mm
 - b) CT circuits 4 sq. mm (minimum number of strands shall be 3 per conductor).
- 3.28.2 All internal wiring shall be securely supported, neatly arranged readily accessible and connected to equipment terminals and terminal blocks.
- 3.28.3 Wire terminations shall be made with solderless crimping type of tinned copper lugs which firmly grip the conductor and insulation. Insulated sleeves shall be provided at all the wire terminations. Engraved core identification plastic ferrules marked to correspond with the wiring diagram shall be fitted at both ends of each wire. Ferrules shall fit tightly on the wires shall not fall off when the wires and shall not fall off when the wire is disconnected from terminal blocks.
- 3.28.4 All wires directly connected to trip circuit breaker shall be distinguished by the addition of a red coloured unlettered ferrule. Number 6 & 9 shall not be included for ferrules purposes.
- 3.28.5 All terminals including spare terminals of auxiliary equipment shall be wired upto terminal blocks. Each equipment shall have its own central control cabinet in which all contacts including spare contacts from all poles shall be wired out. Interpole cabling for all equipment's shall be carried out by the Contractor.

3.28 CABLE GLANDS AND LUGS

- 3.29.1 Cable glands shall be Double compression type, tinned/Nicked plated (coating thickness not less than 20 microns in case of tin and 10 to 15 microns in case of nickel) brass cable glands for all power and control cables. They shall provide dust and weather proof terminations. They shall comprise of heavy duty brass casting, machine finished and tinned to avoid corrosion and oxidation. Rubber components used in cable glands shall be neoprene and off tested quality. Required number of packing glands to close unused openings in gland plates shall also be provided.
- 3.29.2 The cable glands shall be tested as per BS: 6121. The cable glands shall also be duly tested for dust proof and weather proof termination.
- 3.29.3 Cables lugs for power cables shall be tinned copper solder less crimping type conforming to IS:8309 and 8394 suitable for aluminum or copper conductor (as applicable). Cable lugs and ferrules for control cables shall be tinned copper type. The cable lugs for control cables shall

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be provided with insulating sleeve and shall suit the type of terminals provided on the equipment. The cable lugs shall suit the type of terminals provided. The cable lugs shall be of Dowell make or equivalent.

3.29 CONDUITS, PIPES AND ACCESSORIES

- 3.30.1 The bidder shall supply and install all rigid conduits, mild steel pipes, flexible conduits, hume pipes, etc. including all necessary sundry materials, such as tees, elbows, check nuts, bushing reduces, enlargers, wooden plugs, coupling caps, nipples, gland sealing fittings, pull boxes, etc.
- 3.30.2 Rigid conduits shall be flow-coat metal conduits of Nagarjuna Coated Tubes or equivalent make. The outer surface of the conduits shall be coated with hot-dip zinc and chromate conversion coatings. The inner surface shall have silicone epoxy ester coating for easy cable pulling. Mild steel pipes shall be hot-dip galvanised. All rigid conduits/ pipes shall be of a reputed make.
- 3.30.3 Flexible conduits shall be heat-resistant lead coated steel, water-leak, fire and rust proof, and be of PLICA make or equivalent.

3.30 AUXILIARY SWITCH

The auxiliary switch shall conform of following type tests:

- Electrical endurance test - A minimum of 1000 operations for 2A. D.C. with a time constant greater than or equal to 20 milliseconds with a subsequent examination of mV drop/ visual defects/ temperature rise test.
- Mechanical endurance test - A minimum of 5000 operations with a subsequent checking of contact pressure test/ visual examination
- Heat run test on contacts
- IR/HV test, etc.

3.31 LAMPS AND SOCKETS

3.32.1 Lamps:

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

3.32.2 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.

3.32.3 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.

3.32 SWITCHES & FUSES:

Each control panel shall be provided with necessary arrangements for receiving, distributing, isolating and fusing of DC and AC supplies for various control, signaling, lighting and space heater circuits. The incoming and sub-circuits shall be separately provided with switch-fuse 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 of the fuse rating and voltage.

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

3.33 TESTS

General

During manufacture, the Owner/Purchaser's representative(s) shall have the right to expedite and/or inspect design, materials, workmanship and progress of manufacture of the Contractor's and their Sub-Contractor's equipment and may reject defective materials considered unsuitable for the intended purpose or which do not comply with the intent of the tender specification. The Contractor, upon any such rejection by the Purchaser or his representative(s), shall replace the defective or unsuitable materials. The Contractor shall provide every reasonable inspection facility to the Purchaser's Inspector(s) or representative(s) at his own and his Sub-Contractor's works.

The Contractor shall give thirty (30) day notice of readiness for inspection of component parts and/or before final assembly and test, so that the Purchaser's representative(s) may inspect the materials and witness such tests before shipment. The Purchaser's representative(s) may, at any time, inspect and request copies of any or all test data of raw materials and finished components which shall be immediately furnished.

Material being furnished against this order shall only be shipped when factory inspection, satisfactory to the Purchaser and/or their representative(s) has been conducted. Such inspection and acceptance for shipment shall not, however, relieve the Contractor from his entire responsibility for furnishing equipment conforming to the requirement of the tender specification nor shall prejudice any claim, right or privilege which the Purchaser may have because of the use or supply of defective or unsatisfactory materials or equipment. Should the inspection be waived by the purchaser, such waiver shall not also relieve the Contractor, in any way, from his entire obligations under the Contract.

The equipment shall, at the factory or after installation, be demonstrated capable of performing satisfactorily upto the Contractor's guaranteed performance. All tests required by the tender specification including retests and inspection that may be necessary owing the failure to meet any tests specified, shall be made at the Contractor's expenses. Additional tests, as necessary, shall be made to locate such failure(s) and after determining the causes of failure(s) and rectifying it, specified tests shall be repeated to establish that the rebuilt equipment meets the tender specification requirements in every respect.

Should the equipment ultimately fail to pass the specified tests, the Purchaser will have the option to reject the unit.

Tests during Manufacture

During the manufacture of equipment, tests specified in Standard Specification(s) shall be performed on each unit in addition to any of manufacturer's standard tests and requisite number of copies of tests certificates as per Distribution Schedule shall be furnished.

Routine Tests

After completion of manufacture routine tests as specified in relevant Standards and in Standard Specification(s) shall be performed on equipment and requisite number of copies of test certificates as per Distribution Schedule shall be furnished.

All tests shall be conducted in accordance with Indian Standards in effect at the time of testing and in presence of representative(s) of the Purchaser/ Consulting Engineer.

PROJECT: 400kV Switchyard for Panki Thermal Power Station (1x660MW) CUSTOMER: UPRVUNL REVIEW CONSULTANT: NTPC LTD. CONSULTANT: DCPL	
Technical Specification Section-3: Project Details and General Specification	TB-316-401-XXX

Tests on Associated Components

Cast epoxy resin insulators, surge absorbers, current transformers, voltage transformers, control devices and other associated components as applicable, shall be tested in accordance with the relevant Indian standards and/or Manufacturer's Standards.

Type Tests

Contractor will have to submit Type test reports for all equipment for review. The test reports shall be of same or higher rating. In case the test reports are **older than 5 years from the date of techno commercial bid opening i.e. 02.11.15** or related to equipment of lower rating then fresh type tests have to be conducted without any implication.

Site Tests

The Bidder shall indicate tests recommended to be carried out at site during installation and commissioning to ensure satisfactory performance of all the equipment supplied.

Testing Facility

The Bidder shall state in the Proposal the testing facilities available at his works. Should full capacity testing equipment be not available, the Bidder shall state the method proposed to be adopted with detailed computations and justification for adopting such a method to reliably ascertain the equipment characteristics corresponding to full capacity testing.

3.4 Enclosures:

1. ANNEXURE- I – MQP (Customer format)
2. ANNEXURE- II – QUALITY ASSURANCE FOR SWITCHYARD

ANNEXURE-I

MFGR.'s LOGO	MANUFACTURER'S NAME AND ADDRESS		MANUFACTURING QUALITY PLAN				PROJECT : PACKAGE : CONTRACT NO. : MAIN-SUPPLIER :								
			ITEM :		QP NO.: REV.NO: DATE: PAGE: OF....										
SL. NO	COMPONENT & OPERATIONS	CHARACTERI STICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS	
					M	C/N					M	C	N		
1.	2.	3.	4.	5.	6.		7.	8.	9.	D*	** 10.			11.	
				LEGEND: * RECORDS, IDENTIFIED WITH "TICK" (✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION. ** M: MANUFACTURER/SUB-SUPPLIER C: SUPPLIER/NOMINATED INSPECTION AGENCY, N: THE OWNER P: PERFORM W: WITNESS AND V: VERIFICATION. AS APPROPRIATE, CHP: THE OWNER SHALL IDENTIFIED IN COLUM "N"				 		DOC. NO.: REV..... CAT.....					
MANUFACTURER / SUB-SUPPLIER		MAIN- SUPPLIER						FOR THE OWNER USE							
SIGNATURE															
								REVIEWED BY		APPROVED BY		APPRO VAL SEAL			

E2 : SWITCHYARD

ATTRIBUTES, CHARACTERISTICS  	Make, model, Type & Rating, Test Certificate	Routine & Acceptance Test as per IS / IEC	Functional requirements as per Owner Specification
ITEM, COMPONENTS, SUB SYSTEM ASSEMBLY			
Circuit Breaker (IEC: 56)	Y	Y	Y
Interruptor & hollow insulator (IEC: 233/ IS: 5284)	Y	Y	Y
Isolator (IEC: 129 / IEC: 694)	Y	Y	Y
Current Transformer (IEC: 185)	Y	Y	Y
Capacitor Voltage Trams former (IEC: 186 / 358)	Y	Y	Y
Bus Post Insualtor (IEC: 168 / 273 / IS:2544)	Y	Y	Y
Disc,Pin & String Insualtor (IEC: 383 / IS: 731)	Y	Y	Y
Long Rod Insualtor (IEC: 433)	Y	Y	Y
Surge Arrestor (IEC: 99-4)	Y	Y	Y
Hardware fittings for Insulator (IS: 2486 / BS: 3288)	Y	Y	Y
Spacer Clamps & Connector (IS: 10162 / 5561)	Y	Y	Y
Aluminum Tube (IS: 5082 / 2673 / 2678)	Y	Y	Y
Wave Trap (IEC: 353 / IS: 8792 / 8793)	Y	Y	Y
Conductor (IS: 398-P-II)(V)	Y	Y	Y
Galvanised Steel Structures (IS: 2062/2629/4759/6745)	Y	Y	Y
Vibration Damper (IS: 9708)	Y	Y	Y
Sag Compensating Spring DIN: 2089/2096 IS: 3195 / 7906	Y	Y	Y
Control & Relay Panel	Y	Y	Y
SF6 Gas filling & evacuating plant	Y	Y	Y
SF6 Gas Leak Detector	Y	Y	Y
Leakage Current Analyser	Y	Y	Y
Nitrogen Gas Filling Device	Y	Y	Y

Protection Relays	Y	Y	Y
Event Logger	Y	Y	Y
Operation Analyser	Y	Y	Y
Disturbance Recorder	Y	Y	Y
Tariff Metering System	Y	Y	Y
Synchronising Trolley	Y	Y	Y
Relay Test Kit	Y	Y	Y
LT Switchgear /LT Panels (IEC:947 / IS:13947)	Y	Y	Y
Battery IS:1652	Y	Y	Y
Lighting Panels	Y	Y	Y
Surge Monitor	Y	Y	Y

Notes:

- 1) This is an indicative list of test/checks. The manufacture is to furnish a detailed Quality Plan indicating the practice and procedure along with relevant supporting documents during QP finalisation for all items.
- 2) All major Bought Out Items will be subject to Owner/ Owner Engineer approval.

SECTION- IV

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.

BHEL ENQUIRY. NO:

BIDDER: OFFER REFERENCE:

A) TECHNICAL PARAMETERS-

S. No.	Parameters	Data	Confirmation	Remarks
1.	Applicable Standards	Latest IS -1554, 5831, 8130, 3975, 613, ASTM-D2843, ASTM-D2863, IEC60754, IEC60332, IS3961, IS 10418, SS4241475, NEMA WC-70, IEEE-383	Yes	
2.	Rated Voltage	1100V Grade	Yes	
2.A	Type & Category	FRLS	Yes	
3.	Construction feature for HR-PVC Control and Aux Power cable			
3.1	Material of Conductor for Control cables	Plain (untinned) annealed, High conductivity, Stranded Copper Conductor conforming to Class-II of IS:8130	Yes	
3.2	Material of Conductor for Power cables	Stranded Aluminium, Grade H2	Yes	
3.3	Conductor Insulation	Extruded HR-PVC compound Type C	Yes	
3.4	Inner sheath	Extruded HR-PVC, FRLSH compound conforming to Type ST-2 as per IS 5831/1984. Non-hygroscopic, fire retardant	Yes	
3.5	Armouring for Control Cables	Galvanised steel round wire for cables upto and inclusive of 7cores and Galvanised steel strip for cables above 7cores as per Cl:4.01.04 of Section-II & conforming IS 3975	Yes	
3.6	Armouring for Aux Power Cables	Aluminium wire/formed wire (H4 grade) for Single core as per IS 8130 and Galvanised Steel strip/ wire for Multi-core cables as per Cl4.01.04 of Section-II & IS 1554 (Part I).	Yes	
3.7	Outer sheath	Extruded HR-PVC, FRLSH, Type ST-2 as per IS 5831, 1984. Colour shall be black or any other natural colour (with prior approval of customer) Oxygen Index > 29, Temperature Index > 250°C	Yes	

S. No	Parameters	Data	Confirmation	Remarks
4.	Construction feature for XLPE Aux Power cable			
4.1	Material of Conductor for Power cables	Stranded Aluminium; Grade H4	Yes	
4.2	Conductor Insulation	Extruded XLPE of natural colour as per IS 7098 Part-I	Yes	
4.3	Inner sheath	Extruded HR-PVC, FRLSH compound, Type ST-2 as per IS 5831 Non-hygroscopic, fire retardant	Yes	
4.4	Armouring for XLPE Aux Power Cables	Aluminium wire for Single core as per IS and Galvanised Steel wire/Strip for Multi-core cables as per Cl4.01.04 of Section-II & IS 7098 Part-I.	Yes	
4.5	Outer sheath	Extruded HR-PVC, FRLSH, Type ST-2 as per IS 5831, 1984 Colour shall be black or any other natural colour (with prior approval of customer) Oxygen Index > 29, Temperature Index > 250°C	Yes	
5	<i>The offered cables shall be designed to withstand conditions as per Section 2</i>	Yes	Yes	
6	The fillers and inner sheaths shall be of non-hygroscopic, fire retardant material, shall be softer than insulation and outer sheath shall be suitable for the operating temperature of the cable	Yes	Yes	
7	Technical Data Sheet (GTP) of the offered cables	The technical data sheet of the offered cables conforms to the standard technical data of this technical Specification,	Yes	

B) TYPE TESTS

i) Whether type test reports of the following test conducted earlier on identical or similar material are available (test reports are of the test conducted not earlier than 10 (ten) years prior to the date of bid opening). **(YES)**

Date:

**Signature of the authorized representative of Bidder
Company Seal**

Sub : Sub-Qualifying Requirement for Control Cables

In support of supplier experience as indicated in Technical Specification, clause 5.9 of Chapter 04, "Provenness", Volume II. We declare that we have manufactured and supplied the following cables prior to the date of bid opening.

- (a) Atleast 300 Kms of PVC insulated, PVC sheathed stranded copper conductor 1.1 kV grade cables in one single contract.
- (b) Atleast one (1) km of flame retardant low smoke cables.
- (i) The details of above (a) are given as under :

- Sl.No.	Particulars

-	
1.	Client name and its address, fax no. & telephone no.
2.	Name & Designation of the responsible person in client's organisation
3.	Name, Address, telephone no. & fax no. of the user of the cables
4.	Name & designation of the responsible person in user's organisation
5.	Contract No. and date
6.	Details of Stranded copper conductor, PVC insulated, PVC sheathed control cables of 1.1 KV grade
(i)	Manufactured Yes/No
(ii)	Supplied Yes/No
(iii)	Rated voltage of cable KV
(iv)	Type of Cable

Signature of authorized signatory.....

- Sl.No.	Particulars
----------	-------------

(v)	Total Quantity supplied prior to the date of bid opening in one single contract	 Km
-----	---	----------

7. User's Certificate of Cable enclosed

(ii) The details of above (b) are given as under :

1. Client name and its address, fax no. & telephone no.
2. Name & Designation of the responsible person in client's organisation
3. Name, Address, telephone no. & fax no. of the user of the cables
4. Name & designation of the responsible person in user's organisation
5. Contract No. and date
6. Details of Flame Retardant Low Smoke cables

(i)	Manufactured	Yes/No
-----	--------------	--------

(ii)	Supplied	Yes/No
------	----------	--------

(iii)	Type of Cable	
-------	---------------	--

(iv)	Total Quantity supplied as on date of bid opening	 Km
------	---	----------

7. User's Certificate of Cable enclosed

Signature of authorized signatory.....

Date : (Signature).....

Place : (Printed Name).....

(Designation).....

(Common seal).....

Note :

1. Continuation sheets of like size and format may be used as per the Sub-vendor's requirement and shall be annexed to this Attachment-3K.
2. Sub-vendor is required to attach necessary documents like copies of work order, completion certificates, agreements, drawings etc. in support of the details furnished above.

Signature of authorized signatory.....

Sub : Sub-Qualifying Requirement for 1.1kV Power Cables

In support of supplier experience as indicated in Technical Specification clause 5.10 of Chapter 04, "Provenness" , Volume II. We declare that we have manufactured and supplied the following cables prior to the date of bid opening.

- (a) Atleast 100 Kms of aluminium conductor, XLPE insulated, PVC sheathed power cables of 1.1 kV or higher grade in one single contract.
- (b) Atleast 100 km of aluminium conductor, PVC insulated, PVC sheathed power cables of 1.1 kV or higher grade in one single contract.
- (c) Atleast one (1) km of flame retardant low smoke cables.
- (d) 1.1 kV or higher grade power cable of minimum 630 sq.mm. conductor size.
 - (i) The details of above (a) are given as under :

Sl.No.	Particulars	
1.	Client name and its address, fax no. & telephone no.	
2.	Name & Designation of the responsible person in client's organisation	
3.	Name, Address, telephone no. & fax no. of the user of the cables	
4.	Name & designation of the responsible person in user's organisation	
5.	Contract No. and date	
6.	Details of aluminium conductor, XLPE insulated, PVC sheathed Power cables of 1.1 KV or higher grade	
(i)	Manufactured	Yes/No

Signature of authorized signatory.....

- Sl.No.	Particulars	

(ii)	Supplied	Yes/No
(iii)	Rated voltage of cable	 KV
(iv)	Type of Cable	
(v)	Total Quantity supplied prior to the date of bid opening	 Km

7. User's Certificate of Cable enclosed

- (ii) The details of above (b) are given as under :

- Sl.No.	Particulars	

1.	Client name and its address, fax no. & telephone no.	
2.	Name & Designation of the responsible person in client's organisation	
3.	Name, Address, telephone no. & fax no. of the user of the cables	
4.	Name & designation of the responsible person in user's organisation	
5.	Contract No. and date	
6.	Details of aluminium conductor, PVC insulated, PVC sheathed Power cables of 1.1 KV or higher grade	
(i)	Manufactured	Yes/No

Signature of authorized signatory.....

- Sl.No.	Particulars	
- (ii)	Supplied	Yes/No
(iii)	Rated Voltage of Cable	KV
(iv)	Type of Cable	
(v)	Total Quantity supplied prior to the date of bid opening in one single contract	 Km

7. User's Certificate of Cable enclosed

- (iii) The details of above (c) are given as under :

- Sl.No.	Particulars	
1.	Client name and its address, fax no. & telephone no.	
2.	Name & Designation of the responsible person in client's organisation	
3.	Name, Address, telephone no. & fax no. of the user of the cables	
4.	Name & designation of the responsible person in user's organisation	
5.	Contract No. and date	
6.	Details of Flame Retardant Low Smoke cables	
(i)	Manufactured	Yes/No
(ii)	Supplied	Yes/No

Signature of authorized signatory.....

- (iv) The details of above (d) are given as under :

- Signature of authorized signatory.....**

- Sl.No.	Particulars
----------	-------------

7. User's Certificate of Cable enclosed

Date : (Signature).....

Place : (Printed Name).....

(Designation).....

(Common seal).....

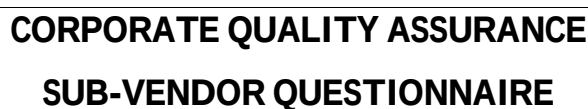
Note :

1. Continuation sheets of like size and format may be used as per the Sub-vendor's requirement and shall be annexed to this Attachment-3K.
2. Sub-vendor is required to attach necessary documents like copies of work order, completion certificates, agreements, drawings etc. in support of the details furnished above.

Signature of authorized signatory.....

	CORPORATE QUALITY ASSURANCE SUB-VENDOR QUESTIONNAIRE
---	---

i.	Item/Scope of Sub-contracting			
ii.	Address of the registered office	Details of Contact Person (Name, Designation, Mobile, Email)		
iii.	Name and Address of the proposed Sub-vendor's works where item is being manufactured	Details of Contact Person: (Name, Designation, Mobile, Email)		
iv.	Annual Production Capacity for proposed item/scope of sub-contracting			
v.	Annual production for last 3 years for proposed item/scope of sub-contracting			
vi.	Details of proposed works			
1.	Year of establishment of present works			
2.	Year of commencement of manufacturing at above works			
3.	Details of change in Works address in past (if any)			
4.	Total Area			
	Covered Area			
5.	Factory Registration Certificate	Details attached at Annexure – F2.1		
6.	Design/ Research & development set-up (No. of manpower, their qualification, machines & tools employed etc.)	Applicable / Not applicable if manufacturing is as per Main Contractor/purchaser design Details attached at Annexure – F2.2 (if applicable)		
7.	Overall organization Chart with Manpower Details (Design/Manufacturing/Quality etc)	Details attached at Annexure – F2.3		
8.	After sales service set up in India, in case of foreign sub-vendor (Location, Contact Person, Contact details etc.)	Applicable / Not applicable Details attached at Annexure – F2.4		
9.	Manufacturing process execution plan with flow chart indicating various stages of manufacturing from raw material to finished product including outsourced process, if any	Details attached at Annexure – F2.5		
10.	Sources of Raw Material/Major Bought Out Item	Details attached at Annexure – F2.6		
11.	Quality Control exercised during receipt of raw material/BOI, in-process , Final Testing, packing	Details attached at Annexure – F2.7		



Company's Seal/Stamp:-

1. For any technical clarification, please contact Sh. Puneet Chawla, Sr. Engineer (TBEM) / Sh. Vivek Kapil, DGM (TBEM); Contact No. 0120-06748499 / 8539; e-mail: puneet.chawla@bhel.in; vivekk@bhel.in
2. 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 / akchowdhary@bhel.in
3. 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.

4. Clause no. ñ 12 of GTC shall be read as follows:

DELIVERY PERIOD: - Vendor to ensure supply of complete material (as per Schedule of Price and Technical Specification) within **20 weeks** (for both power and control cables) from the date of manufacturing clearance from BHEL. However, PO acceptance/Drawings/documents/Type test reports/MQP etc shall be submitted within 2 weeks from the date of PO and every revised submission incorporating comments within 1 week from the date of comments. In case there are delays in submission /resubmission of drawing /documents as per above schedule, that much days would be reduced from delivery period.

Time for BHEL activities such as for inspection and issue of MICC / MDCC (dispatch clearance) has been considered as 3 weeks. Vendor to dispatch the material within 1 week from the date of issue of dispatch clearance (MICC/ MDCC) by BHEL.

2 week's time for type test if applicable, shall be given separately (Either at vendor's works or through Third Party Lab).

Note : 1. 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.

5. Permissible Technical Deviations: No permissible Technical Deviation has been envisaged.
6. Project Status ñ Domestic. GST as applicable.
7. Integrity Pact ñ **APPLICABLE** [Refer Annexure 1 and 2 attached].
8. **Clause No. 5 of GTC** - Guarantee period is required 18 months from the date of last delivery or up to 30/11/2022 whichever is later.
9. **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.
10. **Clause No. – 2 for Prices of GTC shall be on PVC basis as per latest formula mentioned below as per IEEMA circular:**

Copper conductor PVC insulated 1.1 kV control cables

P = Po+CuF(Cu-Cuo)+CCFCu(PVCc-PVCco)+FeF(Fe-Fe0)

For unarmoured cables; FeF = 0

Table references:

CUC (Copper conductor)

P5 (PVC Compound)

P6 (Steel armour)

Aluminium conductor XLPE insulated 1.1 kV power cable

P = Po+AlF(AL-Alo)+XLFAL(CC-Cco)+CCFAI(PVCc-PVCco)+FeF(Fe-Feo)

For unarmoured multicore cables (without steel armour); FeF = 0

Table references:

ALP (Aluminium conductor in single core unarmoured & multicore cables).

P1 (Aluminium conductor aluminium armour in single core armoured cables).

P2 (PVC compound)

P3 (Steel armour)

XL1 (XLPE compound)

The date of delivery shall be PO delivery date or date of actual dispatch, whichever is earlier.

The total adjustment shall be subject to a ceiling of $\pm 20\%$ (plus or minus twenty percent).

The base indices in the formula shall be of first notification of IEEMA of the **AUG 2019**.

11. **The link for Online Supplier registration Portal is <https://supplier.bhel.in/>.**

12. **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"

13. **Pre qualifying requirement :**

Technical: As per clause 3.0 of Section – 1 of Technical Specification.

Commercial: Vendor should be approved from customer (NTPC) as on date of original Techno – Commercial bid opening. (Any vendor approved for any other NTPC project shall be acceptable after formal proposal to customer for this project. Supply made against NTPC site PO may not be considered approved vendor by NTPC).

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.

14. Endorsed LR is not required in GST regime.

15. 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 100% 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/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.

Name:

Signature:

Stamp:

	CORPORATE QUALITY ASSURANCE			
	MAIN CONTRACTOR'S PROPOSAL CUM EVALUATION REPORT			

Ref No:				Date:			
i.	Main Contractor						
ii.	Project						
iii.	Package Name			Package No			
iv.	Proposed Item/Scope of Sub-contracting						
v.	Item covered under	Schedule-1				As per contract clause No-	
		Schedule-2					
vi.	If item is Schedule-1 and proposed sub-vendor is indigenous, Main Contractor to explain how the contractual provisions will be fulfilled						
vii.	Name and Address of the proposed Sub-vendor's works						
viii.	PO placement date/ Start of manufacturing (if self-manufactured) as per L2 network						
ix.	Item Description (Type/Size/Rating/Scope of Sub-Contracting)	Total quantity of proposed item envisaged in this package (Nos/ Running Meters/ Kgs/ Tons etc)	Quantity proposed to be procured from proposed sub-vendor (Nos/ Running Meters /Kgs /Tons etc)	Timeline for quantity requirements as per project schedule & whether the proposed Sub-vendor equipped with adequate capacity to supply proposed order quantity in time			
x.	Supply experience of the proposed sub-vendor (including supplies to Main Contractor, if any) for similar item/scope of sub-contracting, for last 3 years (Note:- Only relevant experience details w.r.t. proposed item/scope of subcontracting to be brought out here)						
	Project/Package	Customer Name	Supplied Item (Type/Rating/Model /Capacity/Size etc)	PO ref no /date	Supplied Quantity	Date of Supply	
We confirm that as per our assessment, the proposed sub-vendor has requisite capabilities & supply experience and is suitable for supplying the proposed item/scope of sub-contracting.							
Name:		Desig:		Contact No:		Sign:	
						Date:	

Company's Seal/Stamp:-

Transmission Business Group

Materials management

Noida

Ref: TBMM/RA

Rev 00, Dated 22.05.2019

Subject: Procedure for Preference for procurement of goods/services from 'Local Suppliers' under Public Procurement (Preference to Make in India) Order, 2017 and revision 2018 in case of Reverse Auction

PROCEDURE

(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.

INTEGRITY PACT

Between

Bharat Heavy Electricals Ltd. (BHEL), a company registered under the Companies Act 1956 and having its registered office at "BHEL House", Siri Fort, New Delhi - 110049 (India) hereinafter referred to as "The Principal", which expression unless repugnant to the context or meaning hereof shall include its successors or assigns of the ONE PART

and

_____, (description of the party along with address), hereinafter referred to as "The Bidder/ Contractor" which expression unless repugnant to the context or meaning hereof shall include its successors or assigns of the OTHER PART

Preamble

The Principal intends to award, under laid-down organizational procedures, contract/s for _____

_____. The Principal values full compliance with all relevant laws of the land, rules and regulations, and the principles of economic use of resources, and of fairness and transparency in its relations with its Bidder(s)/ Contractor(s).

In order to achieve these goals, the Principal will appoint Independent External Monitor(s), who will monitor the tender process and the execution of the contract for compliance with the principles mentioned above.

Section 1- Commitments of the Principal

1.1 The Principal commits itself to take all measures necessary to prevent corruption and to observe the following principles:-

1.1.1 No employee of the Principal, personally or through family members, will in connection with the tender for, or the execution of a contract, demand, take a promise for or accept, for self or third person, any material or immaterial benefit which the person is not legally entitled to.

1.1.2 The Principal will, during the tender process treat all Bidder(s) with equity and reason. The Principal will in particular, before and during the tender process, provide to all Bidder(s) the same information and will not provide to any Bidder(s) confidential/ additional information through which the Bidder(s) could obtain an advantage in relation to the tender process or the contract execution.

1.1.3 The Principal will exclude from the process all known prejudiced persons.

1.2 If the Principal obtains information on the conduct of any of its employees which is a penal offence under the Indian Penal Code 1860 and Prevention of Corruption Act 1988 or any other statutory penal enactment, or if there be a substantive suspicion in this regard, the Principal will inform its Vigilance Office and in addition can initiate disciplinary actions:

Section 2 - Commitments of the Bidder(s)/ Contractor(s)

- 2.1 The Bidder(s)/ Contractor(s) commit himself to take all measures necessary to prevent corruption. He commits himself to observe the following principles during his participation in the tender process and during the contract execution.
- 2.1.1 The Bidder(s)/ Contractor(s) will not, directly or through any other person or firm, offer, promise or give to the Principal or to any of the Principal's employees involved in the tender process or the execution of the contract or to any third person any material, immaterial or any other benefit which he/ she is not legally entitled to, in order to obtain in exchange any advantage of any kind whatsoever during the tender process or during the execution of the contract.
- 2.1.2 The Bidder(s)/ Contractor(s) will not enter with other Bidder(s) into any illegal or undisclosed agreement or understanding, whether formal or informal. This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or any other actions to restrict competitiveness or to introduce cartelization in the bidding process.
- 2.1.3 The Bidder(s)/ Contractor(s) will not commit any penal offence under the relevant Indian Penal Code (IPC) and Prevention of Corruption Act; further the Bidder(s)/ Contractor(s) will not use improperly, for purposes of competition or personal gain, or pass on to others, any information or document provided by the Principal as part of the business relationship, regarding plans, technical proposals and business details, including information contained or transmitted electronically.
- 2.1.4 Foreign Bidder(s)/ Contractor(s) shall disclose the name and address of agents and representatives in India and Indian Bidder(s)/ Contractor(s) to disclose their foreign principals or associates. The Bidder(s)/ Contractor(s) will, when presenting his bid, disclose any and all payments he has made, and is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the contract.
- 2.2 The Bidder(s)/ Contractor(s) will not instigate third persons to commit offences outlined above or be an accessory to such offences.
- 2.3 The Bidder(s)/ Contractor(s) shall not approach the Courts while representing the matters to IEMs and will await their decision in the matter.

Section 3 - Disqualification from tender process and exclusion from future contracts

If the Bidder(s)/ Contractor(s), before award or during execution has committed a transgression through a violation of Section 2 above, or acts in any other manner such as to put his reliability or credibility in question, the Principal is entitled to disqualify the Bidder(s)/ Contractor(s) from the tender process or take action as per the separate "Guidelines on Banning of Business dealings with Suppliers/ Contractors", framed by the Principal.

Section 4 - Compensation for Damages

- 4.1 If the Principal has disqualified the Bidder from the tender process prior to the award according to Section 3, the Principal is entitled to demand and recover the damages equivalent Earnest Money Deposit/ Bid Security.
- 4.2 If the Principal has terminated the contract according to Section 3, or if the Principal is entitled to terminate the contract according to section 3, the Principal shall be entitled to

demand and recover from the Contractor liquidated damages equivalent to 5% of the contract value or the amount equivalent to Security Deposit/ Performance Bank Guarantee, whichever is higher.

Section 5 - Previous Transgression

- 5.1 The Bidder declares that no previous transgressions occurred in the last 3 years with any other company in any country conforming to the anti-corruption approach or with any other Public Sector Enterprise in India that could justify his exclusion from the tender process.
- 5.2 If the Bidder makes incorrect statement on this subject, he can be disqualified from the tender process or the contract, if already awarded, can be terminated for such reason.

Section 6 - Equal treatment of all Bidders/ Contractors / Sub-contractors

- 6.1 The Principal will enter into agreements with identical conditions as this one with all Bidders and Contractors. In case of sub-contracting, the Principal contractor shall be responsible for the adoption of IP by his sub-contractors and shall continue to remain responsible for any default by his sub-contractors.
- 6.2 The Principal will disqualify from the tender process all bidders who do not sign this pact or violate its provisions.

Section 7 - Criminal Charges against violating Bidders/ Contractors /Subcontractors

If the Principal obtains knowledge of conduct of a Bidder, Contractor or Subcontractor, or of an employee or a representative or an associate of a Bidder, Contractor or Subcontractor which constitutes corruption, or if the Principal has substantive suspicion in this regard, the Principal will inform the Vigilance Office.

Section 8 - Independent External Monitor(s)

- 8.1 The Principal appoints competent and credible Independent External Monitor for this Pact. The task of the Monitor is to review independently and objectively, whether and to what extent the parties comply with the obligations under this agreement.
- 8.2 The Monitor is not subject to instructions by the representatives of the parties and performs his functions neutrally and independently. He reports to the CMD, BHEL.
- 8.3 The Bidder(s)/ Contractor(s) accepts that the Monitor has the right to access without restriction to all contract documentation of the Principal including that provided by the Bidder(s)/ Contractor(s). The Bidder(s)/ Contractor(s) will grant the monitor, upon his request and demonstration of a valid interest, unrestricted and unconditional access to his contract documentation. The same is applicable to Sub-contractor(s). The Monitor is under contractual obligation to treat the information and documents of the Bidder(s)/ Contractor(s) / Sub-contractor(s) with confidentiality in line with Non- disclosure agreement.
- 8.4 The Principal will provide to the Monitor sufficient information about all meetings among the parties related to the contract provided such meetings could have an impact on the contractual relations between the Principal and the Contractor. The parties offer to the Monitor the option to participate in such meetings.

- 8.5 The role of IEMs is advisory, would not be legally binding and it is restricted to resolving issues raised by an intending bidder regarding any aspect of the tender which allegedly restricts competition or bias towards some bidders. At the same time, it must be understood that IEMs are not consultants to the Management. Their role is independent in nature and the advice once tendered would not be subject to review at the request of the organization.
- 8.6 For ensuring the desired transparency and objectivity in dealing with the complaints arising out of any tendering process, the matter should be examined by the full panel of IEMs jointly as far as possible, who would look into the records, conduct an investigation, and submit their joint recommendations to the Management.
- 8.7 The IEMs would examine all complaints received by them and give their recommendations/ views to CMD, BHEL, at the earliest. They may also send their report directly to the CVO and the Commission, in case of suspicion of serious irregularities requiring legal/ administrative action. IEMs will tender their advice on the complaints within 10 days as far as possible.
- 8.8 The CMD, BHEL shall decide the compensation to be paid to the Monitor and its terms and conditions.
- 8.9 IEM should examine the process integrity, they are not expected to concern themselves with fixing of responsibility of officers. Complaints alleging mala fide on the part of any officer of the organization should be looked into by the CVO of the concerned organisation.
- 8.10 If the Monitor has reported to the CMD, BHEL, a substantiated suspicion of an offence under relevant Indian Penal Code/ Prevention of Corruption Act, and the CMD, BHEL has not, within reasonable time, taken visible action to proceed against such offence or reported it to the Vigilance Office, the Monitor may also transmit this information directly to the Central Vigilance Commissioner, Government of India.
- 8.11 The number of Independent External Monitor(s) shall be decided by the CMD, BHEL.
- 8.12 The word 'Monitor' would include both singular and plural.

Section 9 - Pact Duration

- 9.1 This Pact shall be operative from the date IP is signed by both the parties till the final completion of contract for successful bidder and for all other bidders 6 months after the contract has been awarded. Issues like warranty / guarantee etc. should be outside the purview of IEMs.
- 9.2 If any claim is made/ lodged during currency of IP, the same shall be binding and continue to be valid despite the lapse of this pact as specified above, unless it is discharged/ determined by the CMD, BHEL.

Section 10 - Other Provisions

- 10.1 This agreement is subject to Indian Laws and jurisdiction shall be registered office of the Principal, i.e. New Delhi.

- 10.2 Changes and supplements as well as termination notices need to be made in writing. Side agreements have not been made.
- 10.3 If the Contractor is a partnership or a consortium, this agreement must be signed by all partners or consortium members.
- 10.4 Should one or several provisions of this agreement turn out to be invalid, the remainder of this agreement remains valid. In this case, the parties will strive to come to an agreement to their original intentions.
- 10.5 Only those bidders / contractors who have entered into this agreement with the Principal would be competent to participate in the bidding. In other words, entering into this agreement would be a preliminary qualification.

For & On behalf of the Principal

(Office Seal)

Place-----

Date-----

Witness:_____

(Name & Address) _____

For & On behalf of the Bidder/

Contractor

(Office Seal)

Witness:_____

(Name & Address) _____

Clause on IP in the tender**“Integrity Pact (IP)”**

- (a) IP is a tool to ensure that activities and transactions between the Company and its Bidders/ Contractors are handled in a fair, transparent and corruption free manner. Following Independent External Monitors (IEMs) on the present panel have been appointed by BHEL with the approval of CVC to oversee implementation of IP in BHEL.

Sl	IEM	Address	Phone & Email
1.	Shri D.R.S Chaudhary, IAS (Retd.)	E-1/164, Arera Colony Bhopal 462016 (M.P.)	dilip.chaudhary@icloud.com
2.	Mrs. Pravin Tripathi, IA & AS (Retd.)	D-243, Anupam Gardens, Lane IB, Neb Sarai, Sainik Farms, New Delhi – 110 068	pravin.tripathi@gmail.com

- (b) The IP as enclosed with the tender is to be submitted (duly signed by authorized signatory) along with techno-commercial bid (Part-I, in case of two/ three part bid). Only those bidders who have entered into such an IP with BHEL would be competent to participate in the bidding. In other words, entering into this Pact would be a preliminary qualification.
- (c) Please refer Section-8 of IP for Role and Responsibilities of IEMs. In case of any complaint arising out of the tendering process, the matter may be referred to any of the above IEM(s). All correspondence with the IEMs shall be done through email only.

Note:

No routine correspondence shall be addressed to the IEM (phone/ post/ email) regarding the clarifications, time extensions or any other administrative queries, etc on the tender issued. All such clarification/ issues shall be addressed directly to the tender issuing (procurement) department's officials whose contact details are provided below:

Details of contact person(s):

(1)

Name: _____
 Deptt: _____
 Address: _____
 Phone: (Landline/ Mobile) _____

Email: _____
 Fax: _____

(2)

Name: _____
 Deptt: _____
 Address: _____
 Phone: (Landline/ Mobile) _____

Email: _____
 Fax: _____

Dear Madam/ Sir,

A. The tenure of Ms. Pravin Tripathi, IA&AS (Retd.) as IEM of BHEL has expired on 11th Aug 2019.

B. Following IEMs have been appointed by BHEL for a period of three years:

SI No.	IEM	Address	Email
1.	Shri Arun Chandra Verma, IPS (Retd.)	Flat No. C -1204, C Tower, Amrapali, Platinum Complex, Sector 119, Noida (U.P.)	acverma1@gmail.com
2.	Shri Virendra Bahadur Singh, IPS (Retd.)	H. No. B-5/64, Vineet Khand, Gomti Nagar, Lucknow - 226010	vbsinghips@gmail.com

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 forMicro / 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



**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 ¹ (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 _____ ² 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 _____ ³ valued at Rs _____ ⁴ (Rupees -----)/FC _____ (in words _____) for _____ ⁵ (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 _____ 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 _____ 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 _____⁶ 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 _____⁷ we shall be discharged from all liabilities under this guarantee thereafter.

We, _____ 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 _____⁸
- b) This Guarantee shall be valid up to _____⁹
- c) Unless the Bank is served a written claim or demand on or before _____¹⁰ 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 _____ .

¹ NAME AND ADDRESS OF EMPLOYER I.e Bharat Heavy Electricals Limited

² NAME AND ADDRESS OF THE VENDOR /CONTRACTOR / SUPPLIER.

³ DETAILS ABOUT THE NOTICE OF AWARD/CONTRACT REFERENCE

⁴ PROJECT/SUPPLY DETAILS

⁵ BG AMOUNT IN FIGURES AND WORDS

⁶ VALIDITY DATE

⁷ DATE OF EXPIRY OF CLAIM PERIOD

⁸ BG AMOUNT IN FIGURES AND WORDS.

⁹ VALIDITY DATE

¹⁰ DATE OF EXPIRY OF CLAIM PERIOD

ANNEXURE - 1

	Description	ALF	CCFAI	FeF	XLFAL
1	SUPPLY- LOW VOLTAGE CABLE : XLPE Insulated, Aluminium Conductor, 3.5 Core x 35sqmm Armoured Aux Power Cable				
2	SUPPLY- LOW VOLTAGE CABLE : XLPE INSULATED ALUMINIUM CONDUCTOR 4 CORE X 6SQMM ARMOURED AUX POWER CABLE				
3	SUPPLY- LOW VOLTAGE CABLE : XLPE INSULATED ALUMINIUM CONDUCTOR 4 CORE X 4SQMM ARMOURED AUX POWER CABLE				
4	SUPPLY- LOW VOLTAGE CABLE : XLPE INSULATED ALUMINIUM CONDUCTOR 4 CORE X 16SQMM ARMOURED AUX POWER CABLE				
5	SUPPLY- LOW VOLTAGE CABLE : XLPE INSULATED ALUMINIUM CONDUCTOR 3.5 CORE X 95SQMM ARMOURED AUX POWER CABLE				
6	SUPPLY- LOW VOLTAGE CABLE : XLPE INSULATED ALUMINIUM CONDUCTOR 3.5 CORE X 70SQMM ARMOURED AUX POWER CABLE				
7	SUPPLY- LOW VOLTAGE CABLE : XLPE INSULATED ALUMINIUM CONDUCTOR 3.5 CORE X 300SQMM ARMOURED AUX POWER CABLE				
8	SUPPLY- LOW VOLTAGE CABLE : XLPE INSULATED ALUMINIUM CONDUCTOR 2 CORE X 6SQMM ARMOURED AUX POWER CABLE				
		CUF	CCFCU	FeF	
9	SUPPLY- LOW VOLTAGE CABLE : HR-PVC INSULATED COPPER (PLAIN) CONDUCTOR 5 CORE X 2.5SQMM ARMOURED CONTROL CABLE				
10	SUPPLY- LOW VOLTAGE CABLE : HR-PVC INSULATED COPPER (PLAIN) CONDUCTOR 4 CORE X 10SQMM ARMOURED CONTROL CABLE				
11	SUPPLY- LOW VOLTAGE CABLE : HR-PVC INSULATED COPPER (PLAIN) CONDUCTOR 2 CORE X 2.5SQMM ARMOURED CONTROL CABLE				
12	SUPPLY- LOW VOLTAGE CABLE : HR-PVC INSULATED COPPER (PLAIN) CONDUCTOR 19 CORE X 2.5SQMM ARMOURED CONTROL CABLE				
13	SUPPLY- LOW VOLTAGE CABLE : HR-PVC INSULATED COPPER (PLAIN) CONDUCTOR 14 CORE X 2.5SQMM ARMOURED CONTROL CABLE				
14	SUPPLY- LOW VOLTAGE CABLE : HR-PVC INSULATED COPPER (PLAIN) CONDUCTOR 10 CORE X 2.5SQMM ARMOURED CONTROL CABLE				