BHARAT HEAVY ELECTRICALS LTD.
(TRANSMISSION BUSINESS GROUP)
GENERAL TERMS AND CONDITIONS FOR TENDER ENQUIRY

This Format is to be submitted in original duly signed and stamped by bidder. Deviation, if any, is to be brought out clearly in Schedule of Commercial deviation giving clause wise deviation. Any condition / clarification / deviation mentioned elsewhere will not be accepted.

Sr. No	ENQUIRY NO. 225E079 DATED 18/06/2015 DUE ON 21/07/2015
1.	1. Sealed bids are invited for the items mentioned in the enquiry. Quotations should be typed and free from over writing and erasures, corrections or additions must be clearly written both in words and figures and attested and otherwise offer may be rejected. 2. Bidder must ensure that their quotation is received / dropped in the tender box on or before 14.00 Hrs. of the due date of opening in ***Material Management Division*** ***Transmission Business Group*** ***Tower A, 5th Floor, BHEL, Advant Navis IT Business Park*** ***Plot No 7, Sector - 142, Express way Noida*** ***Noida -201305*** ***DISTT- GAUTAM BUDH NAGAR, UP*** 3. The same shall be opened at 14.30 Hrs. on the same day. Tenders received late shall be rejected. Bidders must ensure that tender documents are deposited on or before due date. 4. **Bids are to be submitted in Two parts:** i) **Techno-commercial bid (Part I)** – To be submitted in duplicate. A copy of price bid (Part II) (**without prices but clearly mentioning the taxes & duties applicable, if any**) is also to be enclosed in Part I bid as confirmation that the bidder has quoted for all the items mentioned in price bid format. ii) **Price bid (Part II)** – To be submitted only in one copy in a separate sealed envelope. This should not contain any Technical or Commercial Terms. The rates should be quoted both in figures and words. In case of any difference between figures and words, the quoted rate in words will prevail over figure. If there is a calculation mistake in multiplication of unit rate with quantity, then the unit rate quoted will be considered for calculation. Both Part I and Part II bids are to be sealed in separate envelope and both envelops to be kept in another common envelope. Each envelope should be sealed and super scribed with enquiry no., item / package name, project name and due date of opening. **Note: 1 Representative deputed to witness tender opening must produce an authority letter from the signatory of offer at the time of tender opening.** **Note: 2 Authorized signatory should authenticate tender documents.**

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	5. **For any Technical Clarification, please contact:** **SHRI VIVEK KAPIL, Sr. MANAGER / TBEM** **BHARAT HEAVY ELECTRICALS LIMITED** **TRANSMISSION BUSINESS GROUP** **TOWER A, 5TH FLOOR, ADVANT NAVIS IT BUSINESS PARK,** **PLOT NO-7, SECTOR-142, EXPRESSWAY NOIDA,** **NOIDA-201305,** **DISTT- GAUTAM BUDH NAGAR, UP, INDIA** **Phone : 0120-06748539 / 9818080691** **E-mail : vivekk@bhel.in** **For any Commercial Clarification, please contact:** **SH. S.C. SHIVHARE, Sr. MGR.(TBMM) /** **SMT. ARCHANA KUMARI, Sr. ENGR. (TBMM)** **BHARAT HEAVY ELECTRICALS LIMITED** **TRANSMISSION BUSINESS GROUP** **TOWER A, 5TH FLOOR, ADVANT NAVIS IT BUSINESS PARK,** **PLOT NO-7, SECTOR-142, EXPRESSWAY NOIDA,** **NOIDA-201305,** **DISTT- GAUTAM BUDH NAGAR, UP, INDIA** **Phone : 0120-6748467 / 0120-6748471** **Email: archanak@bhel.in / scshivhare@bhel.in** 6. Price bid should not contain any information / description / terms & condition other than given in Part-I of the bid except prices, otherwise bid is liable for rejection. 7. Price bid submitted along with the bid shall remain valid up to validity of offer. Unsolicited Supplementary / Revised price bid submitted during validity period of offer, unless asked by BHEL, shall not be considered. With-drawl of quotation by the bidder, at any stage after its opening, may entail blacklisting of vendor.
2.	**PRICES: The Prices shall remain FIRM during contract period.** **A. The prices shall be quoted by the vendors considering following** The prices are to be quoted on **FOR** (Destination) basis. The break-up of price shall be as under:- **a) Ex-works Price:** Ex- works price including packing & forwarding charges. **b) Excise duty: ED as applicable is to be quoted as percentage in both un-price and price bid.** **c) Sales Tax:** ST / VAT / CST (against C-form) to be quoted as percentage in un-price and price bid. **d) Entry tax / Octroi Charges:** Any Entry tax / Octroi applicable at destination / destination state shall be paid extra on proof of such payment. **e) Freight & Insurance:** Freight and Transit Insurance for door delivery up to destination/store is to be quoted. **f) Type Test charges:** As per technical specification enclosed with this Enquiry.

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	Note: The purchase order shall be placed on Ex- Works basis. **"BHEL reserves the right to go for Reverse Auction (RA) instead of opening the sealed envelope price bid, submitted by the bidder. 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 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."** **(Further to above clause, please refer attached Annexure I for Terms & Conditions Of Reverse Auction Page 1 & 2)**
3.	**<u>TERMS OF PAYMENT:</u>-** 100 % Payment with Taxes, Duties, Freight & Insurance within 60 days (**45 Days for MSE vendor**) from the date of receipt of complete invoice with following documents in 3 sets (Original + 2 copies): - LR duly endorsed in the name of customer by BHEL site - Receipt of material on the attached format by BHEL site - Excise invoice (If Applicable) - Delivery Challan or Packing list (case wise) - Transit insurance certificate from under writers or Copy of Intimation of Transit Insurance duly endorsed by under writers - MICC - Guarantee Certificate - Copy of Performance Bank Guarantee. [A.] Documents to be furnished by vendor immediately after dispatch: - Copy of Invoice - Copy of LR - Copy of Delivery Challan / Packing List - Copy of Insurance Certificate - Copy of Guarantee Certificate [B.] Following Documents to be sent by vendor to TBG, BHEL : - LR duly endorsed in the name of customer by BHEL site - Receipt of material on the attached format by BHEL site - Excise invoice (If Applicable) - Delivery Challan / Packing list (case wise) - Transit insurance certificate from under writers or Copy of Intimation of Transit Insurance duly endorsed by under writers - Dispatch Clearance / MICC - Guarantee certificate - All Test & Inspection Reports
4.	**INTEREST LIABILITY:** In case of any delay in payment due to any reason, BHEL shall not pay any interest

	on delayed payment.
5.	**GUARANTEE :** The equipment / material shall be guaranteed for 18 months from the date of delivery or 12 months from the date of commissioning, which ever is earlier. The defective material / component shall be replaced free of cost at site.
6.	**PERFORMANCE BANK GUARANTEE:** Bidder shall furnish along with first invoice Performance BG / deposit as per follows. **Option A** BG for 10% of the total Ex-works PO value, valid for 18 months + 3 months claim period (i. e. total 21 months) from the date of last delivery. **Option B** Retention of 10% of the total Ex-works PO value by BHEL from the first bill in lieu of Performance Bank Guarantee, to be released after expiry of 24 months from the date of first delivery. The Bank guarantee shall be from State Bank of India / State bank of Hyderabad / State Bank of Travancore / State Bank of Mysore / Canara Bank / Bank of Baroda / Punjab National Bank / Deutsche Bank / HDFC Bank / Standard Chartered Bank / CITI Bank / ICICI Bank / IDBI Bank / HSBC / any other Nationalised Bank. The original BG should be sent by issuing Bank directly to AGM (Finance), TBG, BHEL. All the bank Guarantee shall be from a schedule bank In India acceptable to BHEL. The original BG should be sent by issuing bank directly to AGM (Finance) TBG BHEL. BANK Guarantee should be valid for lodging claim within two month after expiry of guarantee period. **If no option is specified, by default option – A shall be considered for confirmation.**
7.	**FINAL ENGINEERING DOCUMENTATION:** Final documentation as called in the specification is to be submitted within 3 months from the date of despatch of material. In case of default, the Performance BG is liable to be en-cashed.
8.	**INSPECTION:** BHEL and / or customer / third party may inspect the Equipment / Material before despatch. In the event BHEL / Customer waives off inspection, Test Reports and Results shall be submitted for Approval. Supplier shall obtain Approval on Test Reports and MDCC / MICC (Material Inspection Clearance Certificate) before dispatch of equipment. Stage inspection during manufacturing may also be carried out. Material to be dispatched only after getting Dispatch Clearance from BHEL. **Supplier shall send inspection call on prescribed format only, with an advance notice of 15 days. (New Format of Inspection Call attached with this Enquiry).**
9.	**DESPATCH DOCUMENTS:** Following despatch documents are to be immediately sent to purchaser on despatch. - Copy of Invoice - Copy of LR - Copy of Delivery Challan / Packing List - Copy of Insurance Certificate - Copy of Guarantee Certificate
10.	**DELIVERY PERIOD:** Bidder to specify the delivery period in weeks from the date of

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	PO in the Activity Schedule Format enclosed with enquiry. Time for conduction of type test, if required, is to be separately indicated. Note: LR date or Invoice date whichever is later shall be considered as delivery date.
11.	**DELAYED DELIVERY:** In case of delay in execution of order beyond the lot wise contractual delivery, an amount of ½ % of total Ex-Works Value per week or part there-of subject to **maximum of 10% of total Ex-Works value** of P.O. will be levied.
12.	**VALIDITY:** The offer shall be valid for 120 days from the due date of opening.
13.	**ACCEPTANCE / REJECTION OF TENDER:** BHEL reserves the right to reject in full or part, any or all tender without assigning any reason thereof. BHEL also reserves right to vary the quantities mentioned in the tender.
14.	**EVALUATION: Comparative statement shall be prepared based on overall quantity basis for all projects unless otherwise indicated in the enquiry. Evaluation of offers shall be done on the basis of delivered cost to BHEL.**
15.	**DEVIATION:** The bids having deviation(s) w.r.to tender are liable for rejection. However, BHEL, at its discretion, may **load the prices for evaluation of offer as mentioned at Sl. No. - 24.**
16.	**ARBITRATION:** All cases of disputes emanating from and relating to this contract shall be referred to the sole arbitrator appointed by Unit Head / GM, BHEL. The arbitrator may be an employee of BHEL whether serving or retired or any other person nominated by Unit Head/GM BHEL. The arbitration shall be in accordance with 'The Arbitration and Conciliation Act 1996' and the rules there under as amended from time to time. The arbitrator shall give a reasoned award. The decision of the arbitrator shall be final & binding upon both the parties. The venue of arbitration shall be Delhi.
17.	**LEGAL SETTLEMENT:** All disputes shall be subject to jurisdiction of court situated in Delhi/New Delhi only. Notwithstanding contained herein anything in this NIT, the original exclusive jurisdiction shall remain of the court at Delhi / New Delhi.
18.	**SUBCONTRACTING:** In case further subcontracting of BHEL order 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 of the responsibility of fulfilling BHEL purchase order requirements.
19.	**RISK PURCHASE:**

	In case the successful bidder fails to supply or fails to comply with the terms & conditions of the purchase order, BHEL reserves the right to source such material/ component / equipment/ system from any other agency at the risk and cost of the successful bidder.
20.	**ADJUSTMENT OF RECOVERY:** Any amount payable by the supplier under any of the condition of this contract shall be liable to be adjusted against any amount payable to the supplier under any other works/contract awarded to him by any BHEL unit. This is without prejudice to any other action as may be deemed fit by BHEL.
21.	**FORCE MAJEURE CONDITION:** Force Majeure will mean: Circumstances beyond the control of contracting parties such as but not limited to act of God, natural catastrophes, fire, war, embargo, industrial dispute, riot, civil commotion, restrictions etc. Vendors willing to plead force majeure shall inform its effect on fulfilment of contract and shall not be held responsible for non performance in such circumstances.
22.	**DEMURRAGE / WHARFAGE:** For the reasons of delay in receipt of documents from suppliers or due to the same being found to be incomplete, and/or faulty, the suppliers shall be responsible to reimburse in all demurrages / wharfages, if any, paid by BHEL (for stated reasons).
23.	**SPECIAL CONDITION:** Procurement will be from manufacturers only. Manufacturers should submit offers directly. However in case of involvement of any representative the details of the same along with the copy of the agreement should be submitted in the first part of the offer. Principal manufactures must ensure that the nominated representative do not represent any other manufacture for the same item.
24.	**LOADING CRITERIA FOR DEVIATIONS TAKEN BY BIDDER ON:** 24.1 : TERMS OF PAYMENT: If a bidder asks for payment within specified no. of days from the date of receipt of invoice with complete documents as per "Terms of Payment" at sr. No. 3 above, loading to be done as follows: a) Base rate of SBI (as applicable on the date of techno commercial bid opening) + 6 % shall be considered for loading for the period of relaxation sought by the bidder. b) 60 days - No loading 24.2 : DELAYED DELIVERY / PENALITY DUE TO DELAYED DELIVERY: Loading for not accepting this clause / accepting only on un delivered portion shall be the maximum amount specified in this clause.
25.	"MSE suppliers can avail the intended benefits only if they submit along with the offer, attested copies of either 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 (Format enclosed at Annexure -1 where deemed validity of EM II certificate of five years has expired) applicable for the relevant financial year (latest audited). Date to be reckoned for determining the deemed validity will be the date of bid opening (Part 1 in case of

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	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 attested by a Gazetted officer. "
26.	**Pre qualifying requirement :** The bidder shall meet the following requirement 1. The Vendor / Manufacturer should have valid **MQP** (Manufacturing Quality Plan) number approved by POWERGRID. Vendor should have POWERGRID letter showing valid MQP. Vendor's to attach the copy of letter along with their offer. 2. As per clause no. 3.0 for Technical Requirements in Technical Specification. 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.

Signature of Bidder
Seal

Terms & Conditions of Reverse Auction

Against this enquiry for the subject item/ system with detailed scope of supply as per enquiry specifications, BHEL may resort to "REVERSE AUCTION PROCEDURE" i.e., ON LINE BIDDING (THROUGH A SERVICE PROVIDER). The philosophy followed for reverse auction shall be English Reverse (No ties).

1. For the proposed reverse auction, technically and commercially acceptable bidders only shall be eligible to participate.

2. Those bidders who have given their acceptance for Reverse Auction (quoted against this tender enquiry) will have to necessarily submit 'online sealed bid' in the Reverse Auction. Non-submission of 'online sealed bid' by the bidder for any of the eligible items for which techno-commercially qualified, will be considered as tampering of the tender process and will invite action by BHEL as per extant guidelines in vogue.

3. BHEL will engage the services of a service provider who will provide all necessary training and assistance before commencement of on line bidding on internet.

4. In case of reverse auction, BHEL will inform the bidders the details of Service Provider to enable them to contact & get trained.

5. Business rules like event date, time, bid decrement, extension etc. also will be communicated through service provider for compliance.

6. Bidders have to fax the Compliance form (annexure IV) before start of Reverse auction. Without this, the bidder will not be eligible to participate in the event.

7. In line with the NIT terms, BHEL will provide the calculation sheet (e.g., EXCEL sheet) which will help to arrive at "Total Cost to BHEL" like Packing & forwarding charges, Taxes and Duties, Freight charges, Insurance, Service Tax for Services and loading factors (for non-compliance to BHEL standard Commercial terms & conditions) for each of the bidder to enable them to fill-in the price and keep it ready for keying in during the Auction.

8. Reverse auction will be conducted on scheduled date & time.

9. At the end of Reverse Auction event, the lowest bidder value will be known on auction portal.

10. The lowest bidder has to fax/e-mail the duly signed and filled-in prescribed format for price breakup including that of line items, if required, (Annexure VII) as provided on case-to-case basis to Service provider within two working days of Auction without fail.

11. In case BHEL decides not to go for Reverse Auction procedure for this tender enquiry, the Price bids and price impacts, if any, already submitted and available with BHEL shall be opened as per BHEL's standard practice.

12. Bidders shall be required to read the "Terms and Conditions" section of the auctions site of Service provider, using the Login IDs and passwords given to them by the service provider before reverse auction event. Bidders should acquaint themselves of the 'Business Rules of Reverse Auction', which will be communicated before the Reverse Auction.

13. If the Bidder or any of his representatives are found to be involved in Price manipulation/ cartel formation of any kind, directly or indirectly by communicating with other bidders, action *as per extant BHEL guidelines*, shall be initiated by BHEL and the results of the RA scrapped/ aborted.

14. The Bidder shall not divulge either his Bids or any other exclusive details of BHEL to any other party.

15. In case BHEL decides to go for reverse auction, the H1 bidder (whose quote is highest in online sealed bid) may not be allowed to participate in further RA process.

SCHEDULE OF PRICE

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

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SL. NO.	DESCRIPTION OF ITEM	UNIT	QTY.	UNIT PRICE EX. WORKS (Rs.)	TOTAL EX. WORKS (Rs.) (5 * 4)	UNIT FREIGHT & INSURANCE (Rs.)	TOTAL Freight & insurance (Inclusive of Service Tax, if any) (Rs.) (7 * 4)	ED @ ...% OF OF COL 6	CST / ST @ ...% OF COL 6+9 (6 + 9)	TOTAL F.O.R. DESTINATION PRICE (Rs.) (6+8+9+10)
1	2	3	4	5	6	7	8	9	10	11
1	For Rourkela S/s: 3.5C x 70 sq mm PVC/ Al. Aux Power Cable	Meter	300							
2	For Rourkela S/s: 4C x 16 sq mm PVC/ Al. Aux Power Cable	Meter	200							
3	For Rourkela S/s: 2C x 6 sq mm PVC/ Al. Aux Power Cable	Meter	200							
4	For Rourkela S/s: 2C x 2.5 sq mm PVC/Cu. Control Cable	Meter	450							
5	For Rourkela S/s: 5C x 2.5 sq mm PVC/ Cu. Control Cable	Meter	1250							
6	For Rourkela S/s: 10C x 2.5 sq mm PVC/ Cu. Control Cable	Meter	1600							
7	For Rourkela S/s: 14C x 2.5 sq mm PVC/ Cu. Control Cable	Meter	400							
8	For Gazuwaka S/s: 3.5C x 70 sq mm PVC/ Al. Aux Power Cable	Meter	3300							
9	For Gazuwaka S/s: 3.5C x 35 sq mm PVC/ Al. Aux Power Cable	Meter	200							
10	For Gazuwaka S/s: 4C x 16 sq mm PVC/ Al. Aux Power Cable	Meter	200							
11	For Gazuwaka S/s: 4C x 6 sq mm PVC/ Al. Aux Power Cable	Meter	900							
12	For Gazuwaka S/s: 2C x 6 sq mm PVC/ Al. Aux Power Cable	Meter	1500							
13	For Gazuwaka S/s: 2C x 2.5 sq mm PVC/Cu. Control Cable	Meter	1700							
14	For Gazuwaka S/s: 5C x 2.5 sq mm PVC/ Cu. Control Cable	Meter	3500							
15	For Gazuwaka S/s: 7C x 2.5 sq mm PVC/ Cu. Control Cable	Meter	1500							
16	For Gazuwaka S/s: 10C x 2.5 sq mm PVC/ Cu. Control Cable	Meter	13600							
17	For Gazuwaka S/s: 14C x 2.5 sq mm PVC/ Cu. Control Cable	Meter	5400							
18	For Gazuwaka S/s: 19C x 2.5 sq mm PVC/ Cu. Control Cable	Meter	6700							
19	For Biharsharif S/s: 3.5C x 70 sq mm PVC/ Al. Aux Power Cable	Meter	1300							
20	For Biharsharif S/s: 3.5C x 35 sq mm PVC/ Al. Aux Power Cable	Meter	200							
21	For Biharsharif S/s: 4C x 16 sq mm PVC/ Al. Aux Power Cable	Meter	100							
22	For Biharsharif S/s: 4C x 6 sq mm PVC/ Al. Aux Power Cable	Meter	200							
23	For Biharsharif S/s: 2C x 6 sq mm PVC/ Al. Aux Power Cable	Meter	500							
24	For Biharsharif S/s: 2C x 2.5 sq mm PVC/Cu. Control Cable	Meter	800							
25	For Biharsharif S/s: 5C x 2.5 sq mm PVC/ Cu. Control Cable	Meter	2900							

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26	For Biharsharif S/s: 7C x 2.5 sq mm PVC/ Cu. Control Cable	Meter	100							
27	For Biharsharif S/s: 10C x 2.5 sq mm PVC/ Cu. Control Cable	Meter	7000							
28	For Biharsharif S/s: 14C x 2.5 sq mm PVC/ Cu. Control Cable	Meter	1600							
29	For Biharsharif S/s: 19C x 2.5 sq mm PVC/ Cu. Control Cable	Meter	900							
30	For Rengali S/s: 3.5C x 70 sq mm PVC/ Al. Aux Power Cable	Meter	4900							
31	For Rengali S/s: 3.5C x 35 sq mm PVC/ Al. Aux Power Cable	Meter	200							
32	For Rengali S/s: 4C x 16 sq mm PVC/ Al. Aux Power Cable	Meter	400							
33	For Rengali S/s: 4C x 6 sq mm PVC/ Al. Aux Power Cable	Meter	1300							
34	For Rengali S/s: 2C x 6 sq mm PVC/ Al. Aux Power Cable	Meter	2300							
35	For Rengali S/s: 2C x 2.5 sq mm PVC/Cu. Control Cable	Meter	2200							
36	For Rengali S/s: 5C x 2.5 sq mm PVC/ Cu. Control Cable	Meter	6400							
37	For Rengali S/s: 7C x 2.5 sq mm PVC/ Cu. Control Cable	Meter	2100							
38	For Rengali S/s: 10C x 2.5 sq mm PVC/ Cu. Control Cable	Meter	21000							
39	For Rengali S/s: 14C x 2.5 sq mm PVC/ Cu. Control Cable	Meter	8000							
40	For Rengali S/s: 19C x 2.5 sq mm PVC/ Cu. Control Cable	Meter	8700							
41	For Jamshedpur S/s: 3.5C x 70 sq mm PVC/ Al. Aux Power Cable	Meter	800							
42	For Jamshedpur S/s: 3.5C x 35 sq mm PVC/ Al. Aux Power Cable	Meter	300							
43	For Jamshedpur S/s: 4C x 16 sq mm PVC/ Al. Aux Power Cable	Meter	300							
44	For Jamshedpur S/s: 4C x 6 sq mm PVC/ Al. Aux Power Cable	Meter	200							
45	For Jamshedpur S/s: 2C x 6 sq mm PVC/ Al. Aux Power Cable	Meter	500							
46	For Jamshedpur S/s: 2C x 2.5 sq mm PVC/Cu. Control Cable	Meter	1000							
47	For Jamshedpur S/s: 5C x 2.5 sq mm PVC/ Cu. Control Cable	Meter	2980							
48	For Jamshedpur S/s: 10C x 2.5 sq mm PVC/ Cu. Control Cable	Meter	3500							
49	For Jamshedpur S/s: 14C x 2.5 sq mm PVC/ Cu. Control Cable	Meter	1500							
50	For Jamshedpur S/s: 19C x 2.5 sq mm PVC/ Cu. Control Cable	Meter	400							
51	For Durgapur S/s: 3.5C x 70 sq mm PVC/ Al. Aux Power Cable	Meter	1100							
52	For Durgapur S/s: 3.5C x 35 sq mm PVC/ Al. Aux Power Cable	Meter	600							
53	For Durgapur S/s: 4C x 16 sq mm PVC/ Al. Aux Power Cable	Meter	800							
54	For Durgapur S/s: 4C x 6 sq mm PVC/ Al. Aux Power Cable	Meter	700							

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55	For Durgapur S/s: 2C x 6 sq mm PVC/ Al. Aux Power Cable	Meter	900							
56	For Durgapur S/s: 2C x 2.5 sq mm PVC/Cu. Control Cable	Meter	1400							
57	For Durgapur S/s: 5C x 2.5 sq mm PVC/ Cu. Control Cable	Meter	5050							
58	For Durgapur S/s: 7C x 2.5 sq mm PVC/ Cu. Control Cable	Meter	600							
59	For Durgapur S/s: 10C x 2.5 sq mm PVC/ Cu. Control Cable	Meter	9800							
60	For Durgapur S/s: 14C x 2.5 sq mm PVC/ Cu. Control Cable	Meter	4400							
61	For Durgapur S/s: 19C x 2.5 sq mm PVC/ Cu. Control Cable	Meter	3800							
62	For Gorakhpur S/s: 4C x 6 sq mm PVC/ Al. Aux Power Cable	Meter	200							
63	For Gorakhpur S/s: 2C x 6 sq mm PVC/ Al. Aux Power Cable	Meter	600							
64	For Gorakhpur S/s: 5C x 2.5 sq mm PVC/ Cu. Control Cable	Meter	400							
65	For Gorakhpur S/s: 7C x 2.5 sq mm PVC/ Cu. Control Cable	Meter	1200							
66	For Gorakhpur S/s: 10C x 2.5 sq mm PVC/ Cu. Control Cable	Meter	2500							
67	For Gorakhpur S/s: 14C x 2.5 sq mm PVC/ Cu. Control Cable	Meter	1200							
68	For Gorakhpur S/s: 19C x 2.5 sq mm PVC/ Cu. Control Cable	Meter	2400							
	TOTAL PRICE									

Rate of Service Tax applicable on F&I, if any .....%

NOTE:

1. PLEASE NOTE THAT UNPRICED COPY OF PRICE BID (i.e. WITH ALL PRICES BLANKED) SHALL BE FURNISHED ALONG WITH TECHNO-COMMERCIAL BID.
2. REQUIRED COPIES OF FORMAT BE MADE & DETAILS MAY BE ANNEXED.
3. THE PRICES MUST BE QUOTED IN THE PRESCRIBED UNIT ONLY.
4. SALES TAX RATE AS APPLICABLE FOR SPECIFIED DESTINATION SHALL BE QUOTED. IN CASE OF CST, RATE AGAINST "C" FORM SHALL BE QUOTED.
5. IN CASE OF VARIED ED SLAB RATES, CONFIRM YOUR OPTION FOR "X" OR "Y". (STRIKE OFF WHICH IS NOT APPLICABLE) IF NO OPTION IS MENTIONED "X" SHALL BE TAKEN.
6. THE VENDORS MUST INDICATE THE APPLICABLE TARIFF NOS. UNDER WHICH ED AND / OR CST WOULD BE PAID BY THEM TO THE TAX AUTHORITIES.
7. IF A VENDOR SUBMITS AN OFFER WITH REDUCED ED AND OR CST APPLICABLE THAN NORMALLY PAID ON SUCH ITEMS, THEY SHOULD SUBMIT NECESSARY DOCUMENTARY PROOF FOR THE SAME.

"X" THE MAXIMUM ED SLAB RATE BE CONSIDERED FOR PRICE COMPARISON.
IN THE EVENT OF ORDER ED AT ACTUAL BE PAID.

"Y" THE QUOTED ED RATE BE CONSIDERED FOR PRICE COMPARISON.
IN THE EVENT OF ORDER ED AT ACTUAL RATE LIMITED TO QUOTED RATE BE PAID.

SIGNATURE & SEAL OF
TENDERER

TRANSMISSION BUSSINESS GROUP
MATERIAL MANGEMENT
BHEL, NOIDA

ACTIVITY SCHEDULE

Please submit this format duly filled in along with offer. Time indicated will be used for calculating contractual delivery period.

ENQUIRY NO. 225E079 Dated: 18/06/2015

PROJECT: PGCIL BIHARSHARRIF JAMSHEDPUR GAZUWAKA RENGALI ROURKELA DURGAPUR GORAKHPUR

ITEM: 1.1 kV AUXILIARY POWER & CONTROL CABLE

VENDOR : OFFER REF.

SL. NO.	ACTIVITY	ACTIVITY TIME IN WEEKS	REMARKS IF ANY
1.	Receipt of P.O		
2.	P.O Acceptance	ONE WEEK	Vendor must Submit Po acceptance with in one week
3.	Submission of documents necessary for getting manufacturing clearance like Drawings, data sheet etc.		Documents complete in all respect are to be Submitted. Delay in approval on account of incomplete / inadequate information shall be the responsibility of supplier
4.	Review and Approval of documents and issue of manufacturing clearance	BHEL ACTIVITY	Vendor must ensure to reply all queries expeditiously.
5.	Manufacturing Time		Manufacturing time be indicated considering all constrains & must include time required for internal inspections etc.
6	Raise inspection call	-VE 2 WEEKS TO SL NO 5	Call for inspection must be raised at least two weeks in advance in the prescribed format. Non availability of offered material for inspection to the inspector will be viewed very seriously & may result in financial implications. The date of inspection must be with in the period indicated in 5 above.
7	Inspection	BHEL	
8	Issue of MICC, MDCC & other documents like EDEC , Road permits etc	BHEL	Vendor must indicate requirement well in advance.
9	Dispatch	ONE WEEK	Vendor must ensure to dispatch with in one Week of receiving all documents required

Total time in vendor's scope:

Please mention constraints if any. For multiple lot delivery activity landmark for each lot should be mentioned. Multiple inspection calls for one lot are to be avoided & delay on this account shall be vendor's responsibility. Vendors to quote their Best Delivery Plan.

SIGNATURE AND SEAL

ENQUIRY NO. 225E079 Dated: 18/06/2015

SCHEDULE OF COMMERCIAL DEVIATION

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

SL. NO.	CLAUSE NO. OF GENERAL TERMS & CONDITIONS	STATEMENT OF DEVIATION

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

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

NOTE: Continuation sheets of like size and format may be used as per the Bidder's requirement and shall be annexed to this schedule.

Place ……..

Date ……..

Signature of the authorized representative of

Bidder's Name ……

Designation ……..

Company seal ……

ENQUIRY NO. 225E079 Dated: 18/06/2015

SCHEDULE OF TECHNICAL DEVIATION

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

SL. NO.	CLAUSE NO. OF TECHNICAL SPECIFICATIONS	STATEMENT OF DEVIATION

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

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

NOTE: Continuation sheets of like size and format may be used as per the Bidder's requirement and shall be annexed to this schedule.

Place ……..

Date ……..

Signature of the authorized representative of

Bidder's Name ……

Designation ……..

Company seal ……

ENQUIRY NO. 225E079 Dated: 18/06/2015

CHECKLIST

SCHEDULE OF INFORMATION TO BE FURNISHED WITH THE OFFER

NOTE: This format is to be submitted in original only, duly filled in. Reproduction of this format on bidder's letter head or on other paper is not acceptable.

Put a tick mark on "YES" if the information is enclosed with the offer or put a tick mark on "NO" if the information is not enclosed or write "NOT APPLICABLE" if the information is not applicable.

1.	Technical offer with detailed schedule of equipment / material and spares enclosed.	YES / NO
2.	Guaranteed Technical Particulars as per Section – 4 enclosed.	YES / NO
3.	Schedule of deviation, if any, clause wise with respect to Technical Specification enclosed.	YES / NO
4.	Standard Manufacturing Quality Plan enclosed.	YES / NO
5.	GA Drawings with dimensions and weights & foundation / fixing details enclosed.	YES / NO
6.	Drawing and Data submission schedule enclosed.	YES / NO
7.	Type Test Reports enclosed.	YES / NO
8.	Bar Chart showing the schedule indicating time required for design, manufacture, test and inspection, transport, erection, site testing and commissioning enclosed.	YES / NO
9.	Makes of all components as per technical Specification enclosed.	YES / NO
10.	Schedule of commercial deviation exception from the General Terms and Conditions	YES / NO

The above checklist is verified for:-

Offer Ref. :

Equipment :

Submitted by : M/s

Project Reference. :

Signed with Seal ……..

Date ……..

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.

Annexure - I

Certificate by Chartered Accountant on letter head

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

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

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

(Strike off whichever is not applicable)

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

Or

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

Date:

(Signature)

Name -

Membership number -

Seal of Chartered Accountant

Assessment report from BHEL for proposed sub-vendor's along with following enclosures (to the extent available):

1. Registration / Licensé of the works enclosed.
2. Evidence that the proposed sub-vendor is manufacturer of the item
3. Organization chart with name and qualification of key persons
4. List of Plant and Machinery along with process flow chart.
5. List of testing equipment to carry out all the routine tests in-house along with their calibration status.
6. List of Raw material (RM), bought out items with sourcing details
7. List of supplies made to other utilities in last three years.
8. Third party approval, if any (viz. ISO, BIS)
9. Copy of Quality Manual (if ISO certified)
10. Pollution clearance wherever applicable
11. Sanctioned load and Back up power/Shed area/Storage area
12. Formats for RM, in process and acceptance testing
13. Type test approvals conducted in last 5 years if applicable
14. Performance Certificates from customers
15. Company Brochure/ Product Catalogues
16. Photographs of factory, plant and machinery & testing facilities.

(ON RS.100/- NON - JUDICIAL STAMP PAPER)

PROFORMA FOR SECURITY-CUM-PERFORMANCE GUARANTEE

1. This deed of Guarantee made this _____day of _____200 ___ by _____Bank Ltd., _____in favour of **Bharat Heavy Electricals Limited, Transmission Business Group, Tower-A, 5th Floor, Advant Navis IT Business Park, Plot-7, Sector-142, Expressway Noida, Noida-201305** having their registered office at **BHEL House, Siri Fort, New Delhi - 110 049.**

2. Whereas **M/s** _____(here in after called the **Contractor** / **Seller**) have entered into a Contract bearing No. _____ dated _____(herein after called the **Contract**) for supply / erection of **M/s Bharat Heavy Electricals Limited** (hereinafter called the **Company**).

3. And whereas the said Contract Inter-alia provides that the Contractor / Seller shall pay to the company a sum of Rs. _____only, towards **Security deposit-Cum-Performance Guarantee** in the for and manner therein specified.

4. And whereas the Seller/Contractor have approached _____ Bank Limited (hereinafter referred to as the **Guarantor**) and at their request and in consideration of the arrangement arrived at between the **Contractor** and the **Guarantor**, the Guarantor has agreed to give the Guarantee as herein after mentioned in favour of the Company.

NOW THIS DEED WITNESSES AS FOLLOWS :

5. The Guarantor by the hand of Mr. _____ and its lawfully and fully constituted attorney and do hereby guarantee the due and faithful performance of the said contract and do hereby irrevocably undertake and promise to pay the Company without any demur merely on demand made by them a sum not exceeding Rs. _____ only in case the Company sustains any loss or damage by reason of any breach, default, by the Contractor / Seller of any of the terms conditions, stipulations or undertakings or any one of them contained in the said contract and the tender documents attached hereto and for payment of any moneys payable by the Contractor/ Seller to the Company under the terms and conditions of the said contract. The decision of the company regarding the breach, default, loss, damage or payment shall be conclusive and binding in the guarantor irrespective of the fact whether the contractor/seller admits or denies such claims or questions its correctness in any court, tribunal or arbitration proceedings or before any other authority.

(Contd....2.)

6. The company shall have the fullest liberty without effecting in any way the liability of the Guarantor under this Guarantee, from time to time to vary any of the terms and conditions of the contract or extend time by the Seller/Contractor or to postpone for any time and from time to time any of the powers exercisable by its against the Seller/Contractor and either to enforce or forbear from enforcing any of terms and conditions governing the contract or securities available to the Company and the guarantor shall not be released from it's liability under these presents by any exercise by the company of the liberty with reference to the matters aforesaid or by reason of time being given to the seller or any other forbearance, act or omission on the part of the company or any induigence by the company to the Seller/Contractor or of any other matter or thing whatsoever which under the law relating to sureties, would but for this provision have the effect of so releasing the Guarantor/contractor from its liability under this Guarantee.

7. This Guarantee shall remain in full force and effect and the Guarantor shall be liable under the same irrespective of any concession or time being granted by the company to the contractor in or for fulfilling the said contract and this Guarantee shall remain in full force irrespective of any change in terms, conditions, stipulations or any variations in the terms of contract irrespective of whether notice of such change and / or variation is given to the Guarantor or not and the claim to receive such notice of any change and or variation of the terms/or conditions of the contract is hereby specifically waived by the Guarantor.

8. The Guarantor here in contained shall not be determined prejudiced or effected by the liquidation or winding up or insolvency of or change in the constitution of the contractor but shall in all respects and for all purposes be binding and operative until all payments or all moneys due or that may hereafter become payable to the company are paid in respect of any liability or obligation of the contractor under the contract.

9. The Guarantor further agree that the Guarantee herein contained shall remain in full force and effect during the period that would be taken for the commencement of the contract till end of the contract and its claim satisfied or discharged and till the company certified that the terms and conditions of the contract have been fully and properly carried out by the seller and accordingly discharges this Guarantee, subject, however, that the company shall have no claim under this guarantee after _____ months from the date of completion of the guarantee has been served on the guarantor before the expiry of the said period in which case the same shall be enforceable against the Guarantor not with standing the fact that the same is enforced after expiry of said period.

   The Guarantor undertake not to revoke this Guarantee during the period it is in force except with the previous consent of the company in writing and agree that any liquidation or winding up or insolvency or dissolution or any change in the constitution of the Seller or the guarantor shall not discharge the Guarantor's liability here under.

It shall not be necessary for the company to proceed against the seller before proceeding against the Guarantor and the Guarantee herein contained shall be enforceable against them not with standing any security which the company may have obtained or obtained from the seller shall at the time when proceedings are taken against the Guarantor here under be outstanding or unrealised.

The Guarantor hereby declares that it has power to execute this Guarantee and the executant has full powers to do so on its behalf under the power of attorney dated _____granted to him by the proper authorities of the Guarantor.

10. Not withstanding anything here in before contained, our liability under this Guarantee is restricted to Rs. _____(Rs._____only) and will expire on _____ and unless a claim in writing is presented to us or an action or suit to enforce the claim is filed against us, within ***three months*** from the date, all our rights shall be forfeited and we shall be relieved and discharged from all our liabilities there under.

IN WITNESS whereof the _____(Bank) have hereunto set and subscribed their hands the day, month and year first above written.

SIGNED FOR AND ON
BEHALF OF THE BANK

WITNESSESS

Name and Address **Signature**

1. **……**
……
……
……
……

2. **……**
……
……
……
……

BHARAT HEAVY ELECTRICALS LIMITED
TRANSMISSION PROJECTS ENGINEERING MANAGEMENT

DOCUMENT No.	TB-4-370-510-013	Rev. No.	00		Prepared	Checked	Approved
TYPE OF DOC.	TECHNICAL SPECIFICATION			NAME	RK	VK	RS
TITLE	1.1kV POWER & CONTROL CABLES			SIGN	Rajat		Rakesh
				DATE	26/05/15		26/5/15
				GROUP	TBEM	W.O. No	84001

CUSTOMER	Power Grid Corporation of India Ltd.
PROJECTS	**(a) Substation Package for Extension of I) 400kV Biharshariff S/s, II) 400kV Jamshedpur S/s, III) 400 kV Gazuwaka S/s, IV) 400 kV Rengali S/s, V) 400 kV Rourkela S/s, VI) 400 kV Durgapur S/s & VII) 400 kV Gorakhpur S/s Extension package under ERSS-IX**

CONTENTS

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

SECTION 1

SCOPE, SPECIFIC TECHNICAL REQUIREMENTS AND QUANTITIES

1.0 SCOPE

This technical specification covers the requirements of design, manufacture, testing at works, packing and dispatch of 1.1kV Control & Aux. Power Cables. This section covers the specific technical requirements of the cables.

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.

1.1 The equipment is required for the following Project.

Name of customer: **Power Grid Corporation of India Ltd.**

Name of the Project : **Extension of 400kV Rourkela S/S, 400kV Gazuwaka S/S, 400kV Biharshariff S/s, 400kV Rengali S/s, 400kV Jamshedpur S/s, 400kV Durgapur S/s & 400/220kv Gorakhpur S/s under Eastern region strengthening scheme-IX (ERSS-IX)**

Refer Section – 2: Equipment Specification.
Section – 3: Project Details and General Specifications.
Section – 4: Standard Technical Data Sheet.
Section – 5: Checklist

Note: The terms used in this specification namely, "Employer/Purchaser" refers to Power Grid, "Contractor "refers to BHEL & "Sub-contractor" refers to successful bidder.

2.0 SPECIFIC TECHNICAL PARTICULARS

2.1 PVC Insulated 1.1kV Control and Aux. Power cable:

The PVC (70°C) insulated 1100V grade Control & Aux. Power cables shall be of FR type, C1 category conforming to IS: 1554 (Part-I) and its amendments.

S.No	Parameters	Control Cable	Aux. Power Cable
1.	Voltage grade of cable	1100 Volts	
2.	Material of conductor	Plain annealed, High conductivity, Stranded Copper Conductor Grade EC	Stranded Aluminium, Grade H2
3.	Strands	As per standard technical data sheet attached as Section-IV	
4.	Conductor insulation.	Extruded PVC compound Type A as per IS 5831	
5.	Filler (If required)	Non-hygroscopic, fire retardant.	
6.	Inner Sheath	Extruded PVC. Type ST-1 as per IS 5831 Non-hygroscopic, fire retardant.	
7.	Armour**	Round wire for Multi-core cables as per IS 1554 (Part I)	Aluminium round wire (H4 grade) for Single core as per IS and Galvanised Steel round wire / strip for Multi-core cables as per IS 1554 (Part I)
8.	Overall sheathing	PVC Extruded, FR. Type ST-1 as per IS 5831,C1 category as per IS 1554, Oxygen Index > 29, Temperature Index > 250°C	

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

(**)All cables shall be of armoured type

2.3 Bidder shall follow applicable standard POWERGRID approved documents (GTP, MQP etc.). In case of any discrepancy between technical specification and standard POWERGRID approvals, more stringent requirement has to be followed.

3.0 TECHNICAL REQUIREMENTS:

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

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

4.0 BILL OF QUANTITY:

The cable type, size and length requirement shall be as per tables below. ***However, the length of each cable type procured may be subject to a change of +/- 30% at the placement of order to successful bidder. Quantity variation on the total ordered cables shall be +/- 10 % at contract stage. Some of the cable sizes may not be ordered.***

4.1 Standard lengths for each size of power and control cables shall be 1000 meters, unless otherwise specified. For power cable with conductor cross sectional area 300sqmm and above may be supplied in 500m drums. Cut lengths for cable marked as (******) below shall be informed during detailed engineering stage. The cable length per drum shall be subject to a tolerance of plus or minus 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%.

4.2 For detailed BOQ refer Annexure-A

5.0 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.

6.0 TEST :

All cables to be supplied shall be 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 Manufacturer's standard Quality Plan (MQP) approved by POWERGRID is deemed to be included.

The type test, acceptance & 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.

ANNEXURE-A

PVC insulated 1.1kV Aux Power Cables	UNIT	ROURKELA S/s	GAZUWAKA S/s	BIHARSHARIF S/s	RENGALI S/s	JAMSHEDPUR S/s	DURGAPUR S/s	GORAKHPUR S/s
3.5C x 70 sq mm PVC/ Al. Aux Power Cable	m	300	3300	1300	4900	800	1100	0
3.5C x 35 sq mm PVC/ Al. Aux Power Cable	m	0	200	200	200	300	600	0
4C x 16 sq mm PVC/ Al. Aux Power Cable	m	200	200	100	400	300	800	0
4C x 6 sq mm PVC/ Al. Aux Power Cable	m	0	900	200	1300	200	700	200
2C x 6 sq mm PVC/ Al. Aux Power Cable	m	200	1500	500	2300	500	900	600
PVC insulated 1.1kV Control Cables:								
2C x 2.5 sq mm PVC/Cu. Control Cable	m	450	1700	800	2200	1000	1400	0
5C x 2.5 sq mm PVC/ Cu. Control Cable	m	1250	3500	2900	6400	2980	5050	400
7C x 2.5 sq mm PVC/ Cu. Control Cable	m	0	1500	100	2100	0	600	1200
10C x 2.5 sq mm PVC/ Cu. Control Cable	m	1600	13600	7000	21000	3500	9800	2500
14C x 2.5 sq mm PVC/ Cu. Control Cable	m	400	5400	1600	8000	1500	4400	1200
19C x 2.5 sq mm PVC/ Cu. Control Cable	m	0	6700	900	8700	400	3800	2400

SECTION-II

SECTION: POWER AND CONTROL CABLE

Table of contents

SECTION: POWER & CONTROL CABLES

1. *POWER & CONTROL CABLES[FOR WORKING VOLTAGES UP TO AND INCLUDING 1100 V]*

CRITERIA FOR SELECTION OF POWER & CONTROL CABLES

1.1.1. Aluminium conductor XLPE insulated armoured cables shall be used for main power supply purpose from LT Aux. Transformers to control room, between distribution boards, ***supply to oil filtration units, DG supply to AC distribution board*** and for supply for colony lighting from control room.

1.1.2 Aluminium conductor PVC insulated armoured power cables shall be used for various other applications in switchyard area/control room except for control/protection purposes.

1.1.3 For all control/protection purposes, PVC insulated armoured control cables of minimum 2.5 sq. mm. size with stranded Copper conductors shall be used.

1.1.4 POWERGRID has standardised the sizes of power cables for various feeders. Bidders are to estimate the quantity of cables and quote accordingly. The sizes of power cables to be used per feeder in different application shall be as follows:

S.No.	From	To	Cable size	Cable type
1.	Main Switch Board	LT Transformer	2-1C X 630 mm^2 per phase 1-1C X 630 mm^2 for neutral	XLPE
2.	Main Switch Board	AC Distribution Board	2-3½C X 300 mm^2	XLPE
3.	Main Switch Board	Oil Filtration Unit ***& looping to other oil filtration units.***	1-3½C X 300 mm^2	XLPE
4.	Main Switch Board	Colony Lighting	1-3½C X 300 mm^2	XLPE

5.	Main Switch Board	HVW pump LCP	1-3½C X 300 mm^2	XLPE
6.	Main Switch Board	Main Lighting distribution board	1-3½C X 300 mm^2	XLPE
7.	AC Distribution Board	D.G. Set AMF Panel	2-3½C X 300 mm^2	XLPE
8.	AC Distribution Board	Emergency Lighting distribution board	1-3½C X 70 mm^2	PVC
9.	AC Distribution Board	ICT MB	1-3½C X 70 mm^2	PVC
10.	AC Distribution Board	Bay MB	1-3½C X 70 mm^2	PVC
11.	Bay MB	AC Kiosk	1- 3 ½ x 35 mm^2	PVC
12.	AC Distribution Board	Battery Charger	1-3½C X 70 mm^2	PVC
13.	DCDB	Battery	2-1C X 150 mm^2	PVC
14.	DCDB	Battery Charger	2-1C X 150 mm^2	PVC
15.	DCDB	Protection/PLCC panel	1-4C X 16 mm^2	PVC
16.	Main Lighting DB	Lighting panels(Indoor)	1-3½C X 35 mm^2	PVC
17.	Main Lighting DB	Lighting panels (outdoor)	1-3½C X 70 mm^2	PVC
18.	Main Lighting DB	Receptacles (Indoor)	1-3½C X 35 mm^2	PVC
19.	Main Lighting DB	Receptacles (Outdoor)	1-3½C X 70 mm^2	PVC
20.	Lighting Panel	Sub lighting panels	1-4C X 16 mm^2	PVC
21.	Lighting Panel	Street Lighting Poles	1-4C X 16 mm^2	PVC
22.	Lighting Panel/ Sub lighting panels	Lighting Fixtures (Outdoor)	1-2C X 6 mm^2	PVC
23.	Bay MB	Equipments	1-4C X 16 mm^2 /1-4C X 6 mm^2 /1-2C X 6 mm^2	PVC

1.1.5 Bidder may offer sizes other than the sizes specified in clause 1.1.4. In such case and for other application where sizes of cables have not been indicated in the specification, sizing of power cables shall be done keeping in view continuous current ***(including future bays/load requirement)***, voltage drop & short-circuit consideration of the system. Relevant calculations shall be submitted by bidder during detailed engineering for purchaser's approval. ***The entire power and control cables & special cables (if any) required shall be executed by contractor for completion of present scope of work.***

1.1.6 Cables shall be laid conforming to IS : 1255.

1.1.7 While preparing cable schedules for control/protection purpose, following shall be ensured:

1.1.7.1 Separate cables shall be used for AC & DC.

1.1.7.2 Separate cables shall be used for DC1 & DC2.

1.1.8 For different cores of CT & CVT separate cable shall be used

1.1.9 At least one (1) cores shall be kept as spare in each copper control cable of 4C, 5C or 7C size whereas minimum no. of spare cores shall be two (2) for control cables of 10 core or higher size.

1.1.10 For control cabling, including CT/VT circuits, 2.5 sq.mm. size copper cables shall be used per connection. However, if required from voltage drop/VA burden consideration, additional cores shall be used. Further for potential circuits of energy meters, separate connections by 2 cores of 2.5 sq.mm. size shall be provided.

1.1.11 Standard technical data sheets for cable sizes up to and including 1100V are enclosed at Annexure. Cable sizes shall be offered/manufactured in accordance with parameters specified in standard technical data sheets. Technical data sheet for any other cores/sizes required during detailed engineering shall be separately offered for owner's approval by the contractor/supplier. ***Submission of standard technical data sheets for these cable sizes are not required for approval. Contractor/supplier shall intimate name of proposed approved cable manufacturer along with cable sizes, its quantity required during detailed engineering for purchaser's information and acceptance.***

1.2. TECHNICAL REQUIREMENTS

1.2.1. General

1.2.1.1. The cables shall be suitable for laying in racks, ducts, trenches, conduits and underground buried installation with uncontrolled back fill and chances of flooding by water.

1.2.1.2. They shall be designed to withstand all mechanical, electrical and thermal stresses under steady state and transient operating conditions. The XLPE /PVC insulated L.T. power cables of sizes 240 sq. mm. and above shall withstand without damage a 3 phase fault current of at least 45 kA for at least 0.12 second, with an initial peak of 105 kA in one of the phases at rated conductor temperature (70 degC for PVC insulated cables and 90 degC for XLPE insulated cables). The armour for these power cables shall be capable of carrying 45 kA for at least 0.12 seconds without exceeding the maximum allowable temperature of PVC outer sheath.

1.2.1.3. The XLPE insulated cables shall be capable of withstanding a conductor temperature of 250°C during a short circuit without any damage. The PVC insulated cables shall be capable of withstanding a conductor temperature of 160°C during a short circuit.

1.2.1.4. The Aluminium/Copper wires used for manufacturing the cables shall be true circular in shape before stranding and shall be uniformly good quality, free from defects. All Aluminium used in the cables for conductors shall be of H2 grade. In case of single core cables armours shall be of H4 grade Aluminium.

1.2.1.5. The fillers and inner sheath 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.

1.2.1.6. Progressive sequential marking of the length of cable in metres at every one metre shall be provided on the outer sheath of all cables.

1.2.1.7. Strip wire armouring method (a) mentioned in Table 5, Page-6 of IS : 1554 (Part 1) – 1988 shall not be accepted for any of the cables. For control cables only round wire armouring shall be used.

1.2.1.8. The cables shall have outer sheath of a material with an oxygen index of not less than 29 and a temperature index of not less than 250°C.

1.2.1.9. All the cables shall pass fire resistance test as per IS:1554 (Part-I)

1.2.1.10. The normal current rating of all PVC insulated cables shall be as per IS:3961.

1.2.1.11. Repaired cables shall not be accepted.

1.2.1.12. Allowable tolerance on the overall diameter of the cables shall be plus or minus 2 mm.

1.2.2. ~~**XLPE Power Cables**~~

~~1.2.2.1. The XLPE (90°C) insulated cables shall be of FR type, C1 category conforming to IS:7098 (Part-I) and its amendments read alongwith this specification. The conductor shall be stranded aluminium circular/sector shaped and compacted. In multicore cables, the core shall be identified by red, yellow, blue and black coloured strips or colouring of insulation. A distinct inner sheath shall be provided in all multicore cables. For XLPE cables, the inner sheath shall be of extruded PVC of type ST-2 of IS:5831. ***All cables shall be of armoured type***. For single core cables, the ***armouring*** shall consist of aluminium wires/strips. The outer sheath shall be extruded PVC of Type ST-2 of IS:5831 for all XLPE cables.~~

1.2.3. **PVC Power Cables**

1.2.3.1. The PVC (70°C) insulated power cables shall be of FR type, C1 category, conforming to IS: 1554 (Part-I) and its amendments read alongwith this specification and shall be suitable for a steady conductor temperature of 70°C. The conductor shall be stranded aluminium. The Insulation shall be extruded PVC to type-A of IS: 5831. A distinct inner sheath shall be provided in all multicore cables. ***All cables shall be of armoured type.*** For multicore armoured cables, the inner sheath shall be of extruded PVC. The outer sheath shall be extruded PVC to Type ST-1 of IS: 5831 for all cables.

1.2.4. **PVC Control Cables**

1.2.4.1. The PVC (70°C) insulated control cables shall be of FR type C1 category conforming to IS: 1554 (Part-1) and its amendments, read alongwith this specification. The conductor shall be stranded copper. The insulation shall be extruded PVC to type A of IS: 5831. A distinct inner sheath shall be provided in all cables. ***All cables shall be of armoured type.*** The over sheath shall be extruded PVC to type ST-1 of IS: 5831 and shall be grey in colour.

1.2.4.2. Cores shall be identified as per IS: 1554 (Part-1) for the cables up to five (5) cores and for cables with more than five (5) cores the identification of

cores shall be done by printing legible Hindu Arabic Numerals on all cores as per clause 10.3 of IS 1554 (Part-1).

2. ~~*HV POWER CABLES[FOR WORKING VOLTAGES FROM 3.3 kV AND INCLUDING 33 kV]*~~

2.1. ~~*HV* POWER CABLE FOR AUXILIARY POWER SUPPLY~~

(a) ~~The HV cable of 1Cx185 mm^2 (Aluminium Conductor) or 1Cx120mm^2 (Copper Conductor) of voltage class as specified for 630 kVA *and 800 kVA* LT transformer for interconnecting 630kVA *and 800 kVA* LT transformer to the SEB feeder shall be, XLPE insulated, armoured cable conforming to IS 7098 (Part-II) or IEC 60502-2 1998. Terminating accessories shall conform to IS 17573-1992 or IEC 61442-1997/IEC60502-4 1998.~~

(b) ~~The HV cable of 3Cx95 mm^2 (Aluminium Conductor) or 3Cx70mm^2 (Copper Conductor) of voltage class as specified for 250kVA LT transformer for interconnecting 250kVA LT transformer to the SEB feeder shall be, XLPE insulated, armoured cable conforming to IS 7098 (Part-II) or IEC 60502-2 1998. Terminating accessories shall conform to IS 17573-1992 or IEC 61442-1997/IEC60502-4 1998.~~

2.2. ~~Only overhead connection has been foreseen for interconnecting *630 kVA and* 800 kVA, LT transformer to the tertiary of the ICT. However, HV cable connections in place of overhead connection, if necessary shall also be in the scope of contractor. In this case contractor shall provide 1C x 185 mm^2 (Aluminium Conductor) or 1Cx120mm^2 (Copper Conductor), 38/66kV HV cable along with necessary terminating accessories. The construction of XLPE insulated, armoured HV cable shall be generally conforming to IS 7098 (Part-III). Terminating accessories shall conform to IEC60840 1999.~~

2.3. ~~Bidder may offer sizes other than the sizes specified in clause 2.1 and 2.2. In such case sizing of power cables shall be done keeping in view continuous current, voltage drop & short-circuit consideration of the system. Relevant calculations shall be submitted by bidder during detailed engineering for purchaser's approval.~~

2.4. ~~Constructional Requirements~~

~~Cable shall have compacted circular Aluminium conductor, Conductor screened with extruded semi conducting compound , XLPE insulated, insulation screened with extruded semi conducting compound, *distinct extruded PVC inner sheath (Type ST-2) with FR properties*, armoured~~

with non-magnetic material ***for single core cables and galvanized steel wire/strip for multicore cables*** , followed by extruded PVC outer sheath(Type ST-2), with FR properties . ***The armour shall be capable of withstanding rated short time current of conductor.***

2.5 Progressive sequential marking of the length of cable in metres at every one metre shall be provided on the outer sheath of the cable.

2.6 The cables shall have outer sheath of a material with an Oxygen Index of not less than 29 and a Temperature index of not less than 250°C.

2.7 Allowable tolerance on the overall diameter of the cables shall be plus or minus 2 mm.

3. EHV XLPE POWER CABLE [FOR WORKING VOLTAGES FROM 66 kV UP TO AND INCLUDING 500 kV]

3.1 TECHNICAL REQUIREMENTS

The XLPE insulated, EHV cable shall conform to the requirements of IEC 60502-2 (applicable clauses only) for construction and IEC 60840/ IEC62067 (as applicable) for testing. The terminating accessories shall conform to IEC 60840 / IEC62067 (as applicable).

3.2 The cable shall be of specified EHV grade, single core, unarmoured, stranded compacted Copper conductor, core screening by a layer of semiconducting tape followed by a layer of semiconducting compound, cross linked polyethylene (XLPE) dry cured insulation, insulation screening with semiconducting compound extruded directly over the insulation, longitudinal sealing by a layer of non woven tape with water swellable absorbent over insulation screen, followed by radial sealing (Metal sheath of Lead alloy 'E'), metallic screening by concentric layer of plain copper wire followed by an open helix of copper & overall ***HDPE*** sheathed & graphite coated and conforming to the technical particulars of specification.

3.3 The construction of cable shall generally conform to the description mentioned in above mentioned clause of the specification. Bidder may offer necessary layers such as separation tape, binder tapes etc additionally as per their manufacturing practices for meeting required performance of the offered cable. The bidder shall enclose with the bid, drawing showing cross section of the cable. The conductors screen (non-metallic semi-conductive) shall be extruded in a single one-time process to ensure homogeneity and absence of voids.

3.4 ~~The conductors screen (non-metallic semi-conductive) shall be extruded in a single one-time process to ensure homogeneity and absence of voids.~~

3.5 ~~They shall be designed to withstand all mechanical, electrical and thermal stresses under steady state and transient operating conditions.~~

3.6 ~~Progressive sequential marking of the length of cable in metres at every one metre shall be provided on the outer sheath of the cable.~~

3.7 ~~The cables shall have outer sheath of a~~ ***HDPE*** ~~material.~~

3.8 ~~Repaired cables shall not be accepted.~~

3.9 ~~Allowable tolerance on the overall diameter of the cables shall be plus or minus 2 mm~~.

4 CABLE DRUMS

4.1 Cables shall be supplied in returnable wooden or steel drums of heavy construction. Wooden drum shall be properly seasoned sound and free from defects. Wood preservative shall be applied to the entire drum. ***Drums offered shall conform to relevant standards. Drum drawings are not required to be submitted for approval.***

4.2 Standard lengths for each size of power and control cables shall be 500/1000 meters. The cable length per drum shall be subject to a tolerance of plus or minus 5% of the standard drum length. The owner shall have the option of rejecting cable drums with shorter lengths. Maximum, One (1) number non standard length of cable size(s) may be supplied in drums for completion of project.

4.3 A layer of water proof paper shall be applied to the surface of the drums and over the outer most cable layer.

4.4 A clear space of at least 40 mm shall be left between the cables and the lagging.

4.5 Each drum shall carry the manufacturer's name, the purchaser's name, address and contract number and type, size and length of the cable, net and gross weight stencilled on both sides of drum. A tag containing the same information shall be attached to the leading end of the cable. An arrow and suitable accompanying wording shall be marked on one end of the reel indicating the direction in which it should be rolled.

4.6 Packing shall be sturdy and adequate to protect the cables, from any injury due to mishandling or other conditions encountered during transportation, handling and storage. Both cable ends shall be sealed with PVC/Rubber caps so as to eliminate ingress of water during transportation and erection.

5 TYPE TESTS

5.1 All cables shall conform to all type, routine and acceptance tests listed in the relevant IS.

~~5.2~~ ~~***XLPE INSULATED POWER CABLES (For working voltages up to and including 1100V):-***~~

~~5.2.1~~ ~~Following type tests (on one size in a contract) as per IS: 7098 (Part 1) – 1988 including its amendments shall be carried out as a part of acceptance tests on XLPE insulated power cables for working voltages up to and including 1100 V:~~

~~a) Physical tests for insulation~~
- ~~i) Hot set test~~
- ~~ii) Shrinkage test~~

~~b) Physical tests for outer sheath~~
- ~~i) Shrinkage test~~
- ~~ii) Hot deformation~~
- ~~iii) Heat shock test~~
- ~~iv) Thermal stability~~

~~5.2.2~~ ~~Contractor shall submit type test reports as per clause no. 9.2 of Technical Specification, Section: GTR for the following tests-~~

-

- ~~a) Water absorption (gravimetric) test.~~
- ~~b) Ageing in air oven~~
- ~~c) Loss of mass in air oven~~
- ~~d) Short time current test on power cables of sizes 240 sqmm and above on~~
  - ~~i) Conductors.~~
  - ~~ii) Armours.~~
- ~~e) Test for armouring wires/strips.~~
- ~~f) Oxygen and Temperature Index test.~~
- ~~g) Flammability test.~~

5.3 ***PVC INSULATED POWER & CONTROL CABLES (For working voltages up to and including 1100V)-***

5.3.1 Following type tests (on one size in a contract) as per IS: 1554 (Part 1) - 1988 including its amendments shall be carried out as a part of acceptance tests on PVC insulated power & control cables for working voltages up to and including 1100 V:

a) Physical tests for insulation and outer sheath
   i) Shrinkage test
   ii) Hot deformation
   iii) Heat shock test
   iv) Thermal stability
b) High voltage test (water immersion test only a.c. test as per clause no. 16.3.1).

5.3.2 Contractor shall submit type test reports as per clause no. 9.2 of Technical Specification, Section: GTR for the following-

a) High voltage test (water immersion d.c. test as per clause no. 16.3.2 of IS: 1554 (Part 1) - 1988).
b) Ageing in air oven.
c) Loss of mass in air oven.
d) Short time current test on power cables of sizes 240 sqmm and above on
   i) Conductors.
   ii) Armours.
e) Test for armouring wires/strips.
f) Oxygen and Temperature Index test.
g) Flammability test.

~~5.4~~ ~~***XLPE INSULATED HV POWER CABLES(For working voltages from 3.3 kV and including 33 kV)***~~

~~5.4.1~~ ~~Contractor shall submit type test reports as per clause no. 9.2 of Technical Specification, Section: GTR for XLPE insulated HV power cables (as per IS 7098 Part-II including its amendment or as per IEC).~~

~~5.5~~ ~~***XLPE INSULATED EHV POWER CABLES (For working voltages from 66kV up to and including 500 kV)***~~

~~5.5.1~~ ~~Contractor shall submit type test reports as per clause no. 9.2 of Technical Specification, Section: GTR for XLPE insulated EHV cables (as per IEC60840 for cables up to 150 kV & IEC 62067 for cables above 150 kV).~~

5.6 TERMINATING & JOINTING ACCESSORIES-

5.6.1 Contractor shall submit type test reports as per clause no. 9.2 of Technical Specification, Section: GTR for Terminating/jointing accessories as per IS 17573:1992/ IEC 60840:1999/ IEC62067.

SECTION-3

PROJECT DETAILS & GENERAL SPECIFICATION

SITE INFORMATION

	Particular	Details
a)	Customer	**Power Grid Corporation of India Limited**
b)	Project Title	Extension of I) 400kV Biharshariff S/s, II) 400kV Jamshedpur S/s, III) 400 kV Gazuwaka S/s, IV) 400 kV Rengali S/s, V) 400 kV Rourkela S/s, VI) 400 kV Durgapur S/s & VII) 400 kV Gorakhpur S/s Extension package under ERSS-IX
c)	Location	Biharshariff (Bihar) Jamshedpur (Jharkhand) Gazuwaka (Andhra Pradesh) Rengali/ Rourkela (Orissa) Durgapur (West Bengal) Gorakhpur (Uttar Pradesh)
d)	Transport Facilities	Nearest Rail Head Biharshariff (Biharshariff), Jamshedpur (Jamshedpur), Gazuwaka (Vizag), Rengali (Talcher Road), Rourkela (Rourkela), Durgapur (Durgapur) & Gorakhpur (Gorakhpur)
SITE CONDITIONS		
a)	Altitude above sea level	Less than 1000m
b)	Ambient air temp. (Max)	50°C
c)	Average Humidity	Shall be informed during detailed engg.
d)	Special corrosion conditions	-do-
e)	Solar Radiation	-do-
f)	Atmospheric UV radiation	-do-
g)	Seismic Acceleration	0.3g horizontal
h)	Pollution Severity	High Pollution level (25mm/kV)
WIND DATA		
a)	Wind velocity	As per IS
b)	Average No. of thunderstorm days per annum	As per IS

1.0 GENERAL

This Chapter covers Technical Requirements and requirements of auxiliary items.

a) 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 unless included in the list of exclusions.

b) Material and components not specifically stated in this specification but which are necessary for satisfactory operation of the equipment and accessories specified in this specification shall be deemed to be included unless specifically excluded and shall be supplied at no extra cost.

c) Whenever a material or article is specified or described by the name of a particular brand, manufacturer or vendor, the specific name mentioned shall be understood as establishing type, function and quality and not as limiting competition.

d) In case any Deviation Schedule, Bid Proposal Sheet, Schedule of Data Requirements (DRS), test reports or any other document/information are not furnished along-with the bid, the bid is liable to be rejected. Unless brought out clearly, the Bid will be deemed to conform to the specification scrupulously. All deviations from the specification shall be clearly brought out in the respective deviation schedule.

e) Auxiliary supplies as described below would be available at site.

Normal Voltage	Variation in Voltage	Frequency in HZ	Phase/Wire	Neutral connection
415V	± 10%	50 ± 5%	3/4 Wire	Solidly Earthed.
240V	± 10%	50 ± 5%	1/2 Wire	Solidly Earthed.
220V	190V to 240V	DC	-	Isolated 2 wire System
110V	95V to 120V	DC	-	Isolated 2 wire System
48V	–	DC	–	2 wire system (+) earthed

NOTE: Combined variation of frequency and voltage shall be limited to ±10 %.

f) The Bidder shall clearly indicate in the bid, the specific standards in accordance with which the works will be carried out.

g) The equipment must be new, of highest grade, the best quality of their kind, to best engineering practice and latest state of art, and in accordance with purpose for which they are intended and ensure satisfactory performance throughout the service life.

h) All similar parts of the equipment shall be made to gauge and shall be interchangeable with and shall be made of same materials and workmanship as the corresponding parts of the equipment. Where feasible, common components, units shall be employed in different pieces of equipment in order to optimize the spare part stock-up and utilization.

i) The requirement regarding external RIV as specified for equipment shall include the terminal fittings and the equipment shall have been tested preferably with fittings, if any.

j) All drawings, schedules, annexures appended to this specification shall form part of the specification.

2.0 SERVICES TO BE PERFORMED BY THE EQUIPMENT BEING FURNISHED

a) The equipment furnished under this specification shall perform all its functions and operate satisfactorily without showing undue strain, restrike etc.

b) The equipment shall be able to withstand forces due to wind load, short circuit, system over voltages, fluctuations, frequency variations etc., all forces considered together.

3.0 SUPPORT STRUCTURES

a) The support structures should be hot dip galvanised with minimum 610 gram/m^2 net of zinc.

b) The design calculations taking into account the environmental conditions of the substations shall be furnished for sizing of the structures.

4.0 STANDARDS

a) The equipment to be furnished under this specification shall conform to latest issue with all amendments of standard specified under respective Chapters of this Specification. The Bidder shall note that standards mentioned in the specification are not mutually exclusive or complete in themselves, but intended to compliment each other. The Contractor shall also note that list of standards presented in this specification is not complete. Whenever necessary the list of standards

shall be considered in conjunction with specific IS/IEC. When the specific requirements stipulated in the specifications exceed or differ than those required by the applicable standards, the stipulation of the specification shall take precedence.

b) Other internationally accepted standards which ensure equivalent or better performance than that specified in the standards referred shall also be accepted.

c) In case governing standards for the equipment is different from IS or IEC, the salient points of difference shall be clearly brought out in additional information schedule alongwith English language version of standard or relevant extract of the same. The equipment conforming to standards other than IS/IEC shall be subject to Employer's approval.

5.0 ENGINEERING DATA AND DRAWINGS

5.1 The list of drawings/documents which are to be submitted to the Purchaser shall be discussed and finalised by the Purchaser at the time of award. The Contractor shall necessarily submit all the drawings/ documents unless anything is waived.

5.2 The Contractor shall submit 4 (four) sets of drawings/ design documents/ data / detailed bill of quantity and 1 (one) set of test reports for the approval of the Purchaser. The contractor shall also submit the softcopy of the above documents in addition to hardcopy.

5.3 **Drawings**

5.3.1 All drawings submitted by the Contractor 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, dimensions, internal & the external connections, fixing arrangement required and any other information specifically requested in the specifications.

5.3.2 Drawings submitted by the Contractor shall be clearly marked with the name of the Purchaser, the unit designation, the specifications title, the specification number and the name of the Project. POWERGRID has standardized a large number of drawings/documents of various make including type test reports which can be used for all projects having similar requirements and in such cases no project specific approval (except for list of applicable drawings alongwith type test reports) is required. However, distribution copies of standard drawings/documents shall be submitted as per provision of the contract. All titles, noting, markings and writings on the drawing shall be in English. All the dimensions should be in SI units.

5.3.3 The review of these data by the Purchaser will cover only general

conformance of the data to the specifications and documents, interfaces with the equipment provided under the specifications, external connections and of the dimensions which might affect substation layout. This review by the Purchaser may not indicate a thorough review of all dimensions, quantities and details of the equipment, materials, any devices or items indicated or the accuracy of the information submitted. This review and/or approval by the Purchaser shall not be considered by the Contractor, as limiting any of his responsibilities and liabilities for mistakes and deviations from the requirements, specified under these specifications and documents.

5.4 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.

5.5 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 works performed under these specifications shall be performed in strict conformity, unless otherwise expressly requested by the Purchaser in Writing.

5.6 **Approval Procedure**

The scheduled dates for the submission of the drawings as well as for, any data/information to be furnished by the Purchaser would be discussed and finalised at the time of award. The following schedule shall be followed generally for approval and for providing final documentation.

i)	Approval/comments/ by Purchaser on initial submission	As per agreed schedule
ii)	Resubmission (whenever required)	Within 3 (three) weeks from date of comments
iii)	Approval or comments	Within 3 (three) weeks of receipt of resubmission.
iv)	Furnishing of distribution copies (5 hard copies per substation and one scanned copy (pdf format) for Corporate Centre)	2 weeks from the date of approval
v)	Furnishing of distribution copies of test reports	
	(a) Type test reports (one scanned softcopy in	2 weeks from the date of final approval

	pdf format per substation plus one for corporate centre & one hardcopy per substation)	
	(b) Routine Test Reports (one copy for each substation)	-do-
vi)	Furnishing of instruction/ operation manuals (2 copies per substation and one softcopy (pdf format) for corporate centre & per substation)	As per agreed schedule
(vii)	As built drawings (two sets of hardcopy per substation & one softcopy (pdf format) for corporate centre& per substation)	On completion of entire works

NOTE :

(1) The contractor may please note that all resubmissions must incorporate all comments given in the earlier submission by the Purchaser or adequate justification for not incorporating the same must be submitted failing which the submission of documents is likely to be returned.

(2) All drawings should be submitted in softcopy form, however substation design drawings like SLD, GA, all layouts etc. shall also be submitted in AutoCAD Version. SLD, GA & layout drawings shall be submitted for the entire substation in case of substation extension also.

(3) The instruction Manuals shall contain full details of drawings of all equipment being supplied under this contract, their exploded diagrams with complete instructions for storage, handling, erection, commissioning, testing, operation, trouble shooting, servicing and overhauling procedures.

(4) If after the commissioning and initial operation of the substation, the instruction manuals require any modifications/ additions/changes, the same shall be incorporated and the updated final instruction manuals shall be submitted by the Contractor to the Purchaser.

(5) The Contractor shall furnish to the Purchaser catalogues of spare parts.

(6) All As-built drawings/documents shall be certified by site indicating the changes before final submission.

6.0 DESIGN IMPROVEMENTS

6.1 The Employer or the Contractor may propose changes in the specification of the equipment or quality thereof and if the parties agree upon any such changes, the specification shall be modified accordingly.

6.2 The Bidder should however note that changes proposed by him will have to be supported with applicable type test reports.

6.3 If any such agreed change is such that it affects the price and schedule of completion, the parties shall agree in writing as to the extent of any change in the price and/or schedule of completion before the Contractor proceeds with

the change. Following such agreement, the provision thereof, shall be deemed to have been amended accordingly.

7.0 QUALITY ASSURANCE PROGRAMME

7.1 To ensure that the equipment and services under the scope of this 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 programme to control such activities at all points necessary. Such programme shall be outlined by the Contractor and shall be finally accepted by the Employer after discussions before the award of Contract. A quality assurance programme of the contractor shall generally cover the following :

a) The organisation structure for the management and implementation of the proposed quality assurance programme.

b) System for Document and Data Control.

c) Qualification and Experience data of Bidder's key personnel.

d) The procedure for purchases of materials, parts components and selection of sub-contractor's services including vendor analysis, source inspection, incoming raw material inspection, verification of material purchases etc.

e) System for shop manufacturing and site erection controls including process controls and fabrication and assembly control.

f) System for Control of non-conforming products including Deviation Dispositioning, if any and system for corrective and preventive actions based on the feed back received from the Customers and also internally documented system for Customer complaints.

g) Inspection and test procedure both for manufacture and field activities.

h) System for Control of calibration of testing and measuring equipment and the indication of calibration status on the instruments.

i) System for indication and appraisal of inspection status.

j) System of Internal Quality Audits and Management review and initiation of corrective and Preventive actions based on the above.

k) System for authorising release of manufactured product to the Employer.

l) System for maintenance of records.

m) System for handling storage and delivery.

n) A quality plan detailing out the specific quality control measures and procedure adopted for controlling the quality characteristics relevant to each item of equipment furnished and /or service rendered.

o) System for various field activities i.e. unloading, receipt at site, proper storage, erection, testing and commissioning of various equipment and maintenance of records". In this regard, the Employer has already prepared Standard Field Quality Plan for transmission line/substation equipments as applicable, Civil/erection works which is required to be followed for associated works.

The Employer or his duly authorised representative reserves the right to carry out quality audit and quality surveillance of the system and procedure of the bidder/his vendor's quality management and control activities.

7.2 **Quality Assurance Documents**

The Contractor shall be required to submit the following Quality Assurance Documents.

i) All Non-Destructive Examination procedures, stress relief and weld repair procedure actually used during fabrication, and reports including radiography interpretation reports.

ii) Welder and welding operator qualification certificates.

iii) Welder's identification list, welding operator's qualification procedure and welding identification symbols.

iv) Raw Material test reports on components as specified by the specification and in the quality plan.

v) The manufacturing Quality Plan indicating Customer Inspection Points (CIPs) at various stages of manufacturing and methods used to verify that the inspection and testing points in the quality plan were performed satisfactorily.

vi) Factory test results for testing required as per applicable quality plan/technical specifications/GTP/Drawings etc as applicable.

viii) Stress relief time temperature charts/oil impregnation time temperature charts, wherever applicable.

8.0 INSPECTION, TESTING & INSPECTION CERTIFICATE

8.1 The Employer, his duly authorised representative and/or outside inspection agency acting on behalf of the Employer shall have at all reasonable times access to the Contractor's premises or Works and shall have the power 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 at other premises or works, the Contractor shall obtain for the Employer 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. The equipment if found unsatisfactory as to workmanship or material is liable to be rejected.

8.2 The Employer reserves the right to witness any or all type, acceptance and routine tests specified for which at least 30 days notice in advance shall be given by the Contractor. Contractor shall ensure before giving notice for type test that all drawings and quality plans have been got approved. The equipment shall be dispatched to site only after approval of Routine and Acceptance test results and Issuance of Dispatch Clearance in writing by the Employer.

8.3 The Contractor shall give the Employer/Inspector Twenty one (21) days written notice of any material being ready for testing far each stage of testing as identified in the approved quality plan as customer inspection point. Such tests shall be to the Contractor's account except for the expenses of the Inspector. The Employer/inspector, unless witnessing of the tests is waived, will attend such tests within Twenty one (21) days of the date of which the equipment is notified as being ready for test/inspection, failing which the Contractor may proceed with the test which shall be deemed to have been made in the Inspector's presence and he shall forthwith forward to the Inspector six copies of tests, duly certified.

8.4 The Employer or Inspector shall, within Twenty (21) days from the date of inspection as defined herein give notice in writing to the Contractor, of any objection to any drawings and all or any equipment and workmanship which in his opinion is not in accordance with the Contract. The Contractor shall give due consideration to such objections and shall either make the modifications that may be necessary to meet the said objections or shall confirm in writing to the Employer/Inspector giving reasons therein, that no modifications are necessary to comply with the Contract.

8.5 When the factory tests have been completed at the Contractor's or Sub-Contractor's works, the Employer/Inspector shall issue a certificate to this effect within fifteen (15) days after completion of tests but if the tests are not witnessed by the Ernployer/Inspector, the certificate shall be issued within fifteen (15) days of receipt of the Contractor's Test certificate by the Employer/Inspector. Failure of the Employer/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 certificate shall not bind the

Employer to accept the equipment should, it, on further tests after erection, be found not to comply with the Contract.

8.6 In all cases where the Contract provides for tests whether at the premises or works of the Contractor or of any Sub- Contractor, the Contractor except where otherwise specified shall provide free of charge such items as labour, materials, electricity, fuel, water, stores, apparatus and instruments as may be reasonably demanded by the Employer/Inspector or his authorised representative to carry out effectively such tests of the equipment in accordance with the Contract and shall give facilities to the Employer/Inspector or to his authorised representative to accomplish testing.

8.7 The inspection and acceptance by Employer 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, or if such equipment is found to be defective at a later stage.

8.8 Material Inspection clearance certificate (MICC) shall be issued by the Employer after inspection of the equipment. Employer may waive off the presence of Employer's inspecting engineer. In that case test will be carried out as per approved QP and test certificate will be furnished by the supplier for approval. MICC will be issued only after review and approval of the test reports.

8.9 The Employer will have the right of having at his own expenses any other test(s) of reasonable nature carried out at Contractor's premises or at site or in any other place in addition of aforesaid type and routine tests, to satisfy that the material comply with the specification.

8.10 The Employer reserves the right for getting any field tests conducted on the completely assembled equipment at site.

9.0 ENGINEER'S SUPERVISION

a) To eliminate delays and avoid disputes and litigation it is agreed between the parties to the Contract that all matters and questions shall be referred to the Engineer and without prejudice to the provision of Section GCC, the contractor shall proceed to comply with the Engineer's decision.

b) The work shall be performed under the direction and supervision of the Engineer. The scope of the duties of the Engineer, pursuant to the contract, will include but not be limited to the following :

i) Interpretation of all the terms and conditions of these documents and specifications ;

ii) Review and interpretation of all the Contractor's drawings, engineering data etc. ;

iii) Witness or authorise his representative to witness tests and trial either at the manufacturer's works or at site, or at any place where work is performed under the Contract ;

iv) Inspect, accept or reject any equipment, material and work under the Contract ;

v) Issue certificate of acceptance and/or progressive payment and final payment certificates ;

vi) Review and suggest modifications and improvements in completion schedules from time to time ; and

vii) Supervise the quality Assurance programme implementation at all stages of the Works.

10.0 TESTS

10.1 Pre-commissioning Tests

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

10.2 Commissioning Tests

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

b) Any special equipment, tools and tackles required for the successful completion of the Commissioning Tests shall be provided by the Contractor, free of cost.

c) The specific tests to be conducted on equipment have been brought out in the respective sections of the technical specification.

10.3 Test Codes

The provisions outlines in the IS & IEC codes or other international and Indian approved equivalents shall generally be used as a guide for all the above test procedures unless otherwise specified in the Technical Specifications.

11.0 HANDLING, STORING AND INSTALLATION

a) In accordance with the specific installation instructions as shown on manufacturer's drawings or as directed by the Employer or his representative, the Contractor shall unload, store, erect, install, wire, test and place into commercial use all the electrical equipment included in the contract. Equipment shall be installed in a neat, workmanlike manner so that it is level, plumb, square and properly aligned and oriented. Commercial use of switchyard equipment means completion of all site tests specified and energisation at rated voltage.

b) Contractor may engage manufacturer's Engineers to supervise the unloading, transportation to site, storing, testing and commissioning of the various equipment being procured by them separately. Contractor shall unload, transport, store, erect, test and commission the equipment as per instructions of the manufacturer's supervisory Engineer(s) and shall extend full cooperation to them.

c) In case of any doubt/misunderstanding as to the correct interpretation of manufacturer's drawings or instructions, necessary clarifications shall be obtained from the Employer. Contractor shall be held responsible for any damage to the equipment consequent to not following manufacturer's drawings/instructions correctly.

d) Where assemblies are supplied in more than one section, Contractor shall make all necessary mechanical and electrical connections between sections including the connection between buses. Contractor shall also do necessary adjustments/alignments necessary for proper operation of circuit breakers, isolators and their operating mechanisms. All components shall be protected against damage during unloading, transportation, storage, installation, testing and commissioning. Any equipment damaged due to negligence or carelessness or otherwise shall be replaced by the Contractor at his own expense.

e) The Contractor shall be fully responsible for the equipment/material until the same is handed over to the Employer in an operating condition after commissioning. Con tractor shall be responsible for the maintenance of the equipment/material while in storage as well as after erection until taken over by Employer, as well as protection of the same against theft, element of nature, corrosion, damages etc.

f) Where material/equipment is unloaded by Employer before the Contractor arrives at site or even when he is at site, Employer by right

can hand over the same to Contractor and there upon it will be the responsibility of Contractor to store the material in an orderly and proper manner.

g) Contractor shall be responsible for the proper storage and maintenance of all materials/equipment entrusted to him. He shall take all required steps to carry out frequent inspection of material/equipment stored as well as erected until the same is taken over by the Employer.

h) The words 'erection' and 'installation' used in the specification are synonymous.

i) Exposed live parts shall be placed high enough above ground to meet the requirements of electrical and other statutory safety codes.

j) Clearances and spacings shall be provided as per relevant IS.

Bidder shall confirm in their technical offer that all clearances and spacing as stated above will invariably be provided. Even though phase to earth clearance under normal conditions will be as above at certain points where there can be bird faults (i.e. a bird sitting on the earthed metal part coming in contact with the HT terminal) adequate clearance as required shall be provided between the HT terminal and nearest grounded metal part.

12.0 TAKING OVER

Upon successful completion of all the tests to be performed at Site on equipment furnished and erected by the Contractor, the Engineer shall issue to the contractor a taking over certificate as a proof of the final acceptance of the equipment. such certificate shall not unreasonably be withheld nor will the Engineer delay the issuance thereof on account of minor omissions or defects which do not affect the commercial operation and/or cause any serious risk to the equipment. Such certificate shall not relieve the Contractor of any of his obligations which otherwise survive, by the terms and conditions of the Contract after issuance of such certificate.

13.0 PROTECTION

All coated surfaces shall be protected against abrasion, impact, discoloration and any other damages. All exposed threaded portions shall be suitably protected with protecting device. All ends of equipment connections shall be properly sealed with suitable devices to protect them from damage. The parts which are likely to get rusted, due to exposure to weather should also be properly treated and protected in a suitable manner.

14.0 PRESERVATIVE SHOP COATING

14.1 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 beforehand be treated and protected for the life of the equipment. All surfaces shall be thoroughly cleaned of all mill scale, oxide 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 resistance enamel. The finished colours shall be selected and specified by the Employer at a later date.

14.2 Shop primer for all steel surfaces which will be exposed to operating temperature below 95 deg.C. 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 temperatures higher than 95 deg.C. and such primers shall also be subject to the approval of the Employer.

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

15.0 PROTECTIVE GUARDS

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

16.0 DESIGN CO-ORDINATION

The Contractor shall be responsible for the selection and design of appropriate equipment to provide the best coordinated performance of the entire system. The basic design requirements are detailed out in this Technical Specification. The design of various components, sub-assemblies and assemblies shall be so done so that it facilitates easy field assembly and maintenance. All the rotating components shall be so selected that the natural frequency of the complete unit is not critical at or close to the operating range of the unit.

17.0 DESIGN CO-ORDINATION MEETING

The Contractor will be called upon to attend design co-ordination meetings with the Employer, other Contractor's and the Consultants of the Employer during the period of Contract. The Contractor shall attend such meetings at his own cost at New Delhi or at mutually agreed venue as and when required

and fully cooperate with such persons and agencies involved during those discussions.

18.0 BUS POST INSULATORS

The post insulators shall conform in general to latest IS:2544, IEC-168 and IEC-815.

CONSTRUCTIONAL FEATURES

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

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

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

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

18.5 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 insulators by the formation of substance produced by chemical action.

18.6 The design of the insulators shall be such that stresses due to expansion and contraction in any part of the insulator shall not lead to deterioration.

18.7 All ferrous parts shall be hot dip galvanised in accordance with the latest edition of IS:2633 and IS :4579. The zinc used for galvanising shall be grade Zn 99.95 as per IS:209. The zinc coating shall be uniform, adherent, smooth, reasonably bright, continuous and free from imperfections such as flux, ash, rust stains, bulky white deposits and blisters. The metal parts shall not produce any noise generating corona under the operating conditions.

18.8 If corona extinction voltage is to be achieved with the help of corona ring or any other similar device, the same shall be deemed to be included in the scope of the Contractor.

18.9 **Tests**

The post insulators shall be subject to type, acceptance, sample and routine tests as per IS:2544 and IEC-168.

18.10 TECHNICAL REQUIREMENTS FOR BUS POST INSULATORS

a)	Type	:	Solid Core
b)	Voltage class (kV)	:	420
c)	Dry & wet one minute power frequency withstand voltage (kV rms)	:	680
d)	Dry lightning impulse withstand voltage (kVp)	:	±1425
e)	Wet switching surge withstand voltage (kVp)	:	±1050
f)	Max. radio interference voltage (in microvolts) at voltage of 305 KVrms between phase to ground	:	1000
g)	Corona extinction voltage (kV rms)		320 (Min.)
h)	Total minimum cantilever strength (kg)		800
i)	Minimum torsional moment		As per IEC-273
j)	Total height of insulator (mm)		3650
k)	Pollution level as per IEC-815		Heavy (III)
l)	Minimum total creepage distance for heavy pollution (mm)		10500

19.0 REQUIREMENT OF AUXILIARY ITEMS

19.1 BUSHINGS, HOLLOW COLUMN INSULATORS, SUPPORT INSULATORS

a) 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: 5621/IEC:61264, as applicable. The support insulators shall be manufactured and tested as per IS:2544/IEC:168 and IS:2099/IEC:273. The insulators shall also conform to IEC:815 as applicable.

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

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

d) 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.

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

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

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

h) **TESTS :**

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

i) Parameters of bushings/Hollow column insulators/support insulators :

a)	Rated Voltage	:	420 kV*
b)	Impulse withstand voltage (Dry & Wet)	:	± 1425 kVp*

c)	Switching surge withstand voltage(Dry & Wet)	:	± 1050 kVp*
d)	Power frequency with-stand voltage	:	630 kVrms*
e)	Total creepage distance	:	25mm/kV*
f)	Pollution level	:	Class-III : Heavy (as per IEC-71)

g) Insulator shall also meet requirement of IEC - 815, as applicable, having alternate long & short sheds.

NOTE : * The equipment rating is only indicative. Appropriate rating equipment may be supplied if so required in view of the series capacitor requirement.

19.2 **CONTROL PANELS, RELAY PANELS, CABINETS, JUNCTION BOXES, TERMINAL BOXES, MARSHALING BOXES AND MARSHALING KIOSKS:**

a) All types of boxes, cabinet/panels shall generally conform to IS : 5039, IS : 8623, IEC : 439, as applicable and the clauses given below :

b) Control cabinet/panels, junction boxes, Marshaling box & terminal boxes shall be sheet steel/Al. enclosed and shall be dust, water and vermin proof. Sheet steel used shall be at least 2.0 mm thick cold rolled/2.5 mm hot rolled. The box shall be properly braced to prevent wobbling. There shall be sufficient reinforcement to provide level surfaces, resistance to vibrations and rigidity during transportation and installation. In case of Al. enclosed box the thickness of Al. shall be such that it provides adequate rigidity and long life as comparable with sheet steel of specified thickness.

c) The enclosures of all outdoor type control cabinets/panel, junction boxes, terminal box & marshaling boxes shall provide a degree of protection of not less than IP 55 as per IS : 13947 and the same for indoor type enclosures shall be IP 31 as per IS : 13947and one control cabinet/panel, junction box, terminal box & marshaling box of each type shall be tested for the same, if the type test reports submitted are not to the satisfaction of the owner.

d) Control cabinet/panels, junction boxes, marshaling box & terminal box shall be provided with padlocking arrangements.

e) All doors, removable covers and plates shall be gasketed all around with neoprene gaskets. The neoprene gasket shall be tested in the presence of Employer's representative.

f) All sheet steel work shall be degreased, pickled, phosphated and then applied with two coats of zinc chromate primer and two coats of finishing synthetic enamel paint. The colour of finishing paint shall be light admiralty grey in accordance with shade No. 697 of IS : 5 outside and inside shall be glossy white.

g) All terminal boxes, control cabinet/panels, junction boxes & marshaling boxes shall be designed for the entry of cable from bottom by means of weather proof and dust-proof connections. Boxes and cabinet/panels shall be so designed with generous clearances to avoid interference between the wiring entering from below and any terminal blocks or accessories mounted within the box or cabinet/panel. Suitable cable gland plate on the base of the box shall be provided for this purpose. Necessary number of cable glands of suitable sizes shall be supplied and fitted on this gland plate. This removable gasketted gland plate shall have provision for spare glands to be used in future. The glands shall project at least 25 mm above the gland plate to prevent the entry of moisture in the cable crutch. The roof of the outdoor cabinet/panels/boxes shall preferably be of sloping design to prevent stagnation of water.

h) Suitable heaters shall be provided in the cabinet/panel, junction boxes & marshaling boxes to prevent condensation. Heaters shall maintain cubicle temperature approximately 10°C above the outside air temperature. The heaters shall be suitable for 240 V AC supply voltage. On-off switch and fuse for this shall be provided.

i) **Terminal Block :**

All internal wiring to be connected to the external equipment shall terminate on terminal blocks, preferably vertically mounted on the side of cabinet/panel, junction box, terminal box and marshaling box.

The terminal blocks shall be made of moulded, non-inflammable thermosetting plastic. The material of terminal block moulding shall not deteriorate because of varied conditions of heat, cold, humidity, dryness, etc. that would be anticipated at the location where the equipment is proposed to be installed.

The terminal shall be such that maximum contact area is achieved when a cable is terminated. The terminal shall have a locking characteristic to prevent cable from escaping from the terminal clamp unless it is done intentionally. The terminal blocks shall be non-disconnecting stud type equivalent to Elmex type CAT - M4/CST.

The terminal blocks shall be of extensible design.

The terminal blocks shall have locking arrangement to prevent its escape from the mounting rails.

The terminal blocks shall be of ***650*** V grade and shall be rated to carry continuously the maximum current that is expected to be carried by the terminals.

The terminal blocks used for CT circuits shall be fully enclosed with removable covers of transparent, non-deteriorating type plastic material. Insulting barriers shall be provided between the terminal blocks. These barriers shall not hinder the operator from carrying out the wiring without removing the barriers.

The terminals shall be provided with the marking tags for wiring identification.

All boxes shall be provided with 20 % spare terminals unless otherwise specified.

j) There shall be a minimum clearance of 250 mm between the first row of terminal block and the cable gland plate or side of the box. Also the clearance between two rows of terminal blocks or side of the box shall be a minimum of 150 mm.

k) The arrangements shall be in such a manner so that it is possible to safely connect or disconnect terminals on live circuits and replace fuse links when the cabinet/panel is live. Cabinet/panel wiring should be suitable for 60°C as the space heaters will keep the temperature 10°C higher than the ambient.

l) **Wiring :**

All wiring shall be carried out with ***650*** V grade, stranded copper wires. The minimum size of the stranded conductor used for internal wiring shall be as follows :
i)All circuits except CT circuits – 1.5/ 0.75.00.4 sq.mm (depending on the device current rating)

ii) CT circuits- 4sq mm; minimum no. of strands shall be 3 per conductor.

iii) Wrapping wires shall be used for electronic rack connection.

All internal wiring shall be securely supported, neatly arranged readily accessible and connected to equipment terminals and terminal blocks.

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 and shall not fall off when the wire is disconnected from terminal blocks.

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 ferrule purposes.

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.

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

For illumination of Control cabinet/panel a 20 Watts Fluorescent Tube/Incandescent Lamp shall be provided.

All control switches shall be of rotary switch type or push button type and toggle/piano switches shall not be accepted.

In accordance with the requirements stipulated under this Chapter control cabinet/panels, junction boxes, terminal boxes & marshaling boxes shall conform to type tests and shall be subjected to routine tests in accordance with IS : 5039. In addition to the type tests, verification of the degree of protection as per IS : 13947, shall be conducted, if the type test reports submitted by the Contractor are not to the satisfaction of the owner. After protection degree tests on control cabinet/panel, power frequency voltage of 2.0 kV rms for 1 minute shall be applied for checking insulation resistance and functional test shall also be conducted.

m) **Earthing :**

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

19.3 **MOTORS :**

Motors shall be "Squirrel Cage" three phase induction motors of sufficient size capable of satisfactory operation for the application and duty as required for the driven equipment and shall conform to type

tests and shall be subjected to routine tests as per applicable standards. The motors shall be of approved make.

19.4 TERMINAL CONNECTORS AND CLAMP CONNECTORS :

The Terminal Connectors of all types shall meet the following requirements:

a) Terminal connectors shall be manufactured and tested as per IS: 5561.

b) All castings shall be free from blow holes, surface blisters, cracks and cavities. All sharp edges and corners shall be blurred and rounded off.

c) No part of a clamp shall be less than 10 mm thick.

d) All ferrous parts shall be hot dip galvanised conforming to IS: 2633.

e) For bimetallic connectors, copper alloy liner of minimum thickness of 2 mm shall be provided.

f) Flexible connectors shall be made from tinned copper/ aluminium sheets or cables.

g) All current carrying parts shall be designed and manufactured to have minimum contact resistance.

h) Connectors shall be designed to be corona free in accordance with the requirements stipulated in IS: 5561.

i) All test/checks on terminal connectors shall be as per IS: 5561.

19.5 AUXILIARY SWITCH :

The type test reports or the following tests on auxiliary switch shall be furnished :

a) Electrical endurance test - A minimum of 2000 operations for 2A DC with a time constant greater than or equal to 20 milliseconds with a subsequent examination of mV drop/visual defects/temperature rise test.

b) Mechanical endurance test - A minimum of 1,00,000 operations with a subsequent checking of contact pressure test/visual examination.

c) Heat run test on contacts.

d) IR/HV test etc.

SECTION-IV

STANDARD TECHNICAL DATA SHEET
(1.1 kV GRADE XLPE POWER CABLES)

SN	CUSTOMER :	POWERGRID CORPORATION OF INDIA LIMITED	
	Name of manufacturer :	As per approved list	
	Cable Sizes	1 C x 630	3½ C x 300
1	Manufacturer's type designation	A2XWaY	A2XWY
2	Applicable standard	IS: 7098/PT-I/1988 & its referred specifications	
3	Rated Voltage(volts)	1100 V grade	
4	Type & Category	FR & C1	FR & C1
5	Suitable for earthed or unearthed system	for both	
6	Continuous current rating when laid in air in a ambient temp. of 50°C and for maximum conductor temp. of 70 °C of PVC Cables[For information only]	732	410
7	Rating factors applicable to the current ratings for various conditions of installation:	As per IS-3961-Pt-II-67	
8	Short circuit Capacity		
	a) Guranteed Short Circuit Amp. (rms)KA for 0.12 sec duration at rated conductor temperature of 90 degree C, with an initial peak of 105 KA.	45 KA	45 KA
	b) Maximum Conductor temp. allowed for the short circuit duty (deg C.) as stated above.	250 °C	
9	Conductor		
	a) Material	Stranded Aluminium as per Class 2 of IS : 8130	
	b) Grade	H 2 (Electrolytic grade)	
	c) Cross Section area (Sq.mm.)	630	300/150
	d) Number of wires(No.)minimum	53	30/15
	e) Form of Conductor	Stranded and compacted circular	Stranded compacted circular/sector shaped
	f) Direction of lay of stranded layers	Outermost layer shall be R.H lay & opposite in successive layers	
10	Conductor resistance (DC) at 20 °C per km-maximum	0.0469	0.1 / 0.206
11	Insulation		
	a) Composition of insulation	Extruded XLPE as per IS-7098 Part(1)	
	b) Nominal thickness of insulation(mm)	2.8	1.8/1.4
	c) Minimum thickness of insulation	2.42	1.52/1.16
12	Inner Sheath		
	a) Material	Extruded PVC type ST-2 as per IS-5831-84	
	b) Calculated diameter over the laid up cores,(mm)	NA	52
	c) Thickness of Sheath (minimum)mm	N.A	0.6
	d) Method of extrusion	NA	Pressure/Vacuum extrusion
13	Armour		
	a) Type and material of armour	Al. Wire[H4 grade]	Gal. Steel wire
	b) Direction of armouring	left hand	
	c) Calculated diameter of cable over inner sheath (under armour), mm	33.9	53.2
	d)Nominal diameter of round armour wire (minimum)	2	2.5
	e)Guranteed Short circuit capacity of the armour for 0.12 sec at room temperature.	45 KA	45 KA
	f) DC resistance at 20 °C (Ω/Km)	$	0.577
14	Outer Sheath		
	a) Material (PVC Type)	ST-2& FR	ST-2& FR
	b) Calculated diameter under the sheath	38.3	59.50
	c) Min.thickness of sheath(mm)	1.72	2.36
	d) Guaranteed value of minimum oxygen index of outer sheath at 27 °C	Min 29.0	Min 29.0
	e) Guranteed value of minimum temperature index at 21 oxygen index	Min 250	Min 250
	f) colour of sheath	Black	Black
15	a) Nominal Overall diameter of cable	$	$
	b) Tolerance on overall diameter (mm)	+2/-2 mm	
16	Cable Drums	shall conform to IS 10418 and technical specification	
	a) Max./ Standard length per drum for each size of cable (single length) with ±5% Tolerance (mtrs)	1000/500	1000/500
	b) Non standard drum lengths	: Maximum one(1) non standard lengths of each cable size may be supplied in drums only over & above the standard lengths as specified above.(if required for completion of project).	
17	Whether progressive sequential marking on outer sheath provided at 1 meter interval	YES	
18	Identification of cores		
	a) colour of cores	As per IS 7098 Part(1)	
	b) Numbering	N.A	
19	Whether Cables offered are ISI marked	YES	
20	Whether Cables offered are suitable for laying as per IS 1255	YES	

$'- As per manufacturer design data

STANDARD TECHNICAL DATA SHEET
(1.1 kV GRADE PVC POWER CABLES)

SN	CUSTOMER :	POWERGRID CORPORATION OF INDIA LIMITED					
	Name of manufacturer :	As per approved list					
	Cable Sizes	1 c x 150	3.5 cx 70	3.5 cx 35	4 c x 16	4c x 6	2 c x 6
1	Manufacturer's type designation	: AYWaY	AYFY	AYFY	AYFY	AYWY	AYWY
2	Applicable standard	: IS: 1554/PT-I/1988 & its referred standards					
3	Rated Voltage(volts)	: 1100 V grade					
4	Type & Category	: FR & C1	FR & C1	FR & C1	FR & C1	FR & C1	FR & C1
5	Suitable for earthed or unearthed system	: for both					
6	Continuous current rating when laid in air in a ambient temp. of 50°C and for maximum conductor temp. of 70 °C of PVC Cables[For information only]	: 202	105	70	41	24	28
7	Rating factors applicable to the current ratings for various conditions of installation:	: x As per IS-3961-Pt-II-67					
8	Short circuit Capacity						
	a) Short Circuit Amp. (rms)KA for 1 sec duration	: 11.2	5.22	2.61	1.19	0.448	0.448
	b) Conductor temp. allowed for the short circuit duty (deg C.)	: 160 °C					
9	Conductor						
	a) Material	: STRANDED ALUMINIUM					
	b) Grade	: H 2 (Electrolytic grade)					
	c) Cross Section area (Sq.mm.)	: 150	M-70 N-35	M-35 N-16	16	6	6
	d) Number of wires(No.)	: as per Table 2 of IS 8130					
	e) Form of Conductor	Non-compacted Standed circular	shaped conductor	shaped conductor	shaped conductor	Non-compacted Standed circular	Non-compacted Standed circular
	f) Direction of lay of stranded layers	: Outermost layer shall be R.H lay & opposite in successive layers					
10	Conductor resistance (DC) at 20 °C per km-maximum	0.206	0.443/ 0.868	0.868/ 1.91	1.91	4.61	4.61
11	Insulation						
	a) Composition of insulation	: Extruded PVC type A as per IS-5831-84					
	b) Nominal thickness of insulation(mm)	: 2.1	1.4/1.2	1.2/1.0	1.0	1.0	1.0
	c) Minimum thickness of insulation	: 1.79	1.16/0.98	0.98/0.8	0.8	0.8	0.8
12	Inner Sheath						
	a) Material	: Extruded PVC type ST-I as per IS-5831-84					
	b) Calculated diameter over the laid up cores,(mm)	: N.A	27.6	20.4	15.7	11.6	9.6
	c) Thickness of Sheath (minimum)mm	: N.A	0.4	0.3	0.3	0.3	0.3
13	Armour	: as per IS 3975/88					
	a) Type and material of armour	: Al. Wire[H4 grade]	Gal.steel strip	Gal.steel strip	Gal.steel strip	Gal. Steel wire	Gal. Steel wire
	b) Direction of armouring	: left hand					
	c) Calculated diameter of cable over inner sheath (under armour), mm	: 18	28.4	21	16.3	12.2	10.2
	d) Nominal diameter of round armour wire/strip	: 1.6	4 x 0.8	4 x 0.8	4 x 0.8	1.4	1.4
	e) Number of armour wires/strips	: Armouring shall be as close as practicable					
	f) Short circuit capacity of the armour along for 1 sec-for info only	: --K x A√t (K Amp)(where A = total area of armour in mm^2 & t = time in seconds), K=0.091 for Al & 0.05 for steel					
	g) DC resistance at 20 °C (Ω/Km)	: 0.44	2.57	3.38	3.99	3.76	4.4
14	Outer Sheath						
	a) Material (PVC Type)	: ST-1& FR	ST-1& FR	ST-1& FR	ST-1& FR	ST-1& FR	ST-1& FR
	b) Calculated diameter under the sheath	: 21.2	30.1	22.6	17.9	15	13
	c) Min.thickness of sheath(mm)	: 1.4	1.56	1.4	1.4	1.4	1.24
	d) Guaranteed value of minimum oxygen index of outer sheath at 27°C	Min 29.0	Min 29.0	Min 29.0	Min 29.0	Min 29.0	Min 29.0
	e) Guranteed value of minimum temperature index at 21 oxygen index	Min 250	Min 250	Min 250	Min 250	Min 250	Min 250
	f) colour of sheath	: Black	Black	Black	Black	Black	Black
15	a) Overall diameter of cable	: $					
	b) Tolerance on overall diameter (mm)	: +2/-2 mm					
16	Cable Drums	: shall conform to IS 10418 and technical specification					
	a) Max./ Standard length per drum for each size of cable (single length) with ±5% Tolerance (mtrs)	1000/500	1000/500	1000/500	1000/500	1000/500	1000/500
	b) Non standard drum lengths	: Maximum one(1) non standard lengths of each cable size may be supplied in drums only over & above the standard lengths as specified above.(if required for completion of project).					
17	Whether progressive sequential marking on outer sheath provided	: YES					
18	Identification of cores						
	a) colour of cores	Red	R,Y,Bl &Bk	R,Y,Bl &Bk	R,Y,Bl &Bk	R,Y,Bl &Bk	Red & Bk
	b) Numbering	: N.A					
19	Whether Cables offered are ISI marked	: YES					
20	Whether Cables offered are suitable for laying as per IS 1255	: YES					

$'- As per manufacturer design data

TECHNICAL DATA SHEET
(1.1 kV GRADE PVC CONTROL CABLES)

	CUSTOMER :	POWERGRID CORPORATION OF INDIA LIMITED							
SN	Name of manufacturer :	As per approved list							
	Cable Sizes	2c x 2.5	3c x 2.5	5c x 2.5	7c x 2.5	10c x 2.5	14c x 2.5	19c x 2.5	27c x 2.5
1	Manufacturer's type designation	YWY	YWY	YWY	YWY	YWY	YWY	YWY	YWY
2	Applicable standard	IS: 1554/PT-I/1988 & its referred standards							
3	Rated Voltage(volts)	1100							
4	Type & Category	FR & C1							
5	Suitable for earthed or unearthed system	for both							
6	Continuous current rating when laid in air in a ambient temp. of 50°C and for maximum conductor temp. of 70°C of PVC Cables[For information only]	22	19	19	14	12	10.5	9.7	8
7	Rating factors applicable to the current ratings for various conditions of installation:	As per IS-3961-Pt-II-67							
8	Short circuit Capacity								
	a) Short Circuit Amp. (rms)KA for 1 sec-for information only	0.285	0.285	0.285	0.285	0.285	0.285	0.285	0.285
	b) Conductor temp. allowed for the short circuit duty (deg C.)	160 °C							
9	Conductor								
	a] Material	Plain annealed High Conductivity stranded Copper (as per IS 8130/84)							
	b] Grade	Electrolytic							
	c) Cross Section area [Sq.mm.]	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
	d) Number of wires[No.]	as per Table 2 of IS 8130							
	e) Form of Conductor	Non-Compacted stranded circular conductor							
	f] Direction of lay of stranded layers	Outermost layer shall be R.H lay							
10	Conductor resistance [DC] at 20 °C per km[maxm]	7.41	7.41	7.41	7.41	7.41	7.41	7.41	7.41
11	Insulation								
	a] Composition of insulation	Extruded PVC type A as per IS-5831-84							
	b] Nominal thickness of insulation(mm)	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
	c] Minimum thickness of insulation	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71
12	Inner Sheath								
	a] Material	Extruded PVC type ST-I as per IS-5831-84							
	b] Calculated diameter over the laid up cores.[mm]	7.2	7.8	9.7	10.8	14.4	15.9	18	22.1
	c] Thickness of Sheath (minimum]mm	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
13	Armour	as per IS 3975/99							
	a) Type and material of armour	Gal. Steel wire	Gal. Steel wire	Gal. Steel wire	Gal. Steel wire	Gal. Steel wire	Gal. Steel wire	Gal. Steel wire	Gal. Steel wire
	b) Direction of armouring	left land							
	c) Calculated diameter of cable over inner sheath (under armour), mm	7.8	8.4	10.3	11.4	15	16.5	18.6	22.7
	d) Nominal diameter of round armour wire / dimensions of armour strip	1.4	1.4	1.4	1.4	1.6	1.6	1.6	1.6
	e] Number of armour wires	Armouring shall be as close as practicable							
	f) Short circuit capacity of the armour and duration-for info only	–0.05 x A√t (K Amp)(where A = total area of armour in mm^2& t = time in seconds)							
	g] DC resistance at 20°C (Ω/Km] & Resistivity of armour	As per IS 1554 Part(1), whereever applicable & IS 3975-1999							
14	Outer Sheath								
	a] Material [PVC Type]	ST-1& FR	ST-1& FR	ST-1& FR	ST-1& FR	ST-1& FR	ST-1& FR	ST-1& FR	ST-1& FR
	b] Calculated diameter under the sheath	10.6	11.2	13.1	14.2	18.2	19.7	21.8	25.9
	c] Min.thickness of sheath[mm]	1.24	1.24	1.24	1.24	1.4	1.4	1.4	1.56
	d) Guaranteed value of minimum oxygen index of outer sheath	Min 29.0	Min 29.0	Min 29.0	Min 29.0	Min 29.0	Min 29.0	Min 29.0	Min 29.0
	e) Guranteed value of minimum temperature index at 21 oxygen index	Min 250	Min 250	Min 250	Min 250	Min 250	Min 250	Min 250	Min 250
	f] colour of sheath	Grey	Grey	Grey	Grey	Grey	Grey	Grey	Grey
15	a] Overall diameter of cable	$							
	b] Tolerance on overall diameter [mm]	+2/-2 mm							
16	Cable Drums	shall conform to IS 10418 and technical specification							
	a) Max./ Standard length per drum for each size of cable (single length) with ±5% Tolerance [mtrs]	1000/500	1000/500	1000/500	1000/500	1000/500	1000/500	1000/500	1000/500
	b) Non standard drum lengths	Maximum one(1) non standard lengths of each cable size may be supplied in drums only over & above the standard lengths as specified above.(If required for completion of project).							
17	Whether progressive sequential marking on outer sheath provided	YES							
18	Identification of cores								
	a] colour of cores	R & Bk	R,Y &Bl	:,Y,Bl,Bk&(	Grey	Grey	Grey	Grey	Grey
	b] Numbering	N.A.	N.A.	N.A.	Numerals in black ink	Numerals in black ink	Numerals in black ink	Numerals in black ink	Numerals in black ink
19	Whether Cables offered are ISI marked	YES							
20	Whether Cables offered are suitable for laying as per IS 1255	YES							

$'- As per manufacturer design data

SECTION 5

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	Confir mation	Remarks
1.	Applicable Standards	Latest IS -1554, 5831, 8130, 3975, 613, ASTM-D2843, ASTM-D2863, IEC60754, IEC60332, IS3961, IS 10418, NEMA WC-70, IEEE-383	Yes	
2.	Rated Voltage	1100V Grade	Yes	
3.	Type & Category	FR & C1	Yes	
4.	**Construction feature for PVC Control and Aux Power cable**			
4.1	Material of Conductor for Control cables	Plain annealed, High conductivity, Stranded Copper Conductor Grade EC	Yes	
4.2	Material of Conductor for Power cables	Stranded Aluminium, Grade H2 (Electrolytic Grade)	Yes	
4.3	Conductor Insulation	Extruded PVC, Type-A	Yes	
4.4	Inner sheath	Extruded PVC, Type ST-1 as per IS-5831, non- hygroscopic, fire retardant	Yes	
4.5	Armouring for Control Cables	**Galvanized Round steel wire** for Multi-core cables (as per IS 1554 Part I)	Yes	
4.6	Armouring for Aux Power Cables	Aluminium round wire (H4 grade) for Single core And Galvanised Steel round wire / strip for Multi-core cables	Yes	
4.7	Outer sheath	PVC extruded, FR, Type ST-1 , C1 category as per IS:1554)	Yes	
5.	**Construction feature for XLPE Aux Power cable**			
5.1	Material of Conductor for Power cables	Stranded Aluminium as per class 2 of IS:8130 H2(electrolytic Grade); Circular/ Sector shaped and compacted	Yes	
5.2	Conductor Insulation	Extruded XLPE as per IS:7098	Yes	
5.3	Inner sheath	Extruded PVC. Type ST-2 as per IS 5831, Non- hygroscopic, fire retardant	Yes	

S. No.	Parameters	Data	Confir mation	Remarks
5.4	Armouring for XLPE Aux Power Cables	Aluminium round wire (H4 grade) for Single core And Galvanised Steel round wire for Multi-core cables	Yes	
5.5	Outer sheath	PVC extruded, FR, Type ST-2, C1 category as per IS:1554	Yes	
6.	**FR properties of Outer sheath**			
6.1	Minimum Oxygen index	29	Yes	
6.2	Minimum Temperature index	250°C	Yes	
7.	Allowable Tolerance on overall diameter	**± 2mm**	Yes	
8.	Chemicals added to outer sheath to protect from rodent, vermin and termite attack	Yes	Yes	
9.	Standard lengths of each Power & Control Cable	500m / 1000m	Yes	
10.	Tolerance on Cable Length per Drum.	+/-5% of the standard drum length.	Yes	
11.	Layer of water proof paper shall be applied to surface of the drums and over the outermost cable layer.	Yes	Yes	
12	Minimum bending radius for multicore cables	**12 x D**	Yes	
13	Core Identification	By color coding as per Is 1554 (Part-1) / IS:7098 Part-1 for the cables up to five (5) cores and for the cables with more than five (5) cores by printing legible Hindu Arabic Numerals on all cores as per clause 10.3 of IS:1554 (Part-I).	Yes	
14	The offered cables shall be designed to withstand conditions as per clause 1.2.1.2 & 1.2.1.3 of Section 2.	Yes	Yes	
15	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	
16	Technical Data sheet (GTP) of the offered cables	The Technical Data sheets of the offered cables conform to the standard technical Data sheets attached as Section 4 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)**

Type Test reports required for 1.1kV PVC Insulated Power & Control Cables:

S. No.	TESTS	REPORT NO.	Date	Conducted at accredited laboratory or witnessed by independent authority
1	High voltage test (water Immersion d.c. test as per clause no. 16.3.2 of IS: 1554 (Part 1) - 1988).			
2	Ageing in air oven.			
3	Loss of mass in air oven.			
4	Short time current test on power cables of sizes 240 sq.mm and above on i) Conductors. ii) Armours.			
5	Test for armouring wires / strips.			
6	Oxygen and Temperature Index test.			
7	Flammability test.			

ii) Following type tests as per IS: 15541 IS: 7098 including its amendments shall be performed on one size in a contract as a part of acceptance tests.

(YES)

Type Test reports required for 1.1kV PVC Insulated Power & Control Cables:

S.No	TESTS	Confirmation of Bidder	Remarks
1.	Physical tests for insulation and outer sheath i) Shrinkage test ii) Hot deformation iii) Heat shock test		

	iv) Thermal stability		
2.	High voltage test (water immersion test only a.c. test as per clause no. 16.3.1 of IS: 1554 Part-I).		

Qualifying Requirement:

S.No	TESTS	Confirmation of Bidder	Remarks
1.	Bidder to furnish supporting document in line with qualifying requirement at clause **3.0,** Section-I		

Date:

Signature of the authorized representative of Bidder

Company Seal