

Ref. Enquiry No.: **PE/PG/RTC/E-6477/2020**

Dated: 15.07.2020

**TENDER ENQUIRY THROUGH E-PROCUREMENT
(CONDITIONAL ENQUIRY)**

SUBJECT: TENDER ENQUIRY FOR FRAMEWORK AGREEMENT (RATE CONTRACT) OF LT PVC CONTROL CABLES AS PER TECHNICAL SPECIFICATION NO. PE-RC-999-507-E004, REV 00

OUR REF: TENDER ENQUIRY NO: PE/PG/RTC/E-6477/2020, DTD-15.07.2020

DUE DATE – 27.07.2020, BY 10.00AM

Dear Sir/ Ma'am,

We are pleased to invite your offer for subject package in two parts strictly as per Clause-2.0 of “Instructions to Bidders” of **GCC Rev 07**. Please upload your best quotation/ offer on <https://bhel.abcpocure.com> for the requirement strictly as per schedule of price format before above mentioned due date & time. The details of the tender enquiry are as mentioned below:

Sl. No	Description for which (Framework Agreement) Rate Contract is desired	Tentative Quantity	Delivery required
1	LT PVC CONTROL CABLES - Refer Technical specification no PE-RC-998-507-E004, REV 00 for detailed description.	As per BOQ cum price schedule in Annexure-I) cumulative for the Prospective Projects as per Annexure-IV	Within Four (04) months from date of CAT-1 approval of Primary drawing/documents, subjected to drawing/document submission/re-submission schedule as stipulated, in case of any delay in submission/re-submission of Primary drawing/documents, then same shall be reduced from the given delivery period. Delay in BHEL's comments/approval beyond 18 days shall also be considered for delay analysis. Please refer clause no 4 of Technical Specification no-PE-RC-998-507-E004 and cl 14 of NIT

Your best quotation/offer for the above requirement, in line with our terms and conditions, should be submitted online via e-procurement system. It shall be the responsibility of the bidder to ensure that the Tender is submitted on or before the due date by 10.am. Part-I bids shall be opened at 11.00 am on due date through e-procurement Portal.

Detailed Tender documents can be downloaded from the following websites: -

- a) www.eprocure.gov.in b) <https://bhel.abcpocure.com> c) www.bhel.com d) www.bhelpem.com

Tender submission through e-procurement portal- Bidders may go through the Sellers' manual & Help documents provided on E-Procurement Portal website (<https://bhel.abcpocure.com>).

E-procurement service Provider details:

M/s E-Procurement Technologies Limited, Ahmedabad

B705. Wall Street II, Opp. Orient Club, Near Gujrat college, Ellis Bridge, Ahmedabad, PIN 380 006.

Please get in touch with our service provider at the earliest for required support. The contact details of the service provider are given at: <https://bhel.abcpocure.com/EPROC/contactus>

Note: -

1. Please note that Part Supplies offered for tender BOQ shall disqualify the bidder's offer.
2. Documents and Credential as per Technical & Financial PQR, Techno Commercial Bids and Price Bids should be uploaded on the e-procurement portal.
3. Bidders to ensure that Third party/customer issued certificates being submitted as proof of PQR qualification should have verifiable details of document/certificate issuing authority such as name & designation of Issuing Authority and its organisation contact number and email Id etc. In case the same found not available, Purchaser has right to reject such document from evaluation.
4. "This item/Package/System falls under the list of items defined in Para 3 of Ministry of Finance guideline datedt.20-09-2016 (procurement of items related to public safety, health, critical security operations and equipment's, etc.) & hence criteria of prior experience/turnover shall be same for all the bidders including start up/MSME".

Please refer GCC Rev-07 which is available on www.bhelpem.com. You are requested to kindly download the same.

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TERMS AND CONDITIONS

1. This tender is being issued by BHEL PEM for Framework Agreement (Rate Contract) of LT PVC Control Cables required at various BHEL project sites on behalf of various BHEL units. All bidders to note the following –
 - a) As and when requirement arises, the concerned unit of BHEL will place order directly on the supplier against the Framework Agreement (Rate Contract).
 - b) The drawings/ documents submission & approval, submission of BG, submission of invoices, processing and release of payment after supply of material shall be dealt as per Framework Agreement (Rate Contract) contract terms and shall be directly done with BHEL unit which has placed purchase order noted at sl.no. (a) above.
2. Bidders to note that their bid shall be conditional, subject to qualify PQR (technical and financial) & registration in PEM for subject package before price bid opening
3. **Framework Agreement (Rate contract), on PVC basis, will be done for 2 years from placement of Framework Agreement (Rate contract) PO with a provision for further extension after review on mutual consent.**
4. **Framework Agreement (Rate contract) will be done with 2 vendors in ratio of 70:30 value wise at L1 FOR site price (Ex-works + freight) for this package. Splitting of Framework Agreement (Rate contract) between 2 vendors may be changed during project ordering process if any vendor in Framework Agreement (Rate Contract) is not approved by customer (i.e. BHEL may place order on any of the vendor in Framework Agreement (Rate Contract) up to total applicable Framework Agreement (Rate Contract) value in case of non-availability of customer approval for other vendor in Framework Agreement (Rate Contract)). However, order for a project shall not be split.**
5. **Framework Agreement (Rate Contract) will be finalized on total lump sum basis.**
6. L1 Rates (Ex works + Freight) shall be counter offered to all bidders who participated in Price Bid Opening/RA for 30% value and in case acceptance of counter offer received from more than one vendor then **acceptance shall be considered as per FINAL Price Bid Opening / Reverse Auction Ranking (as applicable)**. If none accepts L1 rates, Framework Agreement (Rate Contract) shall be done with L1 vendor for 100% value.
7. PVC shall be applicable for the subject package. **Base date for initial prices for this tender shall be first June 2020.** All bidders shall be asked to quote as per the Price Variation Formulae for Cables uploaded on BHEL PEM website on the link <https://www.bhelpem.com/Documents/GCC/Price%20Variation%20Formulae%20for%20Cables.pdf>.

Also refer Annexure A. The price variation shall be limited to + 20% of total ex-works actually supplied (cable size wise) and negative price variation shall be unlimited.

8. Following clause will be applicable in line with MII circular Public Procurement (preference to make in India), order 2017 Rev dated-04.06.2020-

" For this procurement, the local content to categorize a supplier as a Class I local supplier / Class II local Supplier / Non Local supplier, is as defined in Public Procurement (Preference to Make in India) Order dated 04.06.2020. In case of subsequent orders issued by the nodal ministry, changing the definition of local content for the items of the NIT, the same shall be applicable even if issued after issue of this NIT, but before finalization of PO against this NIT."

Since this package falls under the category of goods, services or works in respect of which nodal ministry/ department has communicated that there is a sufficient local capacity and competition, **only Class-I local suppliers as defined in the order are eligible to bid.**

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9. Following point to be noted regarding verification of local content-

The supplier at the time of tender, bidding or solicitation shall be required to provide a certificate from the statutory auditor or cost auditor of the company (in the case of companies) or from a practicing cost accountant or practicing chartered accountant (in respect of suppliers other than companies) that the item offered meets the minimum local content, in accordance with para 9 (b) of PP-MII order revision dated-04.06.2020.

Point no 8 & 9 above will supersede point no 26 of ITB of GCC Rev 07

10. Bidders to note the following: -

- i. Tender Evaluation - Evaluation will be done on overall L1 (Total Cost to BHEL excluding GST) basis with necessary loading as applicable i.e. **Evaluation will be on Ex Works + Freight basis** for this tender.
 - In case of PBO, the loading (technical/commercial), if any, shall be added by BHEL for evaluation.
 - In case of RA, the loading (technical/commercial), if any, shall be added by bidder while submitting the bid in reverse auction portal.
 - Ordering shall be done after de-loading the commercial/ technical loading from bidder's final price.
- ii. In the course of evaluation, if more than one bidder happens to occupy L-1 status, effective L-1 will be decided by soliciting discounts from the respective L-1 bidders. In case more than one bidder happens to occupy the L-1 status even after soliciting discounts, the L-1 bidder shall be decided by a toss / draw of lots, in the presence of the respective L-1 bidder(s) or their representative(s). Ranking will be done accordingly. BHEL's decision in such situations shall be final and binding.
- iii. **Bidder to give single % of freight charges considering anywhere in India in the freight column. Bidders have to give same % of freight for each line item.**
- iv. Bidders to mention applicable GST rate on (total Ex. works + freight) in the specified cells of price schedule on price form at e-procurement portal. However, may please note that GST shall not be considered in evaluation.
- v. Though evaluation is on Ex Works + Freight, but there is % allocation weightage against BOQ quantity of each item which shall be used for arriving at price break up. Bidders need to give only their total ex works price for given BOQ at the specific cells that has been kept opened in the price schedule available in the e-procurement portal (Grand Total ex works price). Price mentioned anywhere else in BOQ or price uploaded anywhere else in the e-procurement portal shall not be taken in cognizance.
- vi. Rest of the prices shall be derived by BHEL in line with allocation fixed for each item. There is formula applied in price schedule form available in e-procurement portal. As soon as bidder fills the cells for Total Ex works, freight percentage and GST percentage, rest values for e.g. unit ex works – item wise, total ex works – item wise, FOR site price – item wise will filled automatically.
- vii. For better clarity to the bidders where value is to be filled is kept open in price form at e-procurement portal and for other columns it will be locked which shall be derived by BHEL as per allocation fixed against each item.
- viii. HSN Code has been mentioned in Price Schedule.
- ix. Incomplete offer shall be summarily rejected.
- x. **PRE-QUALIFICATION REQUIREMENT: -**
Bidders is requested to fill up the details in "TECHNICAL AND FINANCIAL PRE-QUALIFYING REQUIREMENT" as per the conditions mentioned in the PQR (technical and financial) and also to submit the credentials. Bids of only those bidders shall be evaluated who meet the Technical & Financial pre-qualifying requirements (if applicable). **Bidders to ensure that Third party/customer issued certificates being submitted as proof of PQR qualification should have verifiable details of document/certificate issuing authority such as name & designation of Issuing Authority and its organisation contact number and email Id etc. In case the same found not available, Purchaser has right to reject such document from evaluation.**

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"This item/Package/System falls under the list of items defined in Para 3 of Ministry of Finance guideline dated 20-09-2016 (procurement of items related to public safety, health, critical security operations and equipment's, etc.) & hence criteria of prior experience/turnover shall be same for all the bidders including start up/MSME".

- xi. Bidders to note that their bid shall be conditional subject to qualify PQR (technical & financial) by registered vendors & non-registered vendors have to qualify PQR (technical & financial) & get registered with PEM for the package **before price bid opening**
For registration in PEM "Bidders needs to apply & get registered for subject package with PEM before P-2 (price bid opening) & hence you need to apply online for registration on PEM web portal & have to enclose acknowledgement with this effect with the bid documents else your bid may not be considered for evaluation"
- xii. This enquiry is subject to Conditions/ limits if any imposed in PMD / Vendor registration.
- xiii. Refer Annexure I for tentative quantity of LT PVC Control Cables, required for prospective projects. Project list is indicative only, BHEL may ask for delivery anywhere in India for any of the project added in the prospective project/ existing projects during RC period. No minimum quantity is guaranteed by BHEL.
- xiv. Quantity variation shall be +30%. Bidders to note that the quantities indicated in the tender are tentative quantities. No minimum quantity is guaranteed by BHEL
- xv. CIF allocation is not applicable for this tender. Bidder to quote accordingly.
- xvi. Tenderers must enclose the Quality Plan in the prescribed format, for approval. Equipment will be dispatched only after Purchaser's / Owner's inspection of the hold points specified in the approved Quality Plan and issue of Material Dispatch Clearance Certificate (MDCC).
- xvii. In case of joint bidding, bidders to furnish scope matrix which should be clearly defined between them along with the offer for the complete scope.
- xviii. **Integrity pact is applicable for this tender**
IP is a tool to ensure that activities and transactions between the Company and its Bidders/ Contractors are handled in a fair, transparent and corruption free manner. Following Independent External Monitors (IEMs) have been appointed by BHEL with the approval of CVC to oversee implementation of IP in BHEL.

Sl No.	IEM	Phone & Email
1.	Shri Arun Chandra Verma, IPS (Retd.)	acverma1@gmail.com
2.	Shri Virendra Bahadur Singh, IPS (Retd.)	vbsinghips@gmail.com

The IP as enclosed with the tender is to be submitted (duly signed by authorized signatory) along with techno-commercial bid (Part-I, in case of two/three part bid). Only those bidders who have entered into such an IP with BHEL would be competent to participate in the bidding. In other words, entering into this pact would be a preliminary qualification. (Refer Annexure-IX for Integrity pact).

Please refer Section-8 of IP for Role and Responsibilities of IEMs. In case of any complaint arising out of the tendering process, the matter may be referred to the any of the IEMs mentioned in the NIT. All correspondence with the IEMs shall be done through email only.

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

OTHER TERMS AND CONDITIONS

- Procurement of the subject package shall be done through e-procurement
- Offers should be uploaded in two parts online at <https://bhel.abcpurchase.com> in as follows:
 - Part-I Bid: - Documents and Credential as per Technical & Financial PQR and Techno-Commercial offer (along with un-priced copy of un-priced bid and un-priced schedule of Technical-Commercial Deviation, Annexure I & II)

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- b) Part II Bid: - Price Bid and Priced schedule of Technical-Commercial Deviation
3. Terms and conditions: -
- a) Part I bid will be opened on date & time mentioned in the NIT or subsequent corrigenda/amendments, if any.
- b) **Techno-commercial offer of only those bidders shall be evaluated who will meet the Technical & Financial pre-qualifying requirement of the tender.**
- All the above Tender Documents shall automatically become a part of the Order/Contract after its finalisation.
4. Vendors shall quote in accordance with the requirements mentioned in the tender documents. In case of deviations (Technical/ Commercial), the same shall be highlighted separately giving Clause references along with the Cost of withdrawal of Deviations in e-procurement portal, along with reasons for taking such deviations.
Bidder to note all the points mentioned in "Notes" of cost of withdrawal sheet in e-procurement portal.
5. **Please note the following:**
- a. **Compliance to price form available at e-procurement portal.**
- b. **SCC enclosed for compliance.**
- GCC enclosed for compliance. GCC Rev-07 is available on www.bhelpem.com. You are requested to kindly download the same. Bidders are requested for furnishing compliance of these documents.**
6. Tenders shall be submitted strictly in accordance with the requirements of the above tender documents.
7. Standard pre-printed terms & conditions of the tenderers shall not be considered valid.
8. Validity of offer shall be as per cl.no.7(instruction to bidders) of GCC Rev 07.
9. Unsolicited fresh/revised Price Bids shall not be entertained.
10. Purchaser shall be under no obligation to accept the lowest or any other tender and shall be entitled to accept or reject any/all tender(s) in part or full without assigning any reason whatsoever.
11. Late tenders will be rejected.
12. Definition of Terms is also enclosed. These definitions will apply to all the tender documents including this Enquiry Letter.
13. Tenders and all correspondence thereof, shall be addressed to the undersigned by name & designation and sent at the following address:
- | | |
|---|--|
| Mr. I P SINGH, DGM, CMM
M/s Bharat Heavy Electricals Ltd.,
Project Engineering Management,
Power Project Engineering Institute,
HRD & ESI Complex,
Plot No 25, Sector-16 A, Noida-201301
Kind Attn: I P SINGH/ CMM
E-MAIL: indra.pal.singh@bhel.in
Ph. No. 0120-4218749 ,09818989654 | Mr. SUMEET SAHAY, DY MGR, CMM
M/s Bharat Heavy Electricals Ltd.,
Project Engineering Management,
Power Project Engineering Institute,
HRD & ESI Complex,
Plot No 25, Sector-16 A, Noida-201301
Kind Attn: SUMEET SAHAY/ CMM
E-MAIL: sumeetsahay@bhel.in
Ph. No. 0120-4213532 ,09999498202 |
|---|--|
14. **Delivery: The following delivery term for project specific Purchase Orders which will be issued on the basis of subject Rate Contract will be: -**

Within Four (04) months from date of CAT-1 approval of Primary drawing/documents, subjected to drawing/document submission/re-submission schedule as stipulated, in case of any delay in submission/re-submission of Primary drawing/documents, then same shall be reduced from the given delivery period. Delay in BHEL's comments/approval beyond 18 days shall also be considered for delay analysis.

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Sl No	Drawings/Document Description	Primary/ Secondary	Drawings / Document Number	Drg Sch for Vendors
1	Technical Data sheet – LT Control cables	Primary	Shall be informed later	R-0 within 14 days from PO & subsequent revisions within 10 days of comments received from BHEL. BHEL shall furnish comments / approval on each submission within 18 days from receipt.
2	Cross-sectional Drgs.- LT Control Cables	Primary		
3	Quality Plan - LT Control Cables	Primary		
4	Type test report – LT Control Cables (previously conducted within 10 years)	Primary		
5	Type test report – LT Control Cables (conducted for this contract)	Secondary		Within 1 week after conduction of type test & subsequent revisions within 1 week of comments received from BHEL

** Please refer clause no 4 of Technical Specification no-PE-RC-999-507-E004

Note:

1. The above list of drawings and documents is indicative.

2. After receiving LOI, the vendor shall submit drawings/documents in requisite number of copies as per NIT.

* Standard Quality Plan as enclosed in the technical specification is to be appended with cover sheet bearing document number and description as stated above. The signed and stamped copy of the same shall be submitted to BHEL without making any changes in the contents of the document.

Following to be made the part of NIT.

a. The end period specified is for completion of the deliveries. Deliveries to start progressively so as to meet the completion schedule.

b. The delivery conditions specified are for contractual LD purposes, however BHEL may ask for early deliveries without any compensation thereof.

c. Non-applicable drawings shall be decided during execution of the package.

d. Wherever schedule of drawings/documents submission / re-submission is stipulated in the Technical Specifications, same shall be superseded by delivery specified in NIT

15. All other terms and conditions shall be as per GCC Rev 07 and Special Conditions of (Framework Agreement) Rate Contract as per attached Annexure-IV. In the event of any contradiction in the terms and conditions mentioned, the order of preference shall be as mentioned in clause no 36 of GCTC of GCC (Rev.07).
16. All the above Tender Documents shall automatically become a part of the Order/Contract after its finalization.
17. **All** corrigenda, addenda, amendments, time extensions, clarifications etc. to the tender will be hosted on BHEL websites only (www.bhelpem.com., www.bhel.com & <https://bhel.abcprocure.com> under subject tender reference. Bidders are requested to visit our websites from time to time to keep themselves updated. **Bidders may go through the Sellers' manual & Help documents provided on E-Procurement Portal website & obtain required Digital Signature Certificate for participating in the subject Tender.**
18. Bidders to submit their offers strictly in line with the form available at e-procurement portal.
19. Inspection shall be done by BHEL/ END CUSTOMER/Third party Agency (finalized by BHEL).
20. Foreign & indigenous bidders participating through open/limited tender will necessarily have to but class III DSCs issued by the certifying authorities in India. Basic procedure/ checklist is uploaded on www.bhel.com.
21. Non- registered bidder to submit the credentials required for Registration in BHEL PEM: -
"Online Registration Portal is operational in BHEL. Non-registered Vendors, who wish to apply for registration with BHEL-PEM, have to apply through Online Registration Portal available at www.bhelpem.com - vendor section - Online Supplier Registration. All credentials and/or documents duly signed and stamped related to

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registration has to be uploaded on the website and submit the application for registration. One set of hard copy of the filled-up SRF downloaded from Online Registration Portal duly signed and stamped has to be submitted."

22. Purchaser reserves the right to split up the scope of the tender enquiry and place the orders for different scope/ items with different bidders and also increase or decrease the quantity.
23. RA guideline 2020 shall be applicable for this tender and same is available at http://www.bhel.com/vender_registration/pdf/Guidelines%20for%20Reverse%20Auction-2020.pdf
Bidders to note following point before quoting-
"BHEL shall be resorting to Reverse Auction (RA) (Guidelines as available on www.bhel.com) for this tender. RA shall be conducted among all the techno-commercially qualified bidders. Price bids of all techno-commercially qualified bidders shall be opened and same shall be considered as initial bids of bidders in RA. In case any bidder(s) do(es) not participate in online Reverse Auction, their sealed envelope price bid along with applicable loading, if any, shall be considered for ranking."
Note: - Vendors to note that above RA clause will supersede clause no 13 of " Instruction to bidders " of GCC Rev-07.
"The Bidders has to quote the Single Price (i.e. Total Cost to BHEL) (excl. GST) in Reverse Auction. Price are to be inclusive of Packing & Forwarding charges, all the routine & type tests as per tender scope, Freight as applicable, including loading (if any) but excluding GST. De-loading (if any) shall be done in line with NIT terms.
24. If any bidder has mentioned the term Not Applicable / Not required / Not Quoted in bidding form. The bidder needs to substantiate the same. If the same item will be required in future for the system same will be supplied free of cost.
25. L1 bidder will have to submit Bank Guarantee for each POs (irrespective of value) which will be placed under the (Framework Agreement) Rate Contract finalised through this tender considering RC as original contract as per format mentioned in in GCC Rev 07.

Thanking you,
Yours faithfully,
For and on behalf of BHEL

(Signature of official with Name & Designation)

Enclosure:

1. Enquiry Terms & Conditions.
2. Price Schedule - Annexure-I to NIT (to be filled in e-procurement portal only)
3. Cost of withdrawal sheet -Annexure-II to NIT (to be filled in e-procurement portal only)
4. Technical Specifications.
5. Technical PQR
6. Financial PQR
7. SCC – Annexure-III to NIT.
8. Prospective Project List – Annexure-IV to NIT
9. Bank Guarantee Format – Annexure-V to NIT.
10. Integrity Pact (IP) – Annexure-VI to NIT
11. Annexure A – PVC Formulae

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ANNEXURE I TO NIT REF NO- PE/PG/RTC/E-6477/2020, DTD-15.07.2020

PRICE SCHEDULE FOR LT PVC CONTROL CABLES

FRAMEWORK AGREEMENT (RATE CONTRACT)

NAME OF VENDOR - (Please fill vendor's name)

SL. NO.	ITEM CODE	ITEM DESCRIPTION	UOM	QUANTIT Y	HSN CODE	UNIT EX- WORKS PRICE (DULY PACKED) OF TOTAL EX-WORKS PRICE (INR)	UNIT EX- WORKS PRICE (DULY PACKED) (INR)	FORMULA FOR TOTAL EX- WORKS PRICE (DULY PACKED) (INR)	TOTAL EX- WORKS PRICE (DULY PACKED) (INR)	FREIGHT CHARGES WITHOUT GST @ % OF TOTAL EX WORKS (INR)	APPLICABLE GST RATE % ON (TOTAL EX WORKS + FREIGHT) (INR)	TOTAL FOR SITE PRICE (INR)	REMARKS
1	2	3	4	5	6	7	8	9	10	11	12	13	14
A	1.1kV/ Copper conductor/ PVC insulated/ Innersheath PVC type ST1/ Outersheath PVC type ST1/ outer sheath with FRLSH properties/ Strip & Round wire (as applicable) armoured Cable												
A.1	507-30053-A	12C - 1.5- ARMOURED (STRIP)	Metres	48000	8544	0.00706 * X /48000	Derived	0.00706 * X	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived	
A.2	507-30049-A	10C - 2.5- ARMOURED (STRIP)	Metres	341000	8544	0.06225 * X /341000	Derived	0.06225 * X	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived	
A.3	507-30051-A	12C - 2.5- ARMOURED (STRIP)	Metres	175000	8544	0.03666 * X /175000	Derived	0.03666 * X	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived	
A.4	507-30055-A	5C - 4- ARMOURED (STRIP)	Metres	10000	8544	0.00149 * X /10000	Derived	0.00149 * X	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived	
A.5	507-30056-A	14C X 1.5 SQMM - CU ARMOURED	Metres	119000	8544	0.02618 * X /119000	Derived	0.02618 * X	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived	
A.6	507-30041-A	14C - 2.5- ARMOURED(STRIP)	Metres	210000	8544	0.06409 * X /210000	Derived	0.06409 * X	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived	
A.7	507-30057-A	16C - 2.5- ARMOURED(STRIP)	Metres	24000	8544	0.00814 * X /24000	Derived	0.00814 * X	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived	
A.8	507-30007-A	19C - 2.5- ARMOURED(STRIP)	Metres	122000	8544	0.05008 * X /122000	Derived	0.05008 * X	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived	
A.9	507-30058-A	24C - 2.5- ARMOURED(STRIP)	Metres	8000	8544	0.00377 * X /8000	Derived	0.00377 * X	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived	
A.10	507-30059-A	4C-4 - ARMOURED - FRLS	Metres	75000	8544	0.00735 * X /75000	Derived	0.00735 * X	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived	
A.11	507-30060-A	4C - 2.5- ARMOURED	Metres	75000	8544	0.00994 * X /75000	Derived	0.00994 * X	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived	
A.12	507-30061-A	9C - 2.5- ARMOURED	Metres	415000	8544	0.09956 * X /415000	Derived	0.09956 * X	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived	
A.13	507-30062-A	20C - 2.5- ARMOURED	Metres	75000	8544	0.0319 * X /75000	Derived	0.0319 * X	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived	
A.14	507-30063-A	27C - 2.5- ARMOURED	Metres	50000	8544	0.02573 * X /50000	Derived	0.02573 * X	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived	



ANNEXURE I TO NIT REF NO- PE/PG/RTC/E-6477/2020, DTD-15.07.2020

PRICE SCHEDULE FOR LT PVC CONTROL CABLES

FRAMEWORK AGREEMENT (RATE CONTRACT)

NAME OF VENDOR - (Please fill vendor's name)

SL. NO.	ITEM CODE	ITEM DESCRIPTION	UOM	QUANTITY	HSN CODE	UNIT EX- WORKS PRICE (DULY PACKED) OF TOTAL EX-WORKS PRICE (INR)	UNIT EX- WORKS PRICE (DULY PACKED) (INR)	FORMULA FOR TOTAL EX- WORKS PRICE (DULY PACKED) (INR)	TOTAL EX- WORKS PRICE (DULY PACKED) (INR)	FREIGHT CHARGES WITHOUT GST @ % OF TOTAL EX WORKS (INR)	APPLICABLE GST RATE % ON (TOTAL EX WORKS + FREIGHT) (INR)	TOTAL FOR SITE PRICE (INR)	REMARKS
1	2	3	4	5	6	7	8	9	10	11	12	13	14
A.15	507-30064-A	28C - 2.5- ARMOURED	Metres	50000	8544	0.02797 * X /50000	Derived	0.02797 * X	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived	
A.16	507-30065-A	8C - 4- ARMOURED	Metres	25000	8544	0.00705 * X /25000	Derived	0.00705 * X	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived	
A.17	507-30066-A	14C - 4- ARMOURED	Metres	25000	8544	0.01037 * X /25000	Derived	0.01037 * X	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived	
B	1.1kV/ Copper conductor/ PVC insulated/ Innersheath PVC type ST1/ Outersheath PVC type ST1/ outer sheath with FRLSH properties/ Round wire armoured Cable												
B.1	507-30043-A	2C-1.5- ARMOURED	Metres	4000	8544	0.00019 * X /4000	Derived	0.00019 * X	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived	
B.2	507-30015-A	3C - 1.5- ARMOURED	Metres	126000	8544	0.00693 * X /126000	Derived	0.00693 * X	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived	
B.3	507-30019-A	5C - 1.5- ARMOURED	Metres	439000	8544	0.03536 * X /439000	Derived	0.03536 * X	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived	
B.4	507-30029-A	7C - 1.5- ARMOURED	Metres	30000	8544	0.00302 * X /30000	Derived	0.00302 * X	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived	
B.5	507-30052-A	12C - 1.5- ARMOURED (ROUND WIRE)	Metres	43000	8544	0.00707 * X /43000	Derived	0.00707 * X	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived	
B.6	507-30013-A	2C - 2.5- ARMOURED	Metres	183000	8544	0.01139 * X /183000	Derived	0.01139 * X	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived	
B.7	507-30017-A	3C - 2.5- ARMOURED	Metres	737000	8544	0.05599 * X /737000	Derived	0.05599 * X	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived	
B.8	507-30021-A	5C - 2.5- ARMOURED	Metres	675000	8544	0.07345 * X /675000	Derived	0.07345 * X	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived	
B.9	507-30031-A	7C - 2.5- ARMOURED	Metres	304000	8544	0.04151 * X /304000	Derived	0.04151 * X	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived	
B.10	507-30073-A	9C - 2.5- ARMOURED (ROUND WIRE)	Metres	100000	8544	0.0263 * X /100000	Derived	0.0263 * X	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived	



ANNEXURE I TO NIT REF NO- PE/PG/RTC/E-6477/2020, DTD-15.07.2020

PRICE SCHEDULE FOR LT PVC CONTROL CABLES

FRAMEWORK AGREEMENT (RATE CONTRACT)

NAME OF VENDOR - (Please fill vendor's name)

SL. NO.	ITEM CODE	ITEM DESCRIPTION	UOM	QUANTITY	HSN CODE	UNIT EX- WORKS PRICE (DULY PACKED) OF TOTAL EX-WORKS PRICE (INR)	UNIT EX- WORKS PRICE (DULY PACKED) (INR)	FORMULA FOR TOTAL EX- WORKS PRICE (DULY PACKED) (INR)	TOTAL EX- WORKS PRICE (DULY PACKED) (INR)	FREIGHT CHARGES WITHOUT GST @ % OF TOTAL EX WORKS (INR)	APPLICABLE GST RATE % ON (TOTAL EX WORKS + FREIGHT) (INR)	TOTAL FOR SITE PRICE (INR)	REMARKS
1	2	3	4	5	6	7	8	9	10	11	12	13	14
B.11	507-30050-A	12C - 2.5- ARMOURED (ROUND WIRE)	Metres	168000	8544	0.03787 * X /168000	Derived	0.03787 * X	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived	
B.12	507-30047-A	2C - 4- ARMOURED	Metres	7000	8544	0.00061 * X /7000	Derived	0.00061 * X	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived	
B.13	507-30054-A	5C - 4- ARMOURED (ROUND WIRE)	Metres	26000	8544	0.00416 * X /26000	Derived	0.00416 * X	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived	
B.14	507-30067-A	16C - 2.5- ARMOURED (ROUND WIRE)	Metres	14000	8544	0.00509 * X /14000	Derived	0.00509 * X	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived	
B.15	507-30068-A	24C - 2.5- ARMOURED(ROUND WIRE)	Metres	6000	8544	0.00299 * X /6000	Derived	0.00299 * X	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived	
B.16	507-30069-A	19C - 2.5- ARMOURED(ROUND WIRE)	Metres	6000	8544	0.00262 * X /6000	Derived	0.00262 * X	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived	
C	1.1kV/ Copper conductor/ PVC insulated/ Innersheath PVC type ST1/ Outersheath PVC type ST1/ outer sheath with FRLSH properties/ Unarmoured Cable												
C.1	507-30044-A	2C-1.5- UNARMOURED	Metres	7000	8544	0.00024 * X /7000	Derived	0.00024 * X	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived	
C.2	507-30016-A	3C - 1.5- UNARMOURED	Metres	106000	8544	0.00439 * X /106000	Derived	0.00439 * X	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived	
C.3	507-30020-A	5C - 1.5- UNARMOURED	Metres	230000	8544	0.01568 * X /230000	Derived	0.01568 * X	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived	
C.4	507-30002-A	12C - 1.5- UNARMOURED	Metres	15000	8544	0.00226 * X /15000	Derived	0.00226 * X	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived	
C.5	507-30014-A	2C - 2.5- UNARMOURED	Metres	60000	8544	0.00303 * X /60000	Derived	0.00303 * X	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived	
C.6	507-30018-A	3C - 2.5- UNARMOURED	Metres	19000	8544	0.00103 * X /19000	Derived	0.00103 * X	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived	
C.7	507-30022-A	5C - 2.5- UNARMOURED	Metres	168000	8544	0.02071 * X /168000	Derived	0.02071 * X	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived	



ANNEXURE I TO NIT REF NO- PE/PG/RTC/E-6477/2020, DTD-15.07.2020

PRICE SCHEDULE FOR LT PVC CONTROL CABLES

FRAMEWORK AGREEMENT (RATE CONTRACT)

NAME OF VENDOR - (Please fill vendor's name)

SL. NO.	ITEM CODE	ITEM DESCRIPTION	UOM	QUANTIT Y	HSN CODE	UNIT EX- WORKS PRICE (DULY PACKED) OF TOTAL EX-WORKS PRICE (INR)	UNIT EX- WORKS PRICE (DULY PACKED) (INR)	FORMULA FOR TOTAL EX- WORKS PRICE (DULY PACKED) (INR)	TOTAL EX- WORKS PRICE (DULY PACKED) (INR)	FREIGHT CHARGES WITHOUT GST @ % OF TOTAL EX WORKS (INR)	APPLICABLE GST RATE % ON (TOTAL EX WORKS + FREIGHT) (INR)	TOTAL FOR SITE PRICE (INR)	REMARKS
1	2	3	4	5	6	7	8	9	10	11	12	13	14
C.8	507-30032-A	7C - 2.5- UNARMoured	Metres	91000	8544	0.01476 * X /91000	Derived	0.01476 * X	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived	
C.9	507-30925-A	10C - 2.5- UNARMoured	Metres	12000	8544	0.00276 * X /12000	Derived	0.00276 * X	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived	
C.10	507-30004-A	12C - 2.5- UNARMoured	Metres	43000	8544	0.01305 * X /43000	Derived	0.01305 * X	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived	
C.11	507-30918-A	14C-1.5 SQ.MM Unarmoured	Metres	182000	8544	0.03254 * X /182000	Derived	0.03254 * X	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived	
C.12	507-30070-A	16C - 2.5- UNARMoured	Metres	22000	8544	0.00748 * X /22000	Derived	0.00748 * X	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived	
C.13	507-30071-A	19C - 2.5- UNARMoured	Metres	205000	8544	0.08078 * X /205000	Derived	0.08078 * X	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived	
C.14	507-30072-A	24C - 2.5- UNARMoured	Metres	15000	8544	0.00715 * X /15000	Derived	0.00715 * X	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived	
D	GRAND TOTAL (A.1 TO C.14)								X= TO BE QUOTED (IN FIGURES)	Derived = Rs Y	Derived	Derived	

NOTE:-

1. Bidder to note that evaluation shall be on Total Ex works price + Freight. Bidder to quote grand total Ex works value of the complete package (Sl. No D Column 10.i.e Rs X) only as per the BOQ above. The item wise break up of Ex works prices (unit as well as total) for all the items in the BOQ shall be derived as per the formulae indicated above by BHEL. Bidder also need to indicate Freight and GST rate in percentage in the respective column. Freight percentage to be quoted in percentage of Ex works value considering delivery anywhere in India.

2. The standard drum length shall be 1000 meters as indicated above. Tolerance on individual drum length shall be $\pm 5\%$.

3. Overall tolerance on total dispatched quantity of each size shall be (-) 2% and (+) 0% except where the total ordered quantity is one single drum length of 1000m, in which case it shall be -5% to 0%. Cables consumed for testing and inspection shall be to bidder's account.

4. For each individual cable size, one short length of not less than 200m may be accepted only in the final drum length to complete the supply (except where the total ordered quantity is one single drum length of 1000m). The overall tolerance limits stipulated above shall continue to apply (in case short lengths are accepted).

5. In case of the quantities cleared by BHEL for manufacturing are manufactured and offered for inspection by successful bidder in more than one batch, BHEL reserves the right to witness type testing on all batches without any price implications.

6. For Projects having additional requirement of (a) FRLS inner sheath, (b) HRPVC insulation, (c) outer sheath only FR, additional price implication over basic unit price for these three variant shall be as per Annexure-I A to 'BOQ cum Price Schedule'.



ANNEXURE I TO NIT REF NO- PE/PG/RTC/E-6477/2020, DTD-15.07.2020

PRICE SCHEDULE FOR LT PVC CONTROL CABLES

FRAMEWORK AGREEMENT (RATE CONTRACT)

NAME OF VENDOR - (Please fill vendor's name)

SL. NO.	ITEM CODE	ITEM DESCRIPTION	UOM	QUANTIT Y	HSN CODE	UNIT EX- WORKS PRICE (DULY PACKED) OF TOTAL EX-WORKS PRICE (INR)	UNIT EX- WORKS PRICE (DULY PACKED) (INR)	FORMULA FOR TOTAL EX- WORKS PRICE (DULY PACKED) (INR)	TOTAL EX- WORKS PRICE (DULY PACKED) (INR)	FREIGHT CHARGES WITHOUT GST @ % OF TOTAL EX WORKS (INR)	APPLICABLE GST RATE % ON (TOTAL EX WORKS + FREIGHT) (INR)	TOTAL FOR SITE PRICE (INR)	REMARKS
1	2	3	4	5	6	7	8	9	10	11	12	13	14

7. Unit price of cables quoted by bidder shall be inclusive of type test charges. No separate charges shall be payable for type tests.

8 Value is to be filled only where "to be quoted" is mentioned and for other columns where "derived" is mentioned same shall be derived by BHEL as per % allocation fixed against each item

9. Price mentioned anywhere else in BOQ shall not be taken in cognizance.

10. For any clarification please refer Technical Specification No-PE-RC-999-507-E004

11. In case of Reverse Auction, vendor has to quote their Ex Works price+ Freight , that is price quoted above at SI No-D, column 10 i.e. (Rs X) + Freight Value, Rs Y

12. Quantity variation shall be +30%.

ANNEXURE I A TO NIT REF NO- PE/PG/RTC/E-6450/2020, DTD-03.06.2020

Sl. No.	Description	%age Implication of Basic Price
1	Inner sheath FRLS in place of Non-FRLS	(+) 2.5 %
2	Outer sheath HR PVC in place of PVC	(+) 3.0 %
3	Cable type FR in place of FRLSH	(-) 1.0 %

 ANNEXURE-II: DEVIATION SHEET (COST OF WITHDRAWAL) PACKAGE:- LT PVC CONTROL CABLE- RATE CONTRACT (FRAMEWORK AGREEMENT)										
TENDER ENQUIRY REF NO-PE/PG/RTC/E-6477/2020. DTD-15.07.2020										
NAME OF VENDOR:-										
SL NO	VOLUME/ SECTION	PAGE NO.	CLAUSE NO.	TECHNICAL SPECIFICATION/ TENDER DOCUMENT	COMPLETE DESCRIPTION OF DEVIATION	COST OF WITHDRAWAL OF DEVIATION	REFERENCE OF PRICE SCHEDULE ON WHICH COST OF WITHDRAWAL OF DEVIATION IS APPLICABLE	NATURE OF COST OF WITHDRAWAL OF DEVIATION (POSITIVE/ NEGATIVE)	REASONS FOR QUOTING DEVIATION	
TECHNICAL DEVIATIONS										
COMMERCIAL DEVIATIONS										
PARTICULARS OF BIDDERS/ AUTHORISED REPRESENTATIVE										
NAME				DESIGNATIONS		SIGN & DATE				
NOTES:										
1. Cost of withdrawal of deviation will be applicable on the basic price (i.e. excluding taxes, duties & freight) only.										
2. All the bidders have to list out all their Technical & Commercial Deviations (if any) in detail in the above format.										
3. Any deviation not mentioned above and shown separately or found hidden in offer, will not be taken cognizance of.										
4. Bidder shall submit duly filled unpriced copy of above format indicating "quoted" in "cost of withdrawal of deviation" column of the schedule above along with their Techno-commercial offer, wherever applicable. In the absence of same, such deviation(s) shall not be considered and offer shall be considered in total compliance to NIT.										
5. Bidder shall furnish price copy of above format along with price bid.										
6. The final decision of acceptance/ rejection of the deviations quoted by the bidder shall be at discretion of the Purchaser.										
7. Bidders to note that any deviation (technical/commercial) not listed in above and asked after Part-I opening shall not be considered.										
8. For deviations w.r.t. Credit Period, Liquidated damages, Firm prices if a bidder chooses not to give any cost of withdrawal of deviation loading as per Annexure-VII, will apply. For any other deviation mentioned in un-priced copy of this format submitted with Part-I bid but not mentioned in priced copy of this format submitted with Priced bid, the cost of withdrawal of deviation shall be taken as NIL.										
9. Any deviation mentioned in priced copy of this format, but not mentioned in the un-priced copy, shall not be considered.										
10. All techno-commercial terms and conditions of NIT shall be deemed to have been accepted by the bidder, other than those listed in unpriced copy of this format.										
11. Cost of withdrawal is to be given separately for each deviation. In no event bidder should club cost of withdrawal of more than one deviation else cost of withdrawal of such deviations which have been clubbed together shall be considered as NIL.										
12. In case nature of cost of withdrawal (positive/negative) is not specified it shall be assumed as positive.										
13. In case of discrepancy in the nature of impact (positive/ negative), positive will be considered for evaluation and negative for ordering.										



ANNEXURE III TO NIT REF NO - PE/PG/RTC/E-6450/2020, DTD-03.06.2020

SPECIAL CONDITION OF (FRAMEWORK AGREEMENT) RATE CONTRACT FOR LT PVC CONTROL CABLES

1. BHEL/PEM on behalf of various BHEL units intends to enter into (Framework Agreement) Rate Contract for supply of the tendered items for a period of two years. The (Framework Agreement) Rate Contract shall come into force from the date of issue of Purchase order for Rate Contract. Validity for ordering shall be two years from the purchase order for (Framework Agreement) Rate Contract.
2. For this specific tender, Purchaser word referred in GCC Rev 07 shall mean BHEL units which will place project specific purchase order to seller on the basis of framework agreement (rate contract) finalized with this tender.
3. Seller to use GSTIN number (wherever required) of Purchaser i.e. BHEL unit who will issue project specific purchase order. GSTIN number mentioned in GCC Rev 07 shall be applicable for all project specific purchase orders issued by BHEL PEM.
4. Clause no 7 of GCTC, GCC Rev 07 is applicable for project specific purchase orders issued by BHEL PEM. For other BHEL Unit who will issue project specific purchase order, their respective DMS for drgs/docs submission will be applicable.
5. Details of consignee and project site information for dispatch of material shall be intimated at the time of placement of PO for specific project after finalization of (Framework Agreement) Rate Contract
6. Transit Insurance is in BHEL scope
7. The items will be required against respective projects. Exact quantities and Project information shall be intimated while placing order for a specific project based on the (Framework Agreement) Rate Contract.
8. The prices shall be on PVC basis during the period of two years with a provision for further extension after review on mutual consent. All bidders to quote as per the Price Variation Formulae for Cables uploaded on BHEL PEM website on the link - <https://www.bhelpem.com/Documents/GCC/Price%20Variation%20Formulae%20for%20Cables.pdf>
9. Inspection of materials shall be carried out by BHEL/CQA and or by Customer or by an authorized agency at manufacture's works before dispatch, if required. Dispatch of material to be done, only after receipt of BHEL/Customer MDCC. It is responsibility of vendor to for obtain Material Dispatch Clearance Certificate (MDCC) from BHEL or Customer as required before dispatch of material.

Vendor shall give inspection call on BHEL-CQS web site to applicable inspection agency with a copy of inspection call to BHEL for arranging Customer participation (if applicable) in inspection / Joint inspection on the proposed date with an advance notice of 15 working days. Inspection charges shall be paid by BHEL.

Items have to be manufactured as per specification and supplied strictly in accordance with the approved BHEL / Customer's Drawings & Quality Plan. The items/ test certificate of items, which for any reason are not acceptable to BHEL / Customer, shall be required to be retested. No extra charge shall be payable on those account by BHEL.

10. Other terms and conditions shall be as per Standard Technical specification no, GCC Rev 07 & Enquiry letter.
11. This enquiry is subject to Conditions/ limits if any imposed in PMD/ Vendor registration.
12. Tentative quantity is given in enquiry.
13. Bidders to submit offer for (Framework Agreement) Rate Contract of said items ONLINE via e-Procurement System only. Bidder to upload tender documents complete in all respects duly signed & stamped on each and every page by the authorized signatory of the bidder as a token of acceptance of all the terms and conditions of tender.
14. The Bidder along with its associate/ collaborators/ sub-contractors/ sub-vendor/ consultants/ service providers shall strictly adhere to BHEL Fraud Prevention Policy displayed on BHEL web site <http://www.bhel.com> and shall immediately bring to the notice of BHEL Management about any fraud as soon as it comes to their notice.

ANNEX-IV TO NIT REF NO- PE/PG/RTC/E-6477/2020, DTD-15.07.2020
TENTATIVE PROJECT LIST
FRAMEWORK AGREEMENT (RATE CONTRACT) - LT PVC CONTROL CABLES

Sl.No	Name of Project	
1	3 X 660MW Patratu TPS	
2	5X800MW Yadadri TPS	
3	2x800 MW TANGEDCO UPPUR TPP	
4	1X660MW Bhusawal TPS	
5	1x660 MW Sagardighi Unit 5	
6	2x660 MW Udangudi TPS	
7	4x270 Mw Bhadradi TPS	
8	Ennore	
9	1x660MW Panki TPS	
10	various running FGD projects	

BANK GUARANTEE FOR PERFORMANCE SECURITY

Bank Guarantee No: _____

Date: _____

To,

NAME

& ADDRESSES OF THE BENEFICIARY

Dear Sirs,

In consideration of the Bharat Heavy Electricals Limited 1 (hereinafter referred to as the 'Employer' which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns) incorporated under the Companies Act, 1956 and having its registered office at1 through its Unit at..... (name of the Unit) having awarded to (Name of the Vendor / Contractor / Supplier) having its registered office at2 hereinafter referred to as the 'Vendor/Contractor/Supplier', which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns), a contract Ref No.....dated3 valued at Rs 4 (Rupees)/ FC (in words) for..... 5 (hereinafter called the 'Contract') and the Vendor/Contractor/Seller having agreed to provide a Contract Performance Guarantee, equivalent to % (.... Percent) of the said value of the Contract to the Employer for the faithful performance of the Contract,

we, , (hereinafter referred to as the Bank), having registered/Head office at and inter alia a branch at being the Guarantor under this Guarantee, hereby, irrevocably and unconditionally undertake to forthwith and immediately pay to the Employer a maximum amount Rs 6 (Rupees) without any demur, immediately on first demand from the Employer and without any reservation, protest, and recourse and without the Employer needing to prove or demonstrate reasons for its such demand.

Any such demand made on the Bank shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs.

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

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

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

We BANK further agree with the Employer that the Employer shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said Contract or to extend time of performance by the said Vendor/Contractor/Supplier from time to time or to postpone for any time or from time to time any of the powers exercisable by the Employer against the said Vendor/Contractor/Supplier and to forbear or enforce any of the terms and conditions relating to the said Contract and we shall not be relieved from our liability by reason of any such variation, or extension being granted to the said Vendor/Contractor/Supplier or for any forbearance, act or omission on the part of the Employer or any indulgence by the Employer to the said Vendor/Contractor/Supplier or by any such matter or thing whatsoever which under the law relating to sureties would but for this provision have effect of so relieving us.

The Bank also agrees that the Employer at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor, in the first instance without proceeding against the Vendor/Contractor/Supplier and notwithstanding any security or other guarantee that the Employer may have in relation to the Vendor/Contractor/Supplier 's liabilities.

This Guarantee shall remain in force up to and including..... 7 and shall be extended from time to time for such period as may be desired by Employer.

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

Unless a demand or claim under this guarantee is made on us in writing on or before the8 we shall be discharged from all liabilities under this guarantee thereafter.

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

Notwithstanding anything to the contrary contained hereinabove:

- a. The liability of the Bank under this Guarantee shall not exceed6
- b. This Guarantee shall be valid up to7
- c. Unless the Bank is served a written claim or demand on or before..... 8 all rights under this guarantee shall be forfeited and the Bank shall be relieved and discharged from all liabilities under this guarantee irrespective of whether or not the original bank guarantee is returned to the Bank.

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

Dated.....

For and on behalf of

Place of Issue.....

(Name of the Bank)

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

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

3 DETAILS ABOUT THE NOTICE OF AWARD/ CONTRACT REFERENCE

4 CONTRACT VALUE

5 PROJECT/SUPPLY DETAILS

6 BG AMOUNT IN FIGURES AND WORDS

7 VALIDITY DATE

8 DATE OF EXPIRY OF CLAIM PERIOD

Note:

1. Units are advised that expiry of claim period may be kept 3-6 months after validity date. It may be ensured that the same is in line with the agreement/ contract entered with the vendor.
2. The BG should be on Non-Judicial Stamp paper/e-stamp paper of appropriate value as per Stamp Act prevailing in the State(s) where the BG is submitted or is to be acted upon or the rate prevailing in the State where the BG was executed, whichever is higher. The Stamp Paper/e-stamp paper shall be purchased in the name of Vendor/Contractor/Supplier/Bank issuing the guarantee.
3. In line with the GCC, SCC and contractual terms, Unit may carry out minor modifications in the Standard BG Formats. If required, such modifications may be carried out after taking up appropriately with the Unit/Region's Law Deptt.
4. In Case of Bank Guarantees submitted by Foreign Vendors-
 - a) From Nationalized Public Sector 1 Private Sector/ Foreign Banks (BG issued by Branches in India) can be accepted subject to the condition that the Bank Guarantee should be enforceable in the town/ city or at nearest branch where the Unit (New Delhi for POs issued from PEM Noida/ PO issuing agency) is located i.e. Demand can be presented at the Branch located in the town/ city or at nearest branch where the Unit is located.
 - b) From Foreign Banks (wherein Foreign Vendors intend to provide BG from local branch of the Vendor country's Bank)
 - b.1 In such cases, in the Tender Enquiry/ Contract itself, it may be clearly specified that Bank Guarantee issued by **any of the Consortium Banks** only will be accepted by BHEL. As such, Foreign Vendor needs to make necessary arrangements for issuance of Counter- Guarantee by Foreign Bank in favour of the Indian Bank's (BHEL's Consortium Bank) branch in India. It is advisable that all charges for issuance of Bank Guarantee/ Counter- Guarantee should be borne by the Foreign Vendor. The tender stipulation should clearly specify these requirements.
 - b 2 In case, Foreign Vendors intend to provide BG from Overseas Branch of our Consortium Bank (e.g. if a BG is to be issued by SBI Frankfurt), the same is acceptable. However, the procedure at sl.no. b.1 will required to be followed.
 - b 3 The BG issued may preferably be subject to Uniform Rules for Demand Guarantees (URDG) 758 (as amended from time to time). The BG Format provided to them should clearly specify the same.

or & On behalf of Guarantee issuing bank

(Office Seal)

Name:

E-mail ID:

Contact number:

BHEL-IP

AA:SSP:IP:R02 dtd 10.07.2018

Annexure-1

INTEGRITY PACT

Between

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

and

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

Preamble

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

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

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

Section 1- Commitments of the Principal

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

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

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

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

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

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

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

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

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

Section 4 - Compensation for Damages

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



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

Section 5 - Previous Transgression

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

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

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

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

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

Section 8 - Independent External Monitor(s)

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

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

Section 9 - Pact Duration

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

Section 10 - Other Provisions

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



10.2 Changes and supplements as well as termination notices need to be made in writing. Side agreements have not been made.

10.3 If the Contractor is a partnership or a consortium, this agreement must be signed by all partners or consortium members.

10.4 Should one or several provisions of this agreement turn out to be invalid, the remainder of this agreement remains valid. In this case, the parties will strive to come to an agreement to their original intentions.

10.5 Only those bidders / contractors who have entered into this agreement with the Principal would be competent to participate in the bidding. In other words, entering into this agreement would be a preliminary qualification.

For & On behalf of the Principal
 सुमीत साहाय (अ.प्र.प्र.) / Dy. Manager (CMM)
 उप प्रबंधक (अ.प्र.प्र.) / Dy. Manager (CMM)
 भारत भारी इलेक्ट्रिकल्स लिमिटेड / Bharat Heavy Electricals Ltd.
 नगर क्षेत्र-परियोजना इन्जीनियरिंग प्रबंधन
 Power Sector-Project Engineering Management
 एचआरडी एण्ड ईएसआई कॉम्प्लेक्स
 एचआरडी बिल्डिंग, HRD & ESI Complex,
 प्लॉट नं. १५, बंगलूर - २०१३०१

For & On behalf of the Bidder/
 Contractor

(Office Seal)

(Office Seal)

Place-----

Date-----

Witness: _____

(Name & Address) _____

BHEL PEM Noida

Witness: _____

(Name & Address) _____

LT PVC CONTROL CABLES

FRAMEWORK AGREEMENT - RATE CONTRACT

1. All bidders to quote as per the Price Variation Formulae for Cables uploaded on BHEL PEM website on the link given below.
<https://www.bhelpem.com/Documents/GCC/Price%20Variation%20Formulae%20for%20Cables.pdf>
2. Prices shall be variable as per following PVC formulae given below (basis IEEMA). The price variation shall be limited to + 20% of total ex-works actually supplied (cable size wise) and negative price variation shall be unlimited. Rates for working out price variation shall be as per rates published by IEEMA for the factors given in PVC Annexure II.
3. Base date for prices (as per IEEMA):

Initial Price (As per IEEMA) for Alo, CuO, CCo, PVCCo & Feo:

Base date shall be June 2020

Final Price (As per IEEMA) for Al, Cu, Cc, PVCC & Fe:

The first working day of month, one month prior to the date on which cable is notified as being ready for inspection i.e. TPIA inspection call raise date on web portal.

4. Variation factor value for ALF, CuF, CCFAL, CCFCu, XLFAL, XLFCu, FeF & FeW as applicable shall be as per Technical Specification
5. PVC shall be payable within contractual delivery period (including any extension thereto)

IEEMA TABLE FOR PRICE VARIATION CLAUSE FOR VARIOUS TYPE OF CABLE

Copper Conductor Cable

[illegible]

Ref: PW/PE/CMM-PVC Cables Packages (Rev-02)

Dated:19/02/2019

Note: Applicable for cable tenders released on or after 14/01/2019.

Price Variation Formulae for cables -Annexure-I

1. Prices shall be variable as per price variation formulae given below (basis IEEMA).
The price variation shall be limited to + 20% of total ex-works price actually supplied (cable size wise) and -ve price variation shall be unlimited. Rates for working out price variation shall be as per rates published by IEEMA for the factors given in Annexure-II

2. Base date for prices:

Initial Price (As per IEEMA) for- Alo, Cuo, CCo, PVCCo & Feo:

Base Date shall be- 1st working day of the previous month to the date of issue of tender enquiry.

Final Price (as per IEEMA) for- Al, Cu, Cc, PVCC & Fe:

1st working day of month, one month prior to the date on which cable is notified as being ready for inspection i.e TPIA inspection call raise date on web portal.

3. Variation factor value for ALF, CuF, CCFAL, CCFCu, XLFAL, XLFCu, FeF & FeW as applicable shall be as per Technical Specification.

4. PVC shall be payable within contractual delivery period (including any extension thereto).

IEEMA table for Price variation cause for various type of cable

1. Aluminium conductor cable

S.No	Cable Type	AIF (Single core unarmoured & Multi core armoured)	AIF (Single core armoured)	CCFAI	XLFAL (Single core)	XLFAL (Multi core)	FeF	FeW	IEEMA Formula
1.	HT XLPE Power cable	ALP	H1	H2	XL3	XL4	H3	H5	$P = P_o + AIF(AL - Alo) + XLFAL(CC - CCo) + CCFAI(PVCC - PVCCo) + FeF(Fe - Feo)$
2.	LT XLPE Power Cable	ALP	P1	L2	XL1	XL1	P3	P3 (Additional)	$P = P_o + AIF(AL - Alo) + XLFAL(CC - CCo) + CCFAI(PVCC - PVCCo) + FeF(Fe - Feo)$
3.	LT PVC Power Cable	ALP	P1	P2	-	-	P3	P3 (Additional)	$P = P_o + AIF(AL - Alo) + CCFAI(PVCC - PVCCo) + FeF(Fe - Feo)$
4.	LT HRPVC Power Cable	ALP	P1	P2	-	-	P3	P3 (Additional)	$P = P_o + AIF(AL - Alo) + CCFAI(PVCC - PVCCo) + FeF(Fe - Feo)$

2. Copper conductor cable

S no.	Cable type	CuF	AIF (single core armoured)	CCFCu	XLFCU (Single core)	XLFCU (Multi core)	FeF	FeW	IEEMA Formula
1	HT XLPE Power cable	CUP	H4	H2	XL3	XL4	H3	H5	$P = P_o + CuF(Cu - Cuo) + XLFCU(CC - CCo) + CCFCu(PVCC - PVCCo) + FeF(Fe - Feo) + AIF(AL - Alo)$
2	LT XLPE Power Cable	CUP	P4	L2	XL1	XL1	P3	P3 (Additional)	$P = P_o + CuF(Cu - Cuo) + XLFCU(CC - CCo) + CCFCu(PVCC - PVCCo) + FeF(Fe - Feo) + AIF(AL - Alo)$

S no.	Cable type	CuF	AIF (single core armoured)	CCFCu	XLFCU (Single core)	XLFCU (Multi core)	FeF	FeW	IEEMA Formula
3	LT PVC Power Cable	CUP	P4	P2	--	--	P3	P3 (Addit ional)	$P=Po+CuF(Cu-Cuo) + CCFCu(PVCC-PVCCo) + FeF(Fe-Feo) + AIF(AL-Alo)$
4	LT HRPVC Power Cable	CUP	P4	P2	--	--	P3	P3 (Addit ional)	$P=Po+CuF(Cu-Cuo) + CCFCu(PVCC-PVCCo) + FeF(Fe-Feo) + AIF(AL-Alo)$
5	LT XLPE Control Cable	CUC	--	P5	--	XL2	P6	P6 (Addit ional)	$P=Po+CuF(Cu-Cuo) + XLFCU(CC-CCo) + CCFCu(PVCC-PVCCo) + FeF(Fe-Feo)$
6	LT PVC Control Cable	CUC	--	P5	--	--	P6	P6 (Addit ional)	$P=Po+CuF(Cu-Cuo) + CCFCu(PVCC-PVCCo) + FeF(Fe-Feo)$
7	LT HRPVC Control Cable	CUC	--	P5	--	--	P6	P6 (Addit ional)	$P=Po+CuF(Cu-Cuo) + CCFCu(PVCC-PVCCo) + FeF(Fe-Feo)$
8	LT XLPE Fire Survival Power Cable	CUP	P4	L2	XL1	XL1	P3	P3 (Addit ional)	$P=Po+CuF(Cu-Cuo) + XLFCU(CC-CCo) + CCFCu(PVCC-PVCCo) + FeF(Fe-Feo) + AIF(AL-Alo)$
9	LT XLPE Fire Survival Control	CUC	--	P5	--	XL2	P6	P6 (Addit ional)	$P=Po+CuF(Cu-Cuo) + XLFCU(CC-CCo) + CCFCu(PVCC-PVCCo) + FeF(Fe-Feo)$
10	LT EPR Fire Survival Power Cable	CUP	P4	L2	--	--	P3	P3 (Addit ional)	$P=Po+CuF(Cu-Cuo) + CCFCu(PVCC-PVCCo) + FeF(Fe-Feo) + AIF(AL-Alo)$
11	LT EPR Fire Survival Control cable	CUC	--	P5	--	--	P6	P6 (Addit ional)	$P=Po+CuF(Cu-Cuo) + CCFCu(PVCC-PVCCo) + FeF(Fe-Feo)$
12	Screened control Cable (Overall screen)	Cu POS	--	--	--	--	Fe POS	Fe POS	$P=Po+CuF(Cu-Cuo) + FeF(Fe-Feo)$
13	Screened control Cable (Individual	Cu PIS	--	--	--	--	Fe PIS	Fe PIS	$P=Po+CuF(Cu-Cuo) + FeF(Fe-Feo)$

IEEMA Table for Price Variation Clause for various types of Cables**Notes:-**

- (i) Cu POS, Cu PIS, Fe POS & Fe PIS tables shall be as per IEEMA circular No. IEEMA (PVC) /Instrumentation Cable/2014 effective from dtd 01.07.2014.
- (ii) All other tables shall be as per IEEMA circular No. 35//DIV/CAB/05/ dated 24.04.2018.

Terms used in PVC formulae:

P = Price payable as adjusted in accordance with above appropriate formula (In Rs./Km).
 Po= Price quoted/confined (in Rs./km).

1. ALUMINIUM

ALF Variation factor for aluminium.
 Al =Price of aluminium.
 Alo = Price of aluminium.

2 COPPER

CuF =Variation factor for copper.
 Cu = Price of CC copper rods.
 Cuo = Price of CC copper rods.

3.PVCc COMPOUND/POLYMER

PVCc = Price of PVC compound.
 PVCco= Price of PVC compound.
 CCFAL= Variation factor for PVC compound/Polymer for aluminium conductor cable.
 CCFCu =Variation factor for PVC compound/Polymer for copper conductor cable.

4. XLPE COMPOUND

Cc = Price of XLPE compound.
 Cco= Price of XLPE compound.
 XLFAL= Variation factor for XLPE compound for aluminium conductor cable.
 XLFCu =Variation factor for XLPE compound for copper conductor cable.

5.STEEL

Fe= Price of steel strips/steel wire.
 Feo= Price of steel strips/steel wire.
 FeF =Variation factor for steel.
 FeW=Variation factor for round wire steel armouring.



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IEEMA (PVC)/Instrumentation Cable/2014

Effective from: 1st July 2014

Material Price Variation Clause For Instrumentation Cables

The Price quoted/confirmed is based on the input cost of raw materials/components as on the date of quotation, and the same is deemed to be related to the prices of raw materials as specified in the price variation clause given below. In case of any variation in these prices, the price payable shall be subject to adjustment up or down in accordance with the formulae provided in this document.

Terms used in price variation formulae:

P Price payable as adjusted in accordance with above appropriate formula (in Rs/Km)

P₀ Price quoted/confirmed (in Rs/Km)

COPPER

CuF Variation factor for copper

Cu Price of CC copper rods. This price is as applicable on first working day of the month, one month prior to the date of delivery.

Cu₀ Price of CC copper rods. This price is as applicable on first working day of the month, one month prior to the date of tendering.

STEEL

FeF Variation factor for steel

Fe Price of Steel Strips/steel wire. This price is as applicable on the first working day of the month, one month prior to the date of delivery.

Fe₀ Price of steel strips/steel wire. This price is as applicable on first working day of the month, one month prior to the date of tendering.

The above prices and indices are as published by IEEMA vide Circular reference IEEMA(PVC)/CABLE/--/ prevailing as on 1st working day of the month i.e. one month prior to the date of tendering.

The date of delivery is the date on which the cable is notified as being ready for inspection/dispatch (in the absence of such notification, the date of manufacturer's dispatch note is to be considered as the date of delivery) or the contracted delivery date (including any agreed extension thereto), whichever is earlier.

Page 1 of 2

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Indian Electrical & Electronics Manufacturers' Association

IEEMA (PVC)/Instrumentation Cable/2014

Effective from: 1st July 2014

Notes

- (a) All prices of raw materials are exclusive of modvatable excise/CV duty amount and exclusive of any other central, state or local taxes, octroi, etc.
- (b) All Prices are as on first working day of the month.
- (c) The details of prices are as under:
 - 1. Price of CC copper rods (in Rs/MT) is ex-works price as quoted by the primary producer.
 - 2. Price of galvanized steel strip / steel wire (in Rs/MT) is ex-works price as quoted by the manufacturer for Round steel Wire and Flat steel strip (the relevant price of steel strip or steel wire is to be selected depending upon the type of armouring of the cable).

Price variation formula for 'Instrumentation Cables'

$$P = P_o + CuF (Cu - Cu_o) + FeF (Fe - Fe_o)$$

1. For Pair Instrumentation Over all Screen Cables

Tables References:

Cu POS Copper Factor
Fe POS Steel Factor

2. For Pair Instrumentation Individual and Over all Screen Cables

Tables References:

Cu PIS Copper Factor
Fe PIS Steel Factor

3. For Triad Instrumentation Over all Screen Cables

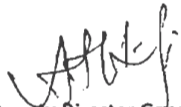
Tables References:

Cu TOS Copper Factor
Fe TOS Steel Factor

4. For Triad Instrumentation Individual & Overall Screen Cables

Tables References:

Cu TIS Copper Factor
Fe TIS Steel Factor


Deputy Director General
Page 2 of 2

Copper Factors for Instrumentation Cables - CuF

Cu POS

Pair Instrumentation Over all Screen Cables					
No. of Pairs Cable size in sq.mm	0.5 sq.mm	0.75 sq.mm	1.0 sq.mm	1.5 sq.mm	2.5 sq.mm
1	0.0142	0.0185	0.0233	0.0326	0.0500
2	0.0258	0.0345	0.0440	0.0625	0.0978
3	0.0353	0.0484	0.0626	0.0904	0.1433
4	0.0448	0.0623	0.0811	0.1183	0.1888
5	0.0578	0.0800	0.1022	0.1467	0.2356
6	0.0662	0.0926	0.1210	0.1768	0.2829
7	0.0756	0.1067	0.1378	0.2000	0.3245
8	0.0852	0.1204	0.1582	0.2327	0.3741
9	0.0933	0.1334	0.1734	0.2534	0.4134
10	0.1046	0.1485	0.1959	0.2893	0.4665
11	0.1111	0.1600	0.2089	0.3067	0.5023
12	0.1236	0.1764	0.2333	0.3452	0.5580
13	0.1289	0.1867	0.2445	0.3600	0.5912
14	0.1378	0.2000	0.2623	0.3867	0.6356
15	0.1467	0.2134	0.2800	0.4134	0.6801
16	0.1618	0.2322	0.3080	0.4573	0.7409
17	0.1645	0.2400	0.3156	0.4667	0.7690
18	0.1734	0.2534	0.3334	0.4934	0.8134
19	0.1822	0.2667	0.3512	0.5201	0.8579
20	0.1911	0.2800	0.3689	0.5467	0.9023
21	0.2000	0.2934	0.3867	0.5734	0.9468
22	0.2089	0.3067	0.4045	0.6001	0.9912
23	0.2178	0.3200	0.4223	0.6267	1.0357
24	0.2381	0.3437	0.4575	0.6813	1.1068
25	0.2356	0.3467	0.4578	0.6801	1.1246
26	0.2445	0.3600	0.4756	0.7068	1.1690
27	0.2534	0.3734	0.4934	0.7334	1.2135
28	0.2623	0.3867	0.5112	0.7601	1.2579
29	0.2711	0.4001	0.5290	0.7868	1.3024
30	0.2800	0.4134	0.5467	0.8134	1.3468
31	0.2889	0.4267	0.5645	0.8401	1.3913
32	0.2978	0.4401	0.5823	0.8668	1.4357
33	0.3067	0.4534	0.6001	0.8934	1.4802
34	0.3156	0.4667	0.6179	0.9201	1.5246
35	0.3245	0.4801	0.6356	0.9468	1.5691
36	0.3334	0.4934	0.6534	0.9735	1.6135
37	0.3423	0.5067	0.6712	1.0001	1.6580
38	0.3512	0.5201	0.6890	1.0268	1.7024
39	0.3600	0.5334	0.7068	1.0535	1.7469
40	0.3689	0.5467	0.7245	1.0801	1.7913
41	0.3778	0.5601	0.7423	1.1068	1.8358
42	0.3867	0.5734	0.7601	1.1335	1.8802
43	0.3956	0.5867	0.7779	1.1601	1.9247
44	0.4045	0.6001	0.7957	1.1868	1.9691
45	0.4134	0.6134	0.8134	1.2135	2.0136
46	0.4223	0.6267	0.8312	1.2402	2.0580
47	0.4312	0.6401	0.8490	1.2668	2.1025
48	0.4710	0.6759	0.9010	1.3410	2.2009

Copper Factors for Instrumentation Cables - CuF

Cu PIS

Pair Instrumentation Individual and Over all Screen Cables					
No. of Pairs Cable size in sq.mm	0.5 sq.mm	0.75 sq.mm	1.0 sq.mm	1.5 sq.mm	2.5 sq.mm
1	0.0133	0.0178	0.0222	0.0311	0.0489
2	0.0349	0.0437	0.0531	0.0717	0.1069
3	0.0490	0.0621	0.0763	0.1041	0.1570
4	0.0630	0.0806	0.0994	0.1389	0.2071
5	0.0800	0.1022	0.1245	0.1689	0.2578
6	0.0937	0.1200	0.1484	0.2042	0.3103
7	0.1067	0.1378	0.1689	0.2311	0.3556
8	0.1218	0.1569	0.1948	0.2692	0.4107
9	0.1334	0.1734	0.2134	0.2934	0.4534
10	0.1503	0.1943	0.2417	0.3349	0.5122
11	0.1600	0.2089	0.2578	0.3556	0.5512
12	0.1785	0.2313	0.2882	0.4001	0.6128
13	0.1867	0.2445	0.3023	0.4178	0.6490
14	0.2000	0.2623	0.3245	0.4489	0.6979
15	0.2134	0.2800	0.3467	0.4801	0.7468
16	0.2350	0.3053	0.3812	0.5305	0.8141
17	0.2400	0.3156	0.3912	0.5423	0.8446
18	0.2534	0.3334	0.4134	0.5734	0.8934
19	0.2667	0.3512	0.4356	0.6045	0.9423
20	0.2800	0.3689	0.4578	0.6356	0.9912
21	0.2934	0.3867	0.4801	0.6668	1.0401
22	0.3067	0.4045	0.5023	0.6979	1.0890
23	0.3200	0.4223	0.5245	0.7290	1.1379
24	0.3479	0.4535	0.5673	0.7911	1.2165
25	0.3467	0.4578	0.5690	0.7912	1.2357
26	0.3600	0.4756	0.5912	0.8223	1.2846
27	0.3734	0.4934	0.6134	0.8534	1.3335
28	0.3867	0.5112	0.6356	0.8846	1.3824
29	0.4001	0.5290	0.6579	0.9157	1.4313
30	0.4134	0.5467	0.6801	0.9468	1.4802
31	0.4267	0.5645	0.7023	0.9779	1.5291
32	0.4401	0.5823	0.7245	1.0090	1.5780
33	0.4534	0.6001	0.7468	1.0401	1.6269
34	0.4667	0.6179	0.7690	1.0712	1.6758
35	0.4801	0.6356	0.7912	1.1024	1.7247
36	0.4934	0.6534	0.8134	1.1335	1.7736
37	0.5067	0.6712	0.8357	1.1646	1.8225
38	0.5201	0.6890	0.8579	1.1957	1.8713
39	0.5334	0.7068	0.8801	1.2268	1.9202
40	0.5467	0.7245	0.9023	1.2579	1.9691
41	0.5601	0.7423	0.9246	1.2891	2.0180
42	0.5734	0.7601	0.9468	1.3202	2.0669
43	0.5867	0.7779	0.9690	1.3513	2.1158
44	0.6001	0.7957	0.9912	1.3824	2.1647
45	0.6134	0.8134	1.0135	1.4135	2.2136
46	0.6267	0.8312	1.0357	1.4446	2.2625
47	0.6401	0.8490	1.0579	1.4757	2.3114
48	0.6887	0.8936	1.1186	1.5587	2.4186

Steel Factors for Instrumentation Cables - FeF					
Fe POS					
Pair Instrumentation Over all Screen Cables					
No. of Pairs Cable size in sq.mm	0.5 sq.mm	0.75 sq.mm	1.0 sq.mm	1.5 sq.mm	2.5 sq.mm
1	0.1490	0.1565	0.1635	0.1735	0.1930
2	0.2190	0.2335	0.2470	0.2665	0.2595
3	0.2360	0.2545	0.2690	0.2900	0.2680
4	0.2390	0.2580	0.2715	0.2945	0.2830
5	0.2630	0.2820	0.2420	0.2805	0.3155
6	0.2840	0.3160	0.2805	0.2995	0.3430
7	0.2840	0.2595	0.2805	0.2995	0.3430
8	0.3235	0.2930	0.3030	0.3315	0.3780
9	0.2805	0.3180	0.3290	0.3590	0.4205
10	0.2970	0.3215	0.3455	0.3755	0.4385
11	0.3005	0.3255	0.3490	0.3805	0.4435
12	0.3055	0.3440	0.3680	0.3880	0.4520
13	0.3265	0.3530	0.3780	0.4105	0.4785
14	0.3265	0.3530	0.3780	0.4105	0.4785
15	0.3490	0.3765	0.4015	0.4365	0.5195
16	0.3490	0.3765	0.4015	0.4365	0.5195
17	0.3590	0.4005	0.4140	0.4635	0.5470
18	0.3590	0.4005	0.4265	0.4635	0.5470
19	0.3590	0.4005	0.4265	0.4635	0.5470
20	0.3830	0.4240	0.4535	0.4920	0.5760
21	0.3830	0.4240	0.4535	0.4920	0.5760
22	0.4065	0.4520	0.4785	0.5310	0.6190
23	0.4065	0.4520	0.4810	0.5310	0.6190
24	0.4305	0.4770	0.5070	0.5595	0.6475
25	0.4305	0.4770	0.5070	0.5595	0.6475
26	0.4305	0.4770	0.5070	0.5595	0.6475
27	0.4355	0.4820	0.5245	0.5660	0.6700
28	0.4570	0.5045	0.5345	0.5895	0.6950
29	0.4570	0.5045	0.5345	0.5895	0.6950
30	0.4570	0.5045	0.5345	0.5895	0.6950
31	0.4795	0.5285	0.5595	0.6150	0.7225
32	0.4820	0.5285	0.5595	0.6150	0.7225
33	0.4820	0.5285	0.5595	0.6150	0.7225
34	0.4920	0.5520	0.5835	0.6410	0.7500
35	0.4920	0.5520	0.5835	0.6410	0.7500
36	0.4920	0.5520	0.5835	0.6410	0.7500
37	0.4920	0.5520	0.5835	0.6410	0.7500
38	0.5145	0.5760	0.6225	0.6550	0.7805
39	0.5145	0.5760	0.6225	0.6550	0.7805
40	0.5145	0.5760	0.6225	0.6550	0.7805
41	0.5395	0.6025	0.6475	0.6975	0.8230
42	0.5395	0.6025	0.6475	0.6975	0.8230
43	0.5395	0.6025	0.6475	0.6975	0.8230
44	0.5635	0.6265	0.6735	0.7250	0.8540
45	0.5635	0.6265	0.6760	0.7250	0.8540
46	0.5635	0.6265	0.6760	0.7250	0.8540
47	0.5635	0.6265	0.6760	0.7250	0.8540
48	0.5635	0.6265	0.6760	0.7375	0.8665

Steel Factors for Instrumentation Cables - FeF

Fe PIS

Pair Instrumentation Individual and Over all Screen Cables

No. of Pairs Cable size in sq.mm	0.5 sq.mm	0.75 sq.mm	1.0 sq.mm	1.5 sq.mm	2.5 sq.mm
1	0.1880	0.1980	0.2070	0.2220	0.2410
2	0.2315	0.2460	0.2595	0.2815	0.2755
3	0.2505	0.2690	0.2820	0.2495	0.2830
4	0.2645	0.2830	0.2420	0.2805	0.3155
5	0.2895	0.2730	0.2805	0.3005	0.3430
6	0.2755	0.2980	0.3005	0.3280	0.3730
7	0.2755	0.2980	0.3005	0.3280	0.3730
8	0.2980	0.3215	0.3455	0.3740	0.4230
9	0.3230	0.3490	0.3730	0.4040	0.4685
10	0.3405	0.3655	0.3765	0.4215	0.4885
11	0.3430	0.3690	0.3815	0.4265	0.4945
12	0.3490	0.3765	0.4015	0.4470	0.5160
13	0.3715	0.3990	0.4255	0.4720	0.5420
14	0.3715	0.3990	0.4255	0.4720	0.5420
15	0.3955	0.4240	0.4510	0.5020	0.5720
16	0.3955	0.4240	0.4510	0.5020	0.5720
17	0.4190	0.4495	0.4795	0.5295	0.6150
18	0.4190	0.4495	0.4795	0.5295	0.6150
19	0.4190	0.4495	0.4795	0.5295	0.6150
20	0.4445	0.4770	0.5060	0.5570	0.6450
21	0.4445	0.4895	0.5060	0.5695	0.6450
22	0.4695	0.5045	0.5345	0.5870	0.6885
23	0.4695	0.5045	0.5345	0.5870	0.6885
24	0.4970	0.5310	0.5620	0.6285	0.7210
25	0.4970	0.5310	0.5620	0.6285	0.7210
26	0.4970	0.5310	0.5620	0.6285	0.7210
27	0.5035	0.5495	0.5810	0.6360	0.7410
28	0.5135	0.5610	0.6050	0.6610	0.7690
29	0.5135	0.5610	0.6050	0.6610	0.7690
30	0.5260	0.5610	0.6050	0.6610	0.7690
31	0.5495	0.5845	0.6300	0.6885	0.7990
32	0.5495	0.5845	0.6300	0.6885	0.7990
33	0.5495	0.5845	0.6300	0.6885	0.7990
34	0.5735	0.6225	0.6585	0.7285	0.8405
35	0.5735	0.6225	0.6585	0.7285	0.8405
36	0.5735	0.6225	0.6585	0.7285	0.8405
37	0.5735	0.6225	0.6585	0.7285	0.8405
38	0.5990	0.6485	0.6850	0.7575	0.8740
39	0.5990	0.6485	0.6850	0.7575	0.8740
40	0.5990	0.6485	0.6850	0.7575	0.8740
41	0.6250	0.6775	0.7135	0.7880	0.9180
42	0.6250	0.6775	0.7135	0.7880	0.9180
43	0.6250	0.6775	0.7135	0.7880	0.9180
44	0.6485	0.7050	0.7410	0.8165	0.9495
45	0.6485	0.7050	0.7410	0.8165	0.9495
46	0.6485	0.7050	0.7410	0.8165	0.9495
47	0.6485	0.7050	0.7410	0.8165	0.9495
48	0.6485	0.7050	0.7535	0.8290	0.9620



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Cir. No. 35/DIV/CAB/05/

24th April 2018

To Members of the Cable Division, Utilities, Railways & Listed purchasing organizations

Sub: Correction in PV formulae of LT XLPE Power Cable and addition of factors for HT XLPE Power Cables

We have recently published revised Price Variation Clause for LT&HT XLPE Power Cables and made it effective from 1st November 2017 vide Cir. No.111/DIV/CAB/05 dated 5th December 2017

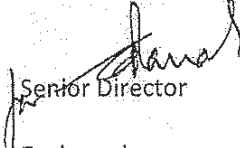
While replying to a query of a buyer it is observed that the polymer factor for LT XLPE Power Cables (both aluminium and copper) was incorrectly represented by Table P2.

We have now corrected the anomaly by correcting the PV formulae of LT XLPE Aluminium and Copper Insulated Cables (Sl. No. D & E) by representing Polymer factor by Table L2.

We have also worked out factors for XLPE, Copper and Steel for 3 core HT XLPE Power Cables for 500 and 630 sq.mm.

We now enclose complete PV clause of Cable by including all the PV formulae of different types of power cable (Sl. No. A to I), polymer factor Table L2 and updated XL4, H2 and H5 Table of factors for your perusal & record.

We request to replace PV clause of Cable already circulated vide Cir. 111/DIV/CAB/05 dated 5th December 2017 with the enclosed PV clause in your records for future use.


 Senior Director
 Encl: as above

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IEEMA (PVC)/CABLE(R-1)/2017**Effective from: 1st November 2017****Material Price Variation Clause For PVC And XLPE Insulated Cables**

The Price quoted/confirmed is based on the input cost of raw materials/components as on the date of quotation, and the same is deemed to be related to the prices of raw materials as specified in the price variation clause given below. In case of any variation in these prices, the price payable shall be subject to adjustment up or down in accordance with the formulae provided in this document.

Terms used in price variation formulae:

P Price payable as adjusted in accordance with above appropriate formula (in Rs/Km)

Po Price quoted/confirmed (in Rs/Km)

ALUMINIUM

AIF Variation factor for aluminium

AI Price of Aluminium. This price is as applicable of first working day of the month, one month prior to the date of delivery.

Alo Price of aluminium. This price is as applicable on first working day of the month, one month prior to the date of tendering.

COPPER

CuF Variation factor for copper

Cu Price of CC copper rods. This price is as applicable on first working day of the month, one month prior to the date of delivery.

Cuo Price of CC copper rods. This price is as applicable on first working day of the month, one month prior to the date of tendering.

PVC COMPOUND

PVCc price of PVC compound. This price is as applicable on first working day of the month, one month prior to the date of delivery.

PVCco Price of PVC compound. This price is as applicable on first working day of the month, one month prior to the date of tendering.

CCFAI Variation factor for PVC compound/Polymer for aluminum conductor cable.

CCFCu Variation factor for PVC compound/Polymer for copper conductor cable.

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IEEMA (PVC)/CABLE(R-1)/2017
XLPE COMPOUND

Effective from: 1st November 217

Cc price of XLPE compound. This price is as applicable on first working day of the month, one month prior to the date of delivery.

Cco Price of XLPE compound. This price is as applicable on first working day of the month, one month prior to the date of tendering.

XLFAL Variation factor for XLPE compound for aluminum conductor cable.

XLFCU Variation factor for XLPE compound for Copper conductor cable.

STEEL

FeF Variation factor for steel

FeW Variation factor for round wire steel armouring

Fe Price of Steel Strips/steel wire. This price is as applicable on the first working day of the month, one month prior to the date of delivery.

Feo Price of steel strips/steel wire. This price is as applicable on first working day of the month, one month prior to the date of tendering.

The above prices and indices are as published by IEEMA vide Circular reference IEEMA (PVC)/CABLE R(1)/--/-- prevailing as on 1st working day of the month i.e. one month prior to the date of tendering.

The date of delivery is the date on which the cable is notified as being ready for inspection/dispatch (in the absence of such notification, the date of manufacturer's dispatch note is to be considered as the date of delivery) or the contracted delivery date (including any agreed extension thereto), whichever is earlier.

Notes

- (a) All prices of raw materials are exclusive of GST amount.
- (b) All prices excluding Aluminium & Copper are as on first working day of the month.
- (c) The details of prices are as under:

1. Price of Aluminium is LME average Cash SELLER Settlement price of Primary Aluminium in US\$ per MT as published by London Metal Bulletin (LME) including Premium for Aluminium Ingot in US\$ per MT is converted in Indian Rs./MT.
2. Price of PVC Compound (in Rs/MT) is the ex-works price, as quoted by the manufacturer.
3. Price of XLPE Compound (in Rs/MT) is the ex-works price, as quoted by the manufacturer
4. Price of CC copper rods (in Rs/MT) is ex-works price as quoted by the primary producer.
5. Price of galvanized steel strip / steel wire (in Rs/MT) is ex-works price as quoted by the manufacturer for Round steel Wire and Flat steel strip (the relevant price of steel strip or steel wire is to be selected depending upon the type of armouring of the cable).

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IEEMA (PVC)/CABLE(R-1)/2017**Effective from: 1st November 217****Price variation formulae for 'Power Cables'****A. Aluminum conductor PVC insulated 1.1 kV power cables**

$$P = P_o + AIF (AL - ALo) + CCFAI (PVCc - PVCco) + FeF (Fe - Feo)$$

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

Table References:

ALP	Aluminium conductor in single core unarmoured & multicore cables
P1	Aluminium conductor aluminium armour in single core armoured cables
P2	PVC compound
P3	Steel armour

B. Copper conductor PVC insulated 1.1 kV power cables

$$P = P_o + CuF (Cu - Cuo) + CCFCu (PVCc - PVCco) + FeF (Fe - Feo) + AIF (Al - ALo)$$

For steel armoured cables; AIF = 0 For aluminium armoured cables; FeF = 0

For unarmoured cables; FeF, AIF = 0

Tables References:

CUP	Copper conductor
P2	PVC compound
P3	Steel armour
P4	Aluminium armour

C. Copper conductor PVC insulated 1.1 kV control cables

$$P = P_o + CuF (Cu - Cuo) + CCFCu (PVCc - PVCco) + FeF (Fe - Feo)$$

For unarmoured cables; FeF = 0

Tables References:

CUC	Copper conductor
P5	PVC compound
P6	Steel armour

D. Aluminum conductor XLPE insulated 1.1 kV power cables

$$P = P_o + AIF (AL - ALo) + XLFAL (CC - Cco) + CCFAI (PVCc - PVCco) + FeF (Fe - Feo)$$

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

Table References:

ALP	Aluminium conductor in single core unarmoured & multicore cables
P1	Aluminium conductor aluminium armour in single core armoured cables
L2	Polymer (CCFAI)
P3	Steel armour
XL1	XLPE Compound (XLFAL)

E. Copper conductor XLPE insulated 1.1 kV power cables

$$P = P_o + CuF (Cu - Cuo) + XLFCU (CC - Cco) + CCFCu (PVCc - PVCco) + FeF (Fe - Feo) + AIF (Al - ALo)$$

For steel armoured cables; AIF = 0 For aluminium armoured cables; FeF = 0

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For unarmoured cables; FeF, AIF = 0

Tables References:

CUP	Copper conductor
L2	Polymer (CCFCu)
P3	Steel armour
P4	Aluminium armour
XL1	XLPE Compound (XLFCu)

F. Copper conductor XLPE insulated 1.1 kV control cables

$$P = P_o + CuF (Cu - Cu_o) + XLFCU (CC-Cco) + CCFCu (PVCc-PVCco) + FeF (Fe-Fe_o)$$

For unarmoured cables; FeF = 0

Tables References:

CUC	Copper conductor
P5	PVC compound
P6	Steel armour
XL2	XLPE Compound

G. For Aluminium conductor XLPE insulated 3.3 to 33 kV power cables

$$P = P_o + AIF (Al - Al_o) + XLFAL (CC-Cco) + CCFAI (PVCc - PVCco) + FeF (Fe - Fe_o)$$

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

Table References:

ALP	Aluminium conductor in single core unarmoured & multicore cables
H1	Aluminium conductor + aluminium armour in single core armoured cables
H2	Polymer
H3/H5	Steel armour (Flat/Round)
XL3/XL4	XLPE Compound (Single core /Multicore)

H. Copper conductor XLPE Insulated 3.3 to 33 kV power cables

$$P = P_o + CuF (Cu - Cu_o) + XLFCU (CC-Cco) + CCFCu (PVCc - PVCco) + FeF (Fe - Fe_o) + AIF (Al - Al_o)$$

For steel armoured cables; AIF = 0 For aluminium armoured cables; FeF = 0

For unarmoured cables; FeF, AIF = 0

Table References:

CUP	Copper conductor
H2	Polymer
H3/H5	Steel armour (Flat/Round)
H4	Aluminium armour
XL3/XL4	XLPE Compound (Single core /Multicore)

I. Copper conductor XLPE insulated 1.0 and 1.5 kV Solar PV DC cables

$$P = P_o + CuF (Cu - Cu_o)$$

Table CUdc Copper Conductor

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TABLE ALP

VARIATION FACTOR FOR ALUMINIUM (AIF)
POWER CABLES WITH ALUMINIUM CONDUCTOR
(EXCLUDING SINGLE CORE ARMoured CABLES)

Nominal Cross Sectional Area (in Sq. mm.)	1 core	2 core	3 core	3.5 core	4 core
2.5	0.007	0.014	0.021	-	0.028
4	0.011	0.023	0.034	-	0.046
6	0.017	0.034	0.052	-	0.069
10	0.029	0.053	0.087	-	0.116
16	0.046	0.091	0.137	-	0.183
25/16	0.073	0.146	0.219	0.262	0.292
35/16	0.101	0.202	0.302	0.345	0.404
50/25	0.137	0.273	0.410	0.478	0.547
70/35	0.197	0.395	0.593	0.687	0.791
95/50	0.274	0.548	0.821	0.949	1.095
120/70	0.346	0.691	1.035	1.221	1.382
150/70	0.425	0.853	1.279	1.464	1.706
185/95	0.533	1.070	1.605	1.861	2.140
225/120	0.655	1.310	1.965	2.287	2.620
240/120	0.703	1.400	2.099	2.421	2.799
300/150	0.879	1.757	2.635	3.033	3.514
400/185	1.126	2.249	3.374	3.873	4.498
500	1.418	2.838	4.256	-	5.675
630	1.828	3.663	5.494	-	7.326
800	2.340	4.679	7.018	-	9.357
1000	2.951	5.890	8.834	-	11.779

IEEMA (PVC)/CABLE(R-1)/2017

Effective from: 1st November 217

TABLE CUP

VARIATION FACTOR FOR COPPER CONDUCTOR (CUF)
POWER CABLES WITH COPPER CONDUCTOR

Nominal Cross Sectional Area (in Sq. mm.)	1 core	2 core	3 core	3.5 core	4 core
2.5	0.023	0.046	0.069	-	0.092
4	0.036	0.076	0.112	-	0.151
6	0.056	0.112	0.171	-	0.227
10	0.095	0.174	0.286	-	0.382
16	0.151	0.299	0.451	-	0.602
25/16	0.240	0.480	0.720	0.862	0.960
35/16	0.332	0.664	0.993	1.135	1.329
50/25	0.451	0.898	1.348	1.572	1.799
70/35	0.648	1.299	1.950	2.260	2.602
95/50	0.901	1.802	2.700	3.121	3.601
120/70	1.138	2.273	3.407	4.016	4.545
150/70	1.398	2.806	4.207	4.815	5.611
185/95	1.753	3.519	5.279	6.121	7.038
225/120	2.154	4.309	6.463	7.522	8.617
240/120	2.312	4.605	6.904	7.963	9.206
300/150	2.891	5.779	8.667	9.976	11.558
400/185	3.703	7.397	11.097	12.738	14.794
500	4.664	9.334	13.998	-	18.665
630	6.012	12.048	18.070	-	24.095
800	7.696	15.389	23.082	-	30.775
1000	9.706	19.372	29.055	-	38.741

TABLE CU_{sd}c

VARIATION FACTOR FOR COPPER CONDUCTOR (CUF)
1.0 & 1.5KV Solar PV DC Cables with Copper Conductor

Cable Size in sq.mm.	Copper content in MT/km
2.5	0.023
4	0.038
6	0.058
10	0.090

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Effective from: 1st November 217

TABLE CUC

**VARIATION FACTOR FOR COPPER CONDUCTOR (CUF)
CONTROL CABLES WITH COPPER CONDUCTOR**

No of Cores	Core size 1.5 sq mm	Core size 2.5 sq mm
2	0.026	0.047
3	0.039	0.070
4	0.052	0.094
5	0.065	0.117
6	0.078	0.141
7	0.091	0.164
8	0.110	0.182
9	0.117	0.205
10	0.130	0.235
12	0.157	0.282
14	0.183	0.329
16	0.209	0.376
18	0.246	0.410
19	0.248	0.446
20	0.260	0.456
24	0.313	0.563
27	0.352	0.634
30	0.391	0.704
37	0.483	0.869
44	0.573	1.033
52	0.678	1.221
61	0.796	1.432

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TABLE P1

Effective from: 1st November 217

VARIATION FACTOR FOR ALUMINIUM (AIF)
ALUMINIUM ARMoured SINGLE CORE PVC INSULATED 1.1 KV CABLES

Nominal cross sectional area (in Sq.mm)	Aluminium factor for Aluminium armoured cable with aluminium conductor
4	0.0685
6	0.0795
10	0.1017
16	0.1303
25	0.1693
35	0.2090
50	0.2597
70	0.3360
95	0.4567
120	0.5443
150	0.6427
185	0.7743
240	0.9737
300	1.2582
400	1.5502
500	1.8958
630	2.3650
800	2.9306
1000	3.7666

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Effective from: 1st November 2017

TABLE P2

VARIATION FACTOR FOR PVC COMPOUND (CCFAI/CCFCu)
PVC INSULATED 1.1 KV POWER CABLES WITH COPPER/ALUMINIUM CONDUCTOR

Nominal cross Sectional Area (in Sq. mm)	1 core	2 core		3 core		3.5 core		4 core	
	Unarm	Unarm	arm	Unarm	arm	Unarm	arm	Unarm	arm
2.5	0.079	0.125	0.139	0.141	0.157	-	-	0.161	0.179
4	0.094	0.140	0.156	0.164	0.182	-	-	0.188	0.209
6	0.101	0.154	0.171	0.179	0.199	-	-	0.198	0.220
10	0.114	0.194	0.216	0.214	0.238	-	-	0.249	0.277
16	0.142	0.234	0.246	0.279	0.290	-	-	0.328	0.345
25	0.171	0.288	0.303	0.364	0.383	0.422	0.444	0.443	0.466
35	0.189	0.321	0.338	0.403	0.429	0.489	0.515	0.498	0.524
50	0.211	0.411	0.433	0.508	0.535	0.613	0.645	0.647	0.681
70	0.241	-	-	0.613	0.645	0.707	0.744	-	-
95	0.284	-	-	0.795	0.811	0.908	0.927	-	-
120	0.339	-	-	0.866	0.884	1.024	1.045	-	-
150	0.388	-	-	1.070	1.092	1.289	1.315	-	-
185	0.450	-	-	1.310	1.337	1.499	1.530	-	-
225	0.521	-	-	1.586	1.618	1.840	1.878	-	-
240	0.534	-	-	1.649	1.683	1.990	2.031	-	-
300	0.653	-	-	2.007	2.048	2.361	2.409	-	-
400	0.770	-	-	2.437	2.487	2.616	2.669	-	-
500	0.936	-	-	3.117	3.181	3.687	3.762	-	-
630	1.175	-	-	-	-	-	-	-	-
800	1.433	-	-	-	-	-	-	-	-
1000	1.642	-	-	-	-	-	-	-	-

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Effective from: 1st November 2017

TABLE P3

VARIATION FACTOR FOR STEEL (FeF)
PVC INSULATED 1.1 KV POWER CABLES WITH COPPER/ALUMINIUM CONDUCTOR

Nominal Cross sectional Area (in Sq. mm)	2 core	Shape	3 core	Shape	3 ½ core	Shape	4 core	Shape
4	0.305	W	0.335	W	-	-	0.363	W
6	0.348	W	0.363	W	-	-	0.407	W
10	0.392	W	0.407	W	-	-	0.293	F
16	0.235	F	0.293	F	-	-	0.323	F
25	0.293	F	0.352	F	0.382	F	0.382	F
35	0.323	F	0.382	F	0.411	F	0.440	F
50	0.382	F	0.440	F	0.469	F	0.499	F
70	0.411	F	0.499	F	-	F	0.587	F
95	0.499	F	0.587	F	0.616	F	0.645	F
120	0.528	F	0.616	F	0.675	F	0.731	F
150	0.587	F	0.675	F	0.731	F	0.790	F
185	0.645	F	0.761	F	0.820	F	0.879	F
240	0.731	F	0.879	F	0.937	F	0.996	F
300	0.820	F	0.966	F	1.055	F	1.113	F
400	0.937	F	1.083	F	1.172	F	1.231	F
500	1.055	F	1.231	F	1.348	F	1.406	F
630	1.172	F	-	-	-	-	-	-

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TABLE P3 (Additional)

Effective from: 1st November 2017

VARIATION FACTOR FOR ROUND WIRE 'W' STEEL (FeF)
PVC INSULATED 1.1 KV POWER CABLES WITH COPPER/ALUMINIUM CONDUCTOR

Nominal Cross Sectional Area (in sq. mm)	2 Core	3 Core	3.5 Core	4 Core
1.5	0.247	0.259		0.288
2.5	0.273	0.289		0.329
4	0.305	0.335		0.363
6	0.348	0.363		0.407
10	0.392	0.407		0.533
16	0.439	0.523	0.014	0.573
25	0.526	0.625	0.664	0.685
35	0.591	0.685	0.729	0.761
50	0.661	0.790	0.864	1.108
70	0.745	1.122	1.200	1.256
95	1.085	1.286	1.376	1.443
120	1.147	1.386	1.479	1.562
150	1.267	1.526	1.684	2.173
185	1.403	2.090	2.315	2.421
240	1.994	2.397	2.641	2.722
300	2.180	2.642	3.670	3.842
400	2.987	3.728	4.126	4.292
500	3.517	4.226	5.958	6.301
630	4.774	6.018	6.737	7.141

IEEMA (PVC)/CABLE(R-1)/2017

Effective from: 1st November 217

TABLE P4

VARIATION FACTOR FOR ALUMINIUM (AIF)
PVC INSULATED 1.1 KV POWER CABLES WITH COPPER CONDUCTOR

Nominal Cross Sectional Area (in Sq. mm)	Aluminium Factor for Aluminium armoured cable with copper conductor
4	0.058
6	0.063
10	0.073
16	0.084
25	0.096
35	0.108
50	0.123
70	0.139
95	0.183
120	0.198
150	0.218
185	0.241
240	0.271
300	0.379
400	0.424
500	0.478
630	0.537
800	0.591
1000	0.816

IEEMA (PVC)/CABLE(R-1)/2017

Effective from: 1st November 2017

TABLE P5

VARIATION FACTOR FOR PVC COMPOUND (CCFCu)
PVC INSULATED CONTROL CABLES WITH COPPER CONDUCTOR

No of cores	Core size 1.5 sq mm		Core size 2.5 sq mm	
	Unarm	Arm	Unarm	Arm
2	0.118	0.121	0.125	0.139
3	0.121	0.131	0.141	0.157
4	0.137	0.152	0.161	0.179
5	0.157	0.174	0.187	0.206
6	0.179	0.199	0.234	0.260
7	0.179	0.199	0.234	0.260
8	0.193	0.215	0.292	0.325
9	0.216	0.241	0.300	0.335
10	0.236	0.262	0.303	0.337
12	0.249	0.277	0.334	0.371
14	0.311	0.327	0.389	0.409
16	0.344	0.362	0.435	0.458
18	0.352	0.371	0.474	0.500
19	0.375	0.395	0.476	0.501
20	0.391	0.412	0.519	0.546
24	0.457	0.481	0.584	0.615
27	0.491	0.517	0.631	0.664
30	0.529	0.557	0.706	0.743
37	0.615	0.647	0.835	0.879
44	0.739	0.778	1.019	1.026
52	0.845	0.889	1.100	1.158
61	0.952	1.002	1.246	1.312

IEEMA (PVC)/CABLE(R-1)/2017

Effective from: 1st November 2017

TABLE P6

VARIATION FACTOR FOR STEEL (FeF)
PVC INSULATED CONTROL CABLES WITH COPPER CONDUCTOR

No of cores	Core size 1.5 sq mm	Shape of armour	Core size 2.5 sq mm	Shape of armour
2	0.243	W	0.277	W
3	0.257	W	0.289	W
4	0.277	W	0.314	W
5	0.303	W	0.342	W
6	0.329	W	0.379	W
7	0.329	W	0.379	W
8	0.341	W	0.456	W
9	0.383	W	0.275	F
10	0.408	W	0.325	F
12	0.289	F	0.342	F
14	0.306	F	0.360	F
16	0.317	F	0.372	F
18	0.332	F	0.350	F
19	0.343	F	0.397	F
20	0.368	F	0.400	F
24	0.398	F	0.475	F
27	0.414	F	0.478	F
30	0.425	F	0.503	F
37	0.461	F	0.548	F
44	0.507	F	0.601	F
52	0.556	F	0.641	F
61	0.585	F	0.685	F

IEEMA (PVC)/CABLE(R-1)/2017
TABLE P6 (Additional)

Effective from: 1st November 217

VARIATION FACTOR FOR ROUND WIRE 'W' STEEL (FeF)
PVC INSULATED CONTROL CABLES WITH COPPER CONDUCTOR

No. of Cores	Core size 1.5 sq mm	Core size 2.5 sq mm
2	0.243	0.273
3	0.257	0.289
4	0.277	0.314
5	0.303	0.342
6	0.329	0.379
7	0.329	0.379
8	0.341	0.456
9	0.383	0.508
10	0.408	0.535
12	0.510	0.572
14	0.546	0.625
16	0.581	0.660
19	0.608	0.696
24	0.714	0.819
25	0.679	0.798
27	0.732	0.837
28	0.696	0.815
30	0.758	0.881
33	0.747	0.883
37	0.820	1.217
44	0.926	1.355
48	1.122	1.308
50	1.122	1.308
52	1.149	1.361
56	1.202	1.388
61	1.299	1.520

IEEMA (PVC)/CABLE(R-1)/2017

Effective from: 1st November 217

TABLE L2

VARIATION FACTOR FOR POLYMER (CCFAI / CCFCu)
XLPE INSULATED 1.1 KV POWER CABLES WITH COPPER / ALUMINIUM CONDUCTOR

Nominal Cross Sectional Area (in Sq. mm)	1 core	2 core		3 core		3.5 core		4 core	
	Unarm	Unarm	Arm	Unarm	Arm	Unarm	Arm	Unarm	Arm
2.5	0.055	0.163	0.175	0.166	0.177	-	-	0.177	0.188
4	0.075	0.201	0.204	0.205	0.213	-	-	0.218	0.213
6	0.085	0.213	0.234	0.205	0.230	-	-	0.242	0.232
10	0.082	0.252	0.280	0.217	0.251	-	-	0.285	0.298
16	0.089	0.278	0.341	0.289	0.246	-	-	0.300	0.279
25	0.101	0.307	0.278	0.276	0.247	0.295	0.264	0.331	0.290
35	0.109	0.330	0.319	0.305	0.270	0.328	0.292	0.368	0.319
50	0.124	0.482	0.685	0.348	0.311	0.372	0.335	0.422	0.394
70	0.146	0.354	0.335	0.469	0.397	0.489	0.420	0.528	0.464
95	0.163	0.436	0.389	0.504	0.441	0.544	0.471	0.591	0.523
120	0.176	0.475	0.421	0.556	0.498	0.599	0.538	0.722	0.656
150	0.217	0.510	0.490	0.690	0.611	0.717	0.633	0.840	0.762
185	0.236	0.631	0.608	0.836	0.738	0.854	0.756	1.007	0.899
240	0.273	0.750	0.726	1.002	0.842	1.079	0.952	1.238	1.119
300	0.303	0.919	0.887	1.161	1.012	1.170	1.031	1.457	1.414
400	0.372	1.093	1.040	1.376	1.283	1.545	1.379	1.778	1.626
500	0.413	1.342	-	1.568	1.400	1.806	1.456	-	-
630	0.469	1.546	-	-	-	-	-	-	-
800	0.569	-	-	-	-	-	-	-	-
1000	0.667	-	-	-	-	-	-	-	-

IEEMA (PVC)/CABLE(R-1)/2017

Effective from: 1st November 217

TABLE XL1
VARIATION FACTOR FOR XLPE COMPOUND (XLFAL/XLFUCU)
XLPE INSULATED 1.1 KV POWER CABLES WITH COPPER/ALUMINIUM CONDUCTOR

Nominal cross Sectional Area (in Sq. mm)	1 core		2 core		3 core		3.5 core		4 core	
	Unarm	Arm	Unarm	Arm	Unarm	arm	Unarm	Arm	Unarm	arm
2.5	0.007	0.010	0.014	0.014	0.021	0.021			0.028	0.028
4	0.009	0.012	0.018	0.018	0.027	0.027			0.036	0.036
6	0.010	0.015	0.022	0.022	0.033	0.033			0.043	0.043
10	0.013	0.018	0.025	0.025	0.039	0.039			0.053	0.053
16	0.016	0.023	0.034	0.034	0.049	0.049			0.065	0.065
25	0.021	0.030	0.048	0.048	0.070	0.070	0.084	0.084	0.093	0.093
35	0.025	0.035	0.059	0.059	0.084	0.084	0.099	0.099	0.112	0.112
50	0.033	0.044	0.075	0.075	0.108	0.108	0.130	0.130	0.144	0.144
70	0.042	0.054	0.095	0.095	0.137	0.137	0.160	0.160	0.179	0.179
95	0.048	0.062	0.110	0.110	0.160	0.160	0.190	0.190	0.211	0.211
120	0.060	0.076	0.138	0.138	0.200	0.200	0.239	0.239	0.266	0.266
150	0.078	0.095	0.180	0.180	0.259	0.259	0.296	0.296	0.344	0.344
185	0.097	0.116	0.224	0.224	0.324	0.324	0.369	0.369	0.430	0.430
240	0.116	0.137	0.266	0.266	0.388	0.388	0.446	0.446	0.518	0.518
300	0.138	0.164	0.325	0.325	0.467	0.467	0.540	0.540	0.620	0.620
400	0.175	0.214	0.357	0.357	0.536	0.536	0.619	0.619	0.714	0.714
500	0.217	0.260	0.440	0.440	0.660	0.660	0.769	0.769	0.880	0.880
630	0.265	0.318	0.542	0.542	0.814	0.814	0.941	0.941	1.085	1.085
800	0.323	0.389								
1000	0.375	0.444								

IEEMA (PVC)/CABLE(R-1)/2017

Effective from: 1st November 217

TABLE XL2
VARIATION FACTOR FOR XLPE COMPOUND (XLFCU)
XLPE INSULATED CONTROL CABLES WITH COPPER CONDUCTOR

No of cores	Core size 1.5 sq mm		Core size 2.5 sq mm	
	Unarm	Arm	Unarm	Arm
2	0.010	0.010	0.012	0.012
3	0.016	0.016	0.018	0.018
4	0.021	0.021	0.025	0.025
5	0.026	0.026	0.031	0.031
6	0.031	0.031	0.037	0.037
7	0.036	0.036	0.043	0.043
8	0.036	0.036	0.043	0.043
9	0.042	0.042	0.049	0.049
10	0.052	0.052	0.061	0.061
12	0.062	0.062	0.074	0.074
14	0.073	0.073	0.086	0.086
16	0.083	0.083	0.098	0.098
18	0.094	0.094	0.110	0.110
19	0.099	0.099	0.116	0.116
20	0.104	0.104	0.123	0.123
24	0.125	0.125	0.147	0.147
27	0.140	0.140	0.165	0.165
30	0.156	0.156	0.184	0.184
37	0.192	0.192	0.227	0.227
44	0.229	0.229	0.270	0.270
52	0.270	0.270	0.319	0.319
61	0.317	0.317	0.374	0.374

IEEMA (PVC)/CABLE(R-1)/2017

Effective from: 1st November 217

TABLE XL3

VARIATION FACTOR FOR XLPE(XLFAL/XLFUC)

SINGLE CORE ARMoured /UNARMoured XLPE INSULATED 3.3 to 33 KV POWER CABLES WITH
CU / AL CONDUCTOR

Nominal Cross Sectional Area (in Sq. mm.)	XLPE Factor for Armoured/ Unarmoured Cable with AL /CU Conductor					
	3.3 KV	6.6 KV (E)	11 KV (E)/ 6.6 KV (UE)	11 KV (UE)	22 KV (E)	33 KV (E)
25	0.110	0.131	0.170	0.279		
35	0.122	0.137	0.175	0.284	0.317	0.522
50	0.135	0.151	0.191	0.307	0.341	0.563
70	0.155	0.172	0.215	0.342	0.379	0.615
95	0.174	0.193	0.241	0.377	0.417	0.670
120	0.192	0.212	0.262	0.407	0.449	0.713
150	0.209	0.229	0.283	0.437	0.481	0.757
185	0.228	0.250	0.308	0.471	0.518	0.809
240	0.255	0.279	0.343	0.519	0.569	0.883
300	0.280	0.322	0.372	0.560	0.613	0.943
400	0.326	0.392	0.420	0.625	0.683	1.041
500	0.388	0.461	0.469	0.694	0.757	1.142
630	0.467	0.520	0.529	0.777	0.845	1.265
800	0.567	0.593	0.602	0.874	0.949	1.407
1000	0.656	0.665	0.660	0.955	1.036	1.525

Note : XLPE factors include Semicons for Conductor & Insulation screen

TABLE - XL4

VARIATION FACTOR FOR XLPE (CCF1A/ / CCF1Cu)

3 CORE XLPE INSULATED 3.3 to 33 KV POWER CABLES WITH COPPER / ALUMINIUM CONDUCTOR

Nominal Cross Sectional Area (in Sq. mm)	3.3 KV ARM	6.6 KV (E) ARM	6.6 KV (UE) / 11 KV (E) ARM	11 KV (UE) ARM	22 KV (E) ARM	33 KV (E) ARM
25	0.315	0.394	0.511	0.838		
35	0.339	0.427	0.545	0.880	0.982	1.638
50	0.378	0.474	0.600	0.957	1.065	1.751
70	0.435	0.541	0.679	1.067	1.183	1.916
95	0.489	0.604	0.755	1.171	1.295	2.071
120	0.537	0.661	0.822	1.265	1.396	2.210
150	0.585	0.719	0.890	1.359	1.497	2.350
185	0.642	0.784	0.968	1.468	1.614	2.513
240	0.717	0.873	1.074	1.615	1.773	2.732
300	0.781	1.006	1.167	1.744	1.928	2.919
400	0.886	1.227	1.314	1.948	2.130	3.229
500	0.956	1.421	1.446	2.148	2.381	3.538
630	1.129	1.582	1.609	2.382	2.630	3.940

Note : XLPE factors include Semicons for Conductor & Insulation screen

TABLE H1
VARIATION FACTOR FOR ALUMINIUM (AIF)
ALUMINIUM ARMoured SINGLE CORE XLPE INSULATED 3.3 TO 33 KV CABLES

Nominal Cross Sectional Area (in Sq. mm.)	Aluminium Factor for Aluminium Armoured Cable with Aluminium Conductor					
	3.3 KV	6.6 KV (E)	11 KV (E)/ 6.6 KV (UE)	11 KV (UE)	22 KV (E)	33 KV (E)
35	0.251	0.284	0.301	0.344	0.358	0.473
50	0.312	0.336	0.352	0.397	0.408	0.672
70	0.385	0.409	0.423	0.469	0.501	0.723
95	0.476	0.500	0.518	0.637	0.656	0.856
120	0.561	0.586	0.601	0.726	0.744	0.949
150	0.653	0.678	0.696	0.823	0.842	1.050
185	0.773	0.797	0.893	0.949	0.965	1.183
240	0.997	1.063	1.083	1.139	1.154	1.387
300	1.209	1.271	1.283	1.333	1.307	1.753
400	1.438	1.556	1.565	1.620	1.636	2.046
500	1.873	1.901	1.910	2.110	2.128	2.484
630	2.337	2.361	2.369	2.580	2.595	2.978
800	3.007	3.071	3.080	3.145	3.163	3.588
1000	3.737	3.741	3.749	3.804	3.822	4.565

TABLE H2
VARIATION FACTOR FOR POLYMER (CCFAI / CCFCu)
3 CORE XLPE INSULATED 3.3 to 33 KV POWER CABLES WITH COPPER / ALUMINIUM CONDUCTOR

Nominal Cross Sectional Area (in Sq. mm)	3.3 KV ARM	6.6 KV (E) ARM	6.6 KV (UE) / 11 KV (E) ARM	11 KV (UE) ARM	22 KV (E) ARM	33 KV (E) ARM
35	0.374	0.990	1.142	1.604	1.782	-
50	0.445	1.119	1.260	1.834	2.046	2.864
70	0.547	1.290	1.396	2.011	2.284	3.219
95	0.594	1.440	1.647	2.269	2.428	3.367
120	0.732	1.692	1.877	2.498	2.715	3.646
150	0.812	1.906	2.061	2.767	2.931	3.927
185	0.960	2.086	2.406	3.028	3.180	4.166
240	1.130	2.484	2.744	3.398	3.580	4.589
300	1.219	2.912	3.161	3.840	4.016	5.029
400	1.313	3.530	3.664	4.353	4.666	5.736
500	1.652	3.925	3.971	4.621	4.878	5.913
630	1.949	4.487	4.982	5.225	5.477	6.696

Fillers added in PVC consumption

IEEMA (PVC)/CABLE(R-1)/2017

Effective from: 1st November 217

TABLE H3
VARIATION FACTOR FOR STEEL (FeF)
XLPE INSULATED 3.3 TO 33 KV POWER CABLES WITH COPPER / ALUMINIUM CONDUCTOR

Nominal Cross Sectional Area Sq. mm.	3.3 KV	6.6 KV (E)	11 KV (E) / 6.6 KV (UE)	11 KV (UE)	22 KV (E)	33 KV (E)
25	0.551	0.604	0.656	0.814		
35	0.645	0.645	0.731	0.879	0.937	-
50	0.675	0.703	0.761	0.937	0.966	1.181
70	0.761	0.761	0.849	0.996	1.055	1.289
95	0.820	0.849	0.907	1.083	1.113	1.348
120	0.879	0.907	0.966	1.142	1.172	1.406
150	0.966	0.966	1.055	1.201	1.259	1.494
185	1.025	1.055	1.113	1.259	1.318	1.553
240	1.142	1.142	1.231	1.377	1.406	1.641
300	1.231	1.259	1.318	1.465	1.524	1.758
400	1.348	1.406	1.435	1.582	1.641	1.876

IEEMA (PVC)/CABLE(R-1)/2017

Effective from: 1st November 217

TABLE H4
VARIATION FACTOR FOR ALUMINIUM (AIF)
XLPE INSULATED SINGLE CORE 3.3 TO 33 KV POWER CABLES WITH COPPER CONDUCTOR

Nominal Cross Sectional Area (in Sq. mm.)	Aluminium Factor for Aluminium Armoured Cable with Copper Conductor					
	3.3 KV	6.6 KV (E)	11 KV (E)/ 6.6 KV (UE)	11 KV (UE)	22 KV (E)	33 KV (E)
35	0.153	0.187	0.204	0.247	0.258	0.372
50	0.179	0.203	0.220	0.262	0.275	0.425
70	0.196	0.219	0.233	0.278	0.311	0.444
95	0.213	0.237	0.254	0.373	0.392	0.470
120	0.228	0.253	0.268	0.393	0.410	0.488
150	0.243	0.269	0.287	0.414	0.432	0.504
185	0.261	0.285	0.381	0.437	0.455	0.526
240	0.324	0.389	0.410	0.465	0.480	0.556
300	0.365	0.428	0.440	0.490	0.510	0.737
400	0.432	0.471	0.480	0.536	0.552	0.783
500	0.489	0.517	0.526	0.726	0.744	0.844
630	0.544	0.568	0.572	0.787	0.801	0.902
800	0.706	0.787	0.797	0.862	0.880	0.982
1000	0.824	0.865	0.867	0.923	0.940	1.324

TABLE - H5
VARIATION FACTOR FOR STEEL (FeW)
XLPE INSULATED 3.3KV TO 33 KV POWER CABLES WITH COPPER / ALUMINIUM CONDUCTOR

Nominal Cross Sectional Area in Sq. mm	3.3/3.3 KV	3.3/6.6 KV	11 KV (E) / 6.6 KV (UE)	11 KV (UE)	22 KV (E)	33 KV (E)
25	1.258	1.457	1.612	2.509	1.503	--
35	1.361	1.569	1.853	2.644	2.797	2.517
50	1.682	1.687	2.321	2.800	2.921	4.569
70	2.033	1.979	2.503	3.219	3.347	4.809
95	2.202	2.507	2.718	4.019	4.200	5.437
120	2.371	2.675	2.882	4.241	4.416	6.713
150	2.870	2.847	3.265	4.447	4.621	6.976
185	3.121	3.309	4.148	4.726	5.289	7.356
240	3.758	4.227	4.442	5.442	6.651	7.718
300	4.099	5.024	5.182	6.894	7.084	8.187
400	5.750	6.572	6.658	7.433	7.657	8.760
500	6.716	6.777	6.861	7.588	7.797	8.830
630	7.492	7.465	7.477	8.209	8.386	9.413

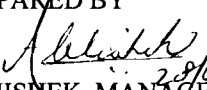
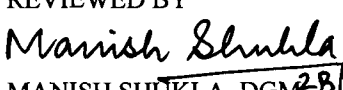
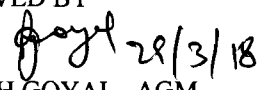
31487(1)/2020/PS-PEM-EL

	PRE-QUALIFICATION REQUIREMENTS FOR LT HRPVC FRLS CONTROL CABLE	PE-PQ-999-507-E020
		REVISION NO. 1 DATE 28/03/2018
		SHEET NO. 1 OF 1

ITEMS : LT HRPVC Control Cable	
SCOPE : Supply : YES; Erection & Commissioning : NO;	
1.0	Vendor should be a manufacturer of LT control cables.
2.0	Availability of test reports of tests of LT PVC/HRPVC FRLS control cables to establish in-house capability to carry out all routine, type & acceptance tests as per relevant IS/ International Standards (except UV radiation & hydrolytic stability test which can be conducted at Govt. Lab/ Govt. approved Independent lab).
3.0	Capacity of manufacturing 200 km of LT control cables per month.
4.0	Manufactured and supplied at least one (1) km of FRLS cables.
5.0	Manufactured and supplied LT control cables upto 12 cores.
6.0	Manufactured & supplied at least 500 km of LT control cables of min. 1.5 sq. mm..in one or more orders and at least 100 km of LT control cables of min. 1.5 sq. mm. in one single order.
7.0	Minimum two (2) nos. purchase orders for LT PVC/HRPVC control cables shall be submitted which should not be more than five (5) years old from the date of application for registration or date of techno- commercial bid opening (as applicable) for establishing continuity in business.

Notes (General points):

1. Consideration of offer shall be subject to customer's approval of bidders, if applicable.
2. Bidder to submit all supporting documents in English. If documents submitted by bidder are in language other than English, a self-attested English translated document should also be submitted.
3. Any other project specific requirement shall be as per Annexure-I and bidder shall submit relevant supporting documents. Bidder to meet criteria as stated above and as per Annexure- I
4. Notwithstanding anything stated above, BHEL reserves the right to assess the capabilities and capacity of the bidder to perform the contract, should the circumstances warrant such assessment in the overall interest of BHEL.
5. After satisfactory fulfillment of all the above criteria/ requirement, offer shall be considered for further evaluation as per NIT and all the other terms of the tender.

PREPARED BY  ABHISHEK, MANAGER (CONVENOR)	REVIEWED BY  MANISH SHUKLA, DGM (APPROVER)	APPROVED BY  RAJNISH GOYAL, AGM (DH)
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ANNEXURE – I**PROJECT SPECIFIC CRITERIA AGAINST ENQUIRY****PROJECT: BULK PROCUREMENT FOR LT PVC CONTROL CABLE**

The bidder/ vendor should have manufactured and supplied as on 08.08.18:

- a) Atleast 300 km of PVC insulated, PVC sheathed stranded copper conductor 1.1kV grade cables in one single contract.
- b) Atleast one (1) km of Flame retardant low smoke cables.

In case of any conflict of project specific PQR with main PQR, vendor to furnish document meeting the stringent requirement between the main PQR and project specific PQR.

Devendra Singh
[Dy. Manager-Elect]

Kavita Gupta
[Manager-Elect]

Manish Shukla
[Sr. DGM-Elect]

Debasisa Rath
[DH-Electrical]

VOLUME-II

TECHNICAL SPECIFICATION

FOR

LT CONTROL CABLE

SPECIFICATION NO: *PE-RC-999-507-E004*

REVISION: 00



BHARAT HEAVY ELECTRICALS LIMITED

POWER SECTOR

PROJECT ENGINEERING MANAGEMENT

NOIDA, UP (INDIA) – 201301



**TECHNICAL SPECIFICATION FOR
LT CONTROL CABLES**

SPECIFICATION NO. PE-RC-999-507-E004

VOLUME II

SECTION

REVISION 0

DATE:

SHEET 1 OF 1

CONTENTS

<u>S. NO.</u>	<u>DESCRIPTION</u>	<u>NO. OF SHEETS</u>
1.	SECTION – I	
	COMPLIANCE CERTIFICATE	01
	SPECIFIC TECHNICAL REQUIREMENTS	03
	DATA SHEET-A	03
	DATA SHEET-C	03
2.	SECTION – II	
	STANDARD TECHNICAL SPECIFICATION	03
	QUALITY PLAN (ALONGWITH ANNEXURE A TO QP)	21
	TYPICAL DRG. FOR WOODEN DRUM	01

TOTAL NO. OF SHEETS=

(INCLUDING COVER/ SEPARATOR SHEETS)



**TECHNICAL SPECIFICATION FOR
LT PVC CONTROL CABLES**

SPECIFICATION NO. PE-RC- 999-507-E004

VOLUME II

SECTION I

REVISION 0

DATE:

SHEET 1 of 1

COMPLIANCE CERTIFICATE

The bidder shall confirm compliance to the following by signing/ stamping this compliance certificate and furnishing same with the offer.

1. The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusion/ deviation with regard to same.
2. There are no deviation with respect to specification other than those furnished in the 'schedule of deviations'.
3. Only those technical submittals which are specifically asked for in NIT to be submitted at tender stage shall be considered as part of offer. Any other submission, even if made, shall not be considered as part of offer.
4. Any comments/ clarifications on technical/ inspection requirements furnished as part of bidder's covering letter shall not be considered by BHEL, and bidder's offer shall be construed to be in conformance with the specification.
5. Any changes made by the bidder in the price schedule with respect to the description/ quantities from those given in "BOQ-Cum-Price schedule" of the specification shall not be considered (i.e., technical description & quantities as per specification shall prevail).

BIDDER'S STAMP & SIGNATURE



**TECHNICAL SPECIFICATION FOR
LT PVC CONTROL CABLES**

SPECIFICATION NO. PE-RC-999-507-E004

VOLUME II

SECTION I

REVISION 0

DATE: 19.05.2017

SECTION - I

SPECIFIC TECHNICAL REQUIREMENTS



TECHNICAL SPECIFICATION FOR LT CONTROL CABLES

SPECIFICATION NO. PE-RC-999-507-E004

VOLUME II

SECTION I

REVISION 0

DATE:

SHEET 1 OF 1

1.0 PURPOSE

This specification is intended for finalization of rate contract between BHEL and Bidder. Standard technical detail as indicated in the specification shall be agreed upon between BHEL and bidder. Project specific technical detail shall be made available to the bidder along with project enquiry.

2.0 SCOPE OF ENQUIRY

2.1 Design, Manufacture, Inspection and Testing at Manufacturer's works, proper packing and delivery to site of LT Control Cable conforming to this specification.

2.2 It is not the intent to specify herein all the details of design & manufacture of material. However, the material shall conform in all respects to high standard of design, engineering & workmanship and shall be capable of performing in continuous commercial operation at site condition.

2.3 Technical requirements of LT Control Cable are indicated in Data Sheet-A & Section-II.

2.4 The stipulations of Section-I, followed by those of Data Sheet-A shall prevail in case of any conflict between the stipulations of Section-I, Data Sheet - A & Section-II.

3.0 BILL OF QUANTITIES

The bidder to quote for items as per price schedule attached with NIT. **The quantity as mentioned in the BOQ is only for evaluation purpose.** However actual ordered quantity may vary from project to project throughout the contract.

4.0 SPECIFIC TECHNICAL REQUIREMENTS

Sl. No	Reference Clause No. of Section-II/ Quality Plan	Specific Requirement/ Change
1.	Annexure-1 to QAP- A (Type test conduction) 2 (a) Sampling: "Type test to be conducted on one size of cable on every lot of cable.	Type test to be conducted on 1 out 10 drums or less of every size for every lot."
2.	Annexure-1 to QAP- B (Acceptance test conduction) 2 Sampling: "Sampling for acceptance test shall be as per Appendix B of IS:1554 part I (control cable).	"Acceptance test (including FRLS & Flammability Test) to be conducted on 1 out 10 drums or less of every size for every lot."

4.0 DRAWINGS & DOCUMENTS TO BE SUBMITTED

4.1 After rate contract; following information shall be furnished by BHEL against specific project requirement: -

a) BOQ (Bill of Quantities)



TECHNICAL SPECIFICATION FOR LT CONTROL CABLES

SPECIFICATION NO. PE-RC-999-507-E004

VOLUME II

SECTION I

REVISION 0

DATE:

SHEET 2 OF 1

4.2 After placement of order, following documents shall be submitted for specific project requirement for BHEL & customer's approval: -

Sl. No.	Drawing / Document Description	Drawing / Document no	Document Type	First Submission	Resubmission
1	Technical Data sheet - LT Control cables	PE-V0-XXX-507-E131	Primary	Within 2 week of award of contract.	Within 1 week of comments
2	Cross-sectional Drgs.- LT Control Cables	PE-V0-XXX-507-E133	Primary	Within 2 week of award of contract.	Within 1 week of comments
3	Quality Plan - LT Control Cables	PE-V0-XXX-507-E915	Primary	Within 2 week of award of contract.	Within 1 week of comments
4	Type test report - LT Control Cables (previously conducted within 10 years)	PE-V0-XXX-507-E916	Primary	Within 2 week of award of contract.	Within 1 week of comments
5	Type test report - LT Control Cables (conducted for this contract)	PE-V0-XXX-507-E917	Secondary	Within 1 week from conducting type test.	Within 1 week of comments.

4.3 Drawings/documents shall be submitted through Document Management System (DMS).

Note:

1. The above list of drawings and documents is indicative.

2. After receiving LOI, the vendor shall submit drawings/documents in requisite number of copies as per NIT.

* Standard Quality Plan as enclosed in the technical specification is to be appended with cover sheet bearing document number and description as stated above. The signed and stamped copy of the same shall be submitted to BHEL without making any changes in the contents of the document.



TECHNICAL SPECIFICATION FOR LT PVC CONTROL CABLES

SPECIFICATION NO. PE-RC-999-507-E004

VOLUME II

SECTION I

REVISION 0

DATE:

SHEET 1 OF 3

DATA SHEET-A (CONTROL CABLE)

1.0	Type of Cable	Flame Retardant Low Smoke Halogen (FR-LSH)
2.0	Standard applicable in general (Latest amendment to be referred if any)	IS:1554 (Part-1), IS:8130, IS:5831, IS:10810, IS:3975, ASTMD:2843, ASTMD:2863, ASTM D 3137:81, IEC-60754-1, IEC:60332 Part-1, IEC:60332 Part-3-23
3.0	Voltage Grade	1.1kV
4.0	Number of cores, cross sectional area of conductors and quantities	As per BOQ-Cum-Price Schedule
5.0	CONDUCTOR	
(a)	Material	Copper
	Grade and Class	Stranded, annealed high conductivity, Class 2
		<i>Non-Compacted</i>
		<i>Untinned</i>
(b)	Standard Applicable	IS: 8130
(c)	Shape	Circular
(d)	Min. number of strands	7
6.0	INSULATION	
(a)	Material	<i>Extruded PVC Type-A (Project specific requirement shall be informed later)</i>
(b)	Standard Applicable	IS: 5831
(c)	Continuous withstand temperature	<i>70°C (Project specific requirement shall be informed later)</i>
(d)	Short-circuit withstand temperature	<i>160°C (Project specific requirement shall be informed later)</i>
(e)	Method of application	By extrusion; sleeve extrusion not permitted.
(f)	Nominal Thickness of insulation	As per Table-2 of IS: 1554 (Part-1)
7.0	CORE IDENTIFICATION	
(a)	Control Cables up to 5 core	Colour coding as per IS 1554 (Part-1)
(b)	Control Cables above 5 cores	By numbering as per IS 1554 (Part-1). Insulation to have black colour.
8.0	INNER SHEATH	
(a)	Material	<i>Extruded PVC Type ST-1 (Project specific requirement shall be informed later)</i>
(b)	Standard Applicable	IS: 5831
(c)	Colour	<i>Black</i>
(d)	Whether FR-LSH Applicable	<i>No (Project specific requirement shall be informed later)</i>
(e)	Thickness of inner sheath	As per Table-4 of IS: 1554 (Part-1)
(f)	Fillers	Acceptable
(g)	Material of fillers (if permitted)	Same as inner sheath (Material of filler to be compatible with that of inner sheath)
(h)	Method of application for multi-core cables:	
(i)	With fillers	<i>Pressure/Vacuum extruded</i>
(ii)	Without fillers	<i>Pressure extruded</i>



TECHNICAL SPECIFICATION FOR LT PVC CONTROL CABLES

SPECIFICATION NO. PE-RC-999-507-E004

VOLUME II

SECTION I

REVISION 0

DATE: 19.05.2017

SHEET 2 OF 3

9.0	ARMOUR	
(a)	<i>Applicable</i>	<i>YES (as per BOQ-Cum price schedule)</i>
(b)	Material:	<i>Galvanised Steel Round Wire, as per BOQ-Cum price schedule. Galvanised Steel Formed Wire/Strip, as per BOQ-Cum price schedule conforming to (i) Type 'a' 'b' as per Table-5 of IS 1554-I and (ii) IS 3975 as per project requirements.</i>
(c)	Standard Applicable	IS: 1554 (Part-1) Table-5 and IS:3975
(d)	Minimum Coverage	90%
(e)	Gap between armour wires	Shall not exceed one armour wire space (No cross-over/ over-riding)
(f)	Breaking load of joint	95 % of normal armour
10.0	OUTERSHEATH	
(a)	Material	Extruded PVC Type ST1
(b)	Standard Applicable	IS: 1554 (Part-1) & IS: 5831
(c)	Colour	<i>Black / Grey (Project specific requirement shall be informed later)</i>
(d)	Whether FR-LSH	<i>Yes (Project specific requirement shall be informed later)</i>
(e)	Method of application	Extruded
(f)	Thickness of outer sheath	As per Table-7 of IS: 1554 (Part-1)
(g)	Marking	<i>Cable size (cross section area and no. of cores), voltage grade, PVC, Ref. IS, FRLS, Manufacturer's name and/ or trade name, and year of manufacture @ 5m (by embossing) 'BHEL-PEM' and 'CUSTOMER' Name @5m (by embossing) Progressive sequential marking @ 1m. (by printing/ embossing) Further customer specific marking requirement (if any) shall be informed later.</i>
11.0	FR-LSH CHARACTERISTICS	
(a)	<i>Oxygen index</i>	<i>Min 29 (As per IS 1554-I /ASTMD 2863)</i>
(b)	<i>Temperature index</i>	<i>Min. 250°C(As per IS 1554-I /ASTMD 2863)</i>
(c)	<i>Acid gas generation</i>	<i>Max. 20% by weight (As per IS 1554-I /IEC-60754-1)</i>
(d)	<i>Smoke density rating</i>	<i>Max. 60% (As per IS 1554-I /ASTM D 2843)</i>
(e)	Flammability Test	
(i)	<i>Flammability test for single cable</i>	<i>YES, As per: IEC-60332 Part-1</i>
(ii)	<i>Flammability test for bunched cables</i>	<i>YES, As per: IEC-60332 Part-3-23, CAT-B</i>
(iii)	<i>Flammability test as per IEEE: 60383</i>	<i>YES</i>
(iv)	<i>Swedish Chimney test SEN-SS-424-1475-F3</i>	<i>YES</i>
12.0	<i>Anti-rodent and Termite repulsion Test</i>	<i>YES</i>
13.0	Special Tests	
(a)	Hydrolytic Stability Test	No (Refer Clause no 3.4 of Section-II).
(b)	Ultraviolet Radiation Test	No (Refer Clause no 3.4 of Section-II).



TECHNICAL SPECIFICATION FOR LT PVC CONTROL CABLES

SPECIFICATION NO. PE-RC-999-507-E004

VOLUME II

SECTION I

REVISION 0

DATE: 19.05.2017

SHEET 3 OF 3

14.0	TOLERANCE ON OUTER DIAMETER	$\pm 2\text{mm}$
15.0	MINIMUM BENDING RADIUS	
(a)	Multi core cables	12 x O.D.
16.0	SAFE PULLING FORCE	
(a)	Copper conductor cable	50 N/ sq. mm.
17.0	CABLE DRUMS	
(a)	<i>Type of Drum</i>	Wooden as per IS 10418
(b)	Standard drum length	<i>1000m ($\pm$) 5%. (Project specific requirement shall be informed later)</i>
(c)	Painting	Entire surface to be painted
(d)	Construction Details	<i>Clause no 4.2 of Section-II of this technical specification</i>
(e)	Particular details on Drum	<i>Clause no 4.3 of Section-II of this technical specification. Further customer specific marking requirement (if any) shall be informed later.</i>
(f)	Cable packing	Please refer Clause no 4.2 of Section-II of this technical specification. It may be noted that the outer most cable layer shall be covered with water proof cover polythene followed by complete drum covering with wooden plank of suitable thickness across flanges. (Please refer typical drawing of cable drum packing, attached in section -II)

	TECHNICAL SPECIFICATION FOR LT PVC CONTROL CABLES	SPECIFICATION NO. PE-RC-999-507-E004	
		VOLUME II	
		SECTION	
		REVISION 0	DATE: 19.05.2017
		SHEET 1 OF 3	

DATA SHEET C
GUARANTEED TECHNICAL PARTICULARS
(TO BE SUBMITTED BY SUCCESSFUL BIDDER)

S NO.	PARTICULARS	
1	Name of manufacturer	
2	Place of manufacture	
3	No of cores X Nominal area of conductor (mm ²)	
4	Cable Type	
5	CONDUCTOR	
	a) Material type & grade	
	b) Shape	
	c) No. of Strands/Diameter of each strand (No. / mm)	
6	PVC INSULATION	
	a) Material	
	b) Dielectric strength kv/mm	
	c) Nominal thickness (mm)	
	d) Volume resistivity at 27° C (ohm-cm)	
	e) Volume resistivity at 70° C (ohm-cm)	
	f) Insulation resistance constant at 27° C (M ohm km)	
	g) Insulation resistance constant at 70° C (M ohm km)	
	h) Min. Tensile strength (N/mm ²)	
	i) Min. Elongation at break (%)	
	j) Negative tolerance on thickness (mm)	
	k) Fictitious dia over insulation (mm)	
7	FILLERS	
	a) Material	
8	INNERSHEATH	
	a) Material	
	b) Whether FRLS	
	c) Minimum thickness (mm)	
	d) Colour of inner sheath	
	e) Fictitious dia over inner sheath (mm)	

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			

	TECHNICAL SPECIFICATION FOR LT PVC CONTROL CABLES	SPECIFICATION NO. PE-RC-999-507-E004	
		VOLUME II	
		SECTION	
		REVISION 0	DATE: 19.05.2017
		SHEET 2 OF 3	

9	ARMOUR	
	a) Material	
	b) Type of armouring	
	c) Nominal size of armour (mm)	
	d) Minimum coverage	
	e) Method of jointing	
	f) Breaking load of joint	
	g) Minimum no. of wires (No.)	
	h) Armour resistance at 20 deg.C (Ohm/km) max	
	i) Max. Resistivity of GS wire (Ohm-cm) max.	
	j) Fictitious dia over Armouring (mm)	
10	OUTERSHEATH	
	a) Material	
	b) Whether FRLS	
	c) Thickness (mm) (Nominal)	
	d) Min. Tensile strength (N/mm ²)	
	e) Min. Elongation at break (%)	
	f) Colour of Outer sheath	
	g) Tolerance on thickness in mm	
11	Permissible Voltage Variation	
12	Permissible Frequency Variation	
13	Combined Voltage & Frequency Variation	
14	Max. rated Conductor temperature	
15	Max. allowable conductor temperature during short circuit	
16	a. Continuous current carrying capacities	
	b. In Ground 30 deg.C (A)	
	c. In Duct 30 deg.C (A)	
	d. In Air 50 deg.C (A)	
	e. Depth of laying	
	f. Thermal resistivity of soil	
17	FRLS PROPERTIES	
	a. Oxygen Index (ASTMD 2863)	
	b. Temperature Index (ASTMD 2863-77)	
	c. Smoke density rating (ASTMD 2843)	
	d. HCL (ACID) Gas Generation (IEC 754-1)	
	e. Flammability tests	

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			

	TECHNICAL SPECIFICATION FOR LT PVC CONTROL CABLES	SPECIFICATION NO. PE-RC-999-507-E004	
		VOLUME II	
		SECTION	
		REVISION 0	DATE: 19.05.2017
		SHEET 3 OF 3	

18	CABLE DRUMS	
	a. Type & construction	
	b. Stranded drum length with tolerance on drum length	
19	Max. D.C. resistance of conductor at 20° C-Main (ohm/km)	
20	Max. A.C. resistance of conductor at 70° C-Main (ohm/km)	
21	Calculated star reactance (ohm/km)	
22	Approx. Cable Capacitance (micro F/km)	
23	Charging current at 415 V (A/km)	
24	Loss tangent (for reference only)	
25	DIAMETERS	
	a. Approx. dia over insulation (mm)	
	b. Approx. dia over inner sheath (mm)	
	c. Fictitious. dia under outer sheath (mm)	
	d. Approx. overall dia of cable (mm)	
	e. Tolerance on overall dia in mm	
26	Minimum bending radius	
27	safe pulling force when pulled by pulling eye N	
28	Approximate weight of cable (kg/km)	
29	Marking at every 5 meter on Outer Sheath by Embossing	
30	Marking at every 1 meter on Outer Sheath by Printing	

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			

Annexure-1 to “BOQ-Cum Price Schedule”

Sl. No.	Description	%age Implication of Basic Price
1	Inner sheath FRLS in place of Non-FRLS	(+) 2.5 %
2	Outer sheath HR PVC in place of PVC	(+) 3.0 %
3	Cable type FR in place of FRLSH	(-) 1.0 %



**TECHNICAL SPECIFICATION FOR
LT CONTROL CABLES**

SPECIFICATION NO. PE-RC-999-507-E004

VOLUME II

SECTION II

REVISION 0

DATE: 19.05.2017

SECTION-II

STANDARD TECHNICAL REQUIREMENTS



TECHNICAL SPECIFICATION FOR LT PVC CONTROL CABLES

SPECIFICATION NO. PE-RC-999-507-E004

VOLUME II

SECTION II

REVISION 0

DATE: 19.05.2017

Sheet 1 of 2

1.0 CODES AND STANDARDS

- 1.1 The material shall comply with all currently applicable safety codes and statutory regulations of India as well as of the locality where the material is to be installed.
- 1.2 The design, material, construction, manufacture, inspection and testing of LT PVC Control Cable shall conform to the latest revision of relevant standards as per Data Sheet-A.
- 1.3 In case of conflict between the applicable reference standard and this specification, this specification shall govern.

2.0 TECHNICAL REQUIREMENTS

- 2.1 LT PVC Control Cable shall be supplied as per technical particulars specified in Data Sheet – A.

3.0 QUALITY ASSURANCE, TESTING & INSPECTION

- 3.1 Bidder shall confirm compliance with the BHEL Standard Quality Plan (PE-QP-999-507-E003, Rev-1) as attached with the specification without any deviations. At contract stage, the successful bidder shall submit the same QP for BHEL/ ultimate customer's approval. In case bidder has reference QP agreed with ultimate customer, same can be submitted for specific project after award of contract for BHEL/ultimate customer's approval. There shall be no commercial implication to BHEL on account of minor changes in QP during contract stage.
- 3.2 All materials shall be procured, manufactured, inspected and tested by vendor/ sub-vendor as per approved Quality Plan.
- 3.3 Type testing, routine / acceptance testing and special testing requirements shall be as per Annexure –A to QAP. Charges for all these tests for all the equipments & components shall be deemed to be included in the bid price (except UV Radiation & Hydraulic Stability test).
- 3.4 The charges of UV Radiation test & Hydrolytic Stability test (if applicable) shall be reimbursed extra at actual against original money receipt of Govt. Lab. (CPRI/ ERDA etc).
- 3.5 Cost of cables consumed for testing shall be to bidder's account.

4.0 PACKING

- 4.1 Cables shall be supplied in non-returnable drums. Material of cable drums shall be wooden.
- 4.2 For wooden drums, all wooden parts shall be manufactured from seasoned wood treated with copper naphthenates / zinc naphthenates (refer IS: 401) and anti-termite. The surface of the drum and the outer most cable layer shall be covered with water proof cover. Both the ends of the cables shall be properly sealed with heat shrinkable PVC/ rubber caps secured by 'U' nails so as to eliminate ingress of water during transportation, storage and erection. Dimensions of wooden drums shall be as per IS 10418. All ferrous parts shall be treated with suitable rust protective finish or coating to avoid rusting during transit and storage. BIS certification mark shall be stamped on each cable drum.



**TECHNICAL SPECIFICATION FOR
LT PVC CONTROL CABLES**

SPECIFICATION NO. PE-RC-999-507-E004

VOLUME II

SECTION II

REVISION 0

DATE: 19.05.2017

Sheet 2 of 2

- 4.3 Each drum shall carry manufacturer's name, purchaser's name, address and contract no., item no. & type, size & length of cable and net gross weight stencilled on both sides of drum. A tag containing same information shall be attached to the leading end of the cable. An arrow & suitable accompanying wording shall be marked on one end of the reel indicating the direction in which it should be rolled.

ANNEXURE-1

INSTRUCTIONS FOR QUALITY PLAN

The Quality Plan shall include all the Quality Control Measures and Checks adopted by the Vendor to ensure that the material/component/assembly/services supplied by him meet/will meet the requirements as per specifications and good practices. They shall include all stages of operation such as materials, processes, manufacture, assembly, packing and despatch. The following guide lines may be noted:

Column 1-	Serial Number
Column 2-	Component/Operation- The component and/or operation being checked shall be given here.
Column 3-	Characteristics check- The characteristics being checked shall be given here, e.g., chemical composition, mechanical properties, leak tightness, surface defects etc..
Column 4-	Category - 'CR' stands for critical characteristic - affecting safety of equipment and personnel 'MA' stands for major Characteristic - affecting safety of equipment and personnel 'MI' stands for minor characteristic - affecting appearance etc.
Column 5-	Type/Method of check e.g. chemical analysis tensile testing, hydraulic test, visual examination radiography etc.
Column 6-	Extent of check, such as, 100, 10, 1 percent etc.
Column 7-	Reference Documents - Documents, such as technical specification, drawings, standard specifications (IS, BS ETC.) procedure, etc. according to which check is done.
Column 8-	Acceptance Norms - Standards etc. according to which acceptability or otherwise of the characteristics being checked is decided.
Column 9-	Format of Record - Formats, log shets, reports, etc. in which the observations are recorded. Standard log sheets, reports, formats etc. of the Vendors shall be numbered and such reference numbers shall be included here.
Column 10-	Agency - The agency which performs the test/instruction shall be written in sub-column 'W' The agency which verifies test certificates/inspection records and carries out audit check of the components/operation shall be written in sub-column 'V' The agencies are codified as 1,2 & 3 '1' stands for (BHEL) '1' * means the operation shall be cleared by BHEL before the start of the next operation. '2' Stands for Vendor '3' stands for sub-Vendor of the Vendor and so on.
Example :	
Entry	'3' in column 'P' means test./inspection to be performed by sub-Vendor's QC
Entry	'2' in column 'W' means test./inspection to be witnessed by Vendor's QC
Entry	'1' in column 'V' means verification shall be done by BHEL and next stage to be started only after the hold point is cleared by BHEL
Column11-	Remarks - Any special remarks shall be given here.

NOTES :

1. In absence of correlation with the test certificate(s) (e.g. material identification) samples shall be drawn bgy BHEL and all tests as per relevent specifications shall be carried out in their presence or in recognized Government Laboratory.
2. When materials and components are initially identified and stamped by BHEL QS engineer, the identification marks shall be presserved till despatch. Wherever this is not possible, the identification mark shall be transferred to the components in the presence of BHEL QS Engineer unless other wise agreed.
3. For castings and forgings integral test specimens shall be provided, When this is not possible for casting, they shall be poured in the presence of BHEL QS Engineer unless otherwise, if witnessing of test by BHEL is called for.
4. When welders qualified by reputed inspection agencies or statutory bodies are not available, qualification tests shall be conducted in the presence of BHEL QS Engineer.
5. This Quality Plan is liable to be modified as per the requirements of approved drawings and changes in technical specifications/drawings. If there are contradictions in respect of column 7 & 8 between this Quality Plan and the approved drawings specifications, the latter shall prevail.
6. Wherever inspection by BHELs Purchaser/Third Party/Statutory authorities are mandatory, this shall be compiled with.
7. Inspection reports, log sheets, test reports/certificate. etc. shall be furnished to BHEL at the appropoate stages or at the time of final inspection, as required.
8. This Quality Plan is also applicable to spares, if any, under scope of supply of Vendor.
9. The quality plan shall be submitted in minimum 4 copies with a soft copy of the same or in line with contract requirements.



MANUFACTURER/
SUPPLIER NAME & ADDRESS

STANDARD QUALITY PLAN

SPEC. NO : PE-RC-999-507-E004

DATE:

CUSTOMER :

QP NO.: PE-QP-999-507-E003, R-1

DATE:

PROJECT:

PO NO.:

DATE:

ITEM: 1.LT PVC CONTROL CABLE
2.LT HR PVC CONTRL CABLE
3. LT PVC POWER CABLE
4. LT HRPVC POWER CABLE

SYSTEM:

SECTION: II

SHEET 1 OF 17

Sl. No.	COMPONE NTS & OPERATIO NS	CHARACTERSTICS	CLA SS	TYPE OF CHECK	QUANTUM OF CHECK	REFEREN CE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS
1	2	3	4	5	6 M C/N	7	8	9	* D M C N	**

RAW MATERIAL

Copper Rods												
GENERAL:												
1. Physical properties	MA	Physical Tests	Sample/Batch	Sample/Batch	IS 613	IS 613	Test Certificate	✓	P/V	V	-	
2. Elec. Properties	MA	Electrical Tests	Sample/Batch	Sample/Batch	-do-	-do-	-do-	✓	P/V	V	-	
SPECIFIC CHECKS:												
a) Make	MA	Verify	100%	100%	Manufacturer approved source	Manufacturer approved source	COC	✓	P	V	-	
b) Grade	MA	-do-	-do-	-do-	IS 613	IS 613	Test Certificate	✓	P	V	-	

BHEL

ENGINEERING

QUALITY

BIDDER/SUPPLIER

FOR CUSTOMER REVIEW & APPROVAL

Prepared by:	Sign & Date	Name	Checked by:	Sign & Date	Name
Reviewed by:	Sign & Date	MANISH SHUKLA	Reviewed by:	Sign & Date	R.K. JAISWAL

Sign & Date	Seal
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Doc No:	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			



MANUFACTURER/
SUPPLIER NAME & ADDRESS

STANDARD QUALITY PLAN

SPEC. NO : PE-RC-999-507-E004

DATE:

CUSTOMER :

QP NO.: PE-QP-999-507-E003, R-1

DATE:

PROJECT:

PO NO.:

DATE:

ITEM: 1.LT PVC CONTROL CABLE
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3. LT PVC POWER CABLE
4. LT HRPVC POWER CABLE

SYSTEM:

SECTION: II

SHEET 2 OF 17

Sl. No.	COMPONENTS & OPERATIONS	CHARACTERISTICS	CLASSIFICATION	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS
1	2	3	4	5	6 M C/N	7	8	9	* ** D M C N	

	c) Resistivity	MA	Electrical Tests	Manufacturer std.	Manufacturer	IS 613	IS 613	Test Certificate	✓	P	V	-	
	PVC Compound (for insulation)												
	<u>GENERAL :</u>												
	1. Physical properties	MA	Physical Tests	Sample/Batch	Sample/Batch	IS 5831	IS 5831	Test Certificate	✓	P/V	V	-	
	2. Elec. Properties	MA	Electrical Tests	Sample/Batch	Sample/Batch	-do-	-do-	-do-	✓	P/V	V	-	
	<u>SPECIFIC CHECKS:</u>												

ENGINEERING				QUALITY				BIDDER/SUPPLIER				FOR CUSTOMER REVIEW & APPROVAL			
BHEL															
Prepared by:	Sign & Date	Name	Checked by:	Sign & Date	Name	Seal		Doc No:	Sign & Date	Name	Seal				
by: <i>Manish</i>	<i>28/02/2020</i>	DEVENDRA SINGH	by: <i>Manish</i>	<i>28/02/2020</i>	KUNAL GANDHI			Reviewed by:							
Reviewed by:		MANISH SHUKLA	Reviewed by:		R.K. JAISWAL			Approved by:							



MANUFACTURER/
SUPPLIER NAME & ADDRESS

STANDARD QUALITY PLAN

SPEC. NO. : PE-RC-999-507-E004

DATE:

CUSTOMER :

QP NO.: PE-QP-999-507-E003, R-1

DATE:

PROJECT:

PO NO.:

DATE:

ITEM: 1.LT PVC CONTROL CABLE
2.LT HR PVC CONTRL CABLE
3. LT PVC POWER CABLE
4. LT HRPVC POWER CABLE

SYSTEM:

SECTION: II

SHEET 3 OF 10

Sl. No.	COMPONENTS & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS
1	2	3	4	5	6 M C/N	7	8	9	* D M C N	**

	a) Make	MA	Verify	100%	100%	Manufacturer approved source	Manufacturer approved source	COC	✓	P	V	-	
	b) Type/ Grade	MA	-do-	-do-	-do-	Approved datasheet	Approved datasheet	-do-	✓	P	V	-	
	c) Shelf life/ Storage condition	MA	-do-	-do-	-do-	Compound Manufacturer er std.	Compound Manufacturer std.	-do-	✓	P	V	-	
	Filters (as applicable)	MA	Verify	100%	100%	Manufacturer approved source	Manufacturer approved source	COC	✓	P	V	-	Filters material chosen shall be compatible with the temperature rating of the cable and shall have no deleterious effect on any other component of cable)
	2. Flame retardant & moisture resistant. (as applicable)	CR	Chemical/ Environ.	-do-	-	Appd. Data Sheet	Appd. Data Sheet	-do-	✓	P/V	-	-	

ENGINEERING				QUALITY			
Prepared by:	Sign & Date	Name	Checked by:	Sign & Date	Name		
Reviewed by:	Sign & Date	MANISH SINGH	Reviewed by:	Sign & Date	R.K. GANDHI		
		MANISH SINGH			JAISWAL		

BIDDER/SUPPLIER	
Sign & Date	Seal

FOR CUSTOMER REVIEW & APPROVAL			
Doc No.:	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			



MANUFACTURER/
SUPPLIER NAME & ADDRESS

STANDARD QUALITY PLAN

SPEC. NO : PE-RC-999-507-E004

DATE:

CUSTOMER :

QP NO.: PE-QP-999-507-E003, R-1

DATE:

PROJECT:

PO NO.:

DATE:

ITEM: 1.LT PVC CONTROL CABLE
2.LT HR PVC CONTRL CABLE
3. LT PVC POWER CABLE
4. LT HRPVC POWER CABLE

SYSTEM:

SECTION: II

SHEET 4 OF 17

Sl. No.	COMPONENTS & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS
1	2	3	4	5	6	7	8	9	* D M C N	** M C N

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BHEL				QUALITY			
ENGINEERING		Name		Sign & Date		Name	
Prepared by:	<i>[Signature]</i>	DEVEDRA SINGH	Checked by:	<i>[Signature]</i>	KUNAL GANDHI		
Reviewed by:	<i>[Signature]</i>	MANISH SHUKLA	Reviewed by:	<i>[Signature]</i>	R.K. JAISWAL		

BIDDER/SUPPLIER		Sign & Date		Seal	

FOR CUSTOMER REVIEW & APPROVAL					
Doc No:		Sign & Date		Name	
Reviewed by:					
Approved by:					

28/02/2020

[Signature]



MANUFACTURER/
SUPPLIER NAME & ADDRESS

STANDARD QUALITY PLAN

SPEC. NO : PE-RC-999-507-E004

DATE:

CUSTOMER :

QP NO.: PE-QP-999-507-E003, R-1

DATE:

PROJECT:

PO NO.:

DATE:

ITEM: 1.LT PVC CONTROL CABLE
2.LT HR PVC CONTRL CABLE
3. LT PVC POWER CABLE
4. LT HRPVC POWER CABLE

SYSTEM:

SECTION: II

SHEET 5 OF 17

Sl. No.	COMPONE NTS & OPERATIO NS	CHARACTERSTICS	CLA SS	TYPE OF CHECK	QUANTUM OF CHECK	REFEREN CE DOCUMENT T	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS
1	2	3	4	5	6 M C/N	7	8	9	* ** D M C N	

PVC compound for Sheath	GENERAL :									
	1. Physical properties	MA	Physical Tests	Sampl e/Batc h	Sample /Batch	IS 5831	IS 5831	Inspection report/ Test Certificate	✓ P/ V	V -
	2. Elec.Properties	MA	Electrical Tests	Sampl e/Batc h	Sample /Batch	-do-	-do-	-do-	✓ P/ V	V -
	3. FRLS Properties (as applicable)	CR	Chemical/ Environ.	Sampl e/Batc h	Sample /Batch	Approved datasheet	Approved datasheet	-do-	✓ P/ V	V -
	SPECIFIC CHECKS :									

BHEL				BIDDER/ SUPPLIER				FOR CUSTOMER REVIEW & APPROVAL							
ENGINEERING		QUALITY		Sign & Date		Seal		Doc No:		Sign & Date		Name		Seal	
Prepared by:	Devendra Singh	Checked by:	Manish Shukla	Sign & Date		Seal		Reviewed by:		Sign & Date		Name		Seal	
Reviewed by:	Manish Shukla	Reviewed by:	R.K. Jaiswal	Sign & Date		Seal		Approved by:		Sign & Date		Name		Seal	

		MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS		STANDARD QUALITY PLAN		SPEC. NO : PE-RC-999-507-E004		DATE:	
		CUSTOMER :				QP NO.: PE-QP-999-507-E003, R-1		DATE:	
		PROJECT:				PO NO.:		DATE:	
		ITEM: 1.LT PVC CONTROL CABLE 2.LT HR PVC CONTRL CABLE 3. LT PVC POWER CABLE 4. LT HRPVC POWER CABLE		SYSTEM:		SECTION: II		SHEET 6 OF 17	

Sl. No.	COMPONENTS & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS
1	2	3	4	5	6 M C/N	7	8	9	* D M C N	** M C N

		a) Make	MA	Verify	100%	100%	Manufacturer approved source	Manufacturer approved source	COC	✓	P	V	-	
		b) Type/ Grade	MA	-do-	-do-	-do-	Approved datasheet	Approved datasheet	-do-	✓	P	V	-	
		c) Shelf life/ Storage condition	MA	-do-	-do-	-do-	Compound Manufacturer std.	Compound Manufacturer std.	-do-	✓	P	V	-	
	Wooden drums	1. Phy. & Constructional checks	MA	Visual	Mfr's Plant Std.	Mfr's Plant Std.	IS 10418	IS 10418	Inspection report/ Test Certificate	✓	P	V	-	
		2. Anti-termite treatment	MA	Chem.	-do-	-do-	Mfr's Plant Std.	Mfr's Plant Std.	COC	✓	P	V	-	

ENGINEERING				QUALITY			
Sign & Date		Name	Checked by:	Sign & Date		Name	
Prepared by: <i>Devendra Singh</i>		DEVENDRA SINGH		Reviewed by: <i>R.K. Jaishwal</i>		R.K. JAISWAL	
Reviewed by: <i>Manish Shukla</i>		MANISH SHUKLA		Reviewed by: <i>28/12/2020</i>			

BIDDER/ SUPPLIER	
Sign & Date	Seal

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:		Sign & Date	Name
Reviewed by:			
Approved by:			



MANUFACTURER/
SUPPLIER NAME & ADDRESS

STANDARD QUALITY PLAN

SPEC. NO : PE-RC-999-507-E004

DATE:

CUSTOMER :

QP NO.: PE-QP-999-507-E003, R-1

DATE:

PROJECT:

PO NO.:

DATE:

ITEM: 1.LT PVC CONTROL CABLE
2.LT HR PVC CONTRL CABLE
3. LT PVC POWER CABLE
4. LT HRPVC POWER CABLE

SYSTEM:

SECTION: II

SHEET 7 OF 17

Sl. No.	COMPONENTS & OPERATIONS	CHARACTERISTICS	CLASSIFICATION	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS
1	2	3	4	5	6 M C/N	7	8	9	* D M C N	**

	Steel drums (if applicable)	1. Dimension	MA	Meas.	Mfr's Plant Std.	Mfr's Plant Std.	Approved drawing of steel drum	Approved drawing of steel drum	Inspection report	✓	P	V	-
		2. Surface finish	MA	Visual	-do-	-do-	Surface shall be smooth	Surface shall be smooth	Inspection report	✓	P	V	-
	IN PROCESS												
	Wire Drawing & Annealing	1. Size	MA	Dimensional	Mfr's Plant Std.	Mfr's Plant Std.	Approved Data Sheet	Approved Data Sheet	Inspection report	✓	P	V	-
		2. Surface finish	MA	Visual	-do-	-do-	Surface shall be smooth	Surface shall be smooth	-do-	✓	P	V	-

BHEL

ENGINEERING

QUALITY

BIDDER/SUPPLIER

FOR CUSTOMER REVIEW & APPROVAL

Prepared by:	Sign & Date	Name	Checked by:	Sign & Date	Name
Reviewed by:	Sign & Date	Name	Reviewed by:	Sign & Date	Name

Sign & Date	Seal
-------------	------

Doc No:	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

28/02/2020

28/2/2020



MANUFACTURER/
SUPPLIER NAME & ADDRESS

STANDARD QUALITY PLAN

SPEC. NO : PE-RC-999-507-E004

DATE:

CUSTOMER :

QP NO.: PE-QP-999-507-E003, R-1

DATE:

PROJECT:

PO NO.:

DATE:

ITEM: 1.LT PVC CONTROL CABLE
2.LT HR PVC CONTRL CABLE
3. LT PVC POWER CABLE
4. LT HRPVC POWER CABLE

SYSTEM:

SECTION: II

SHEET 8 OF 17

Sl. No.	COMPONENTS & OPERATIONS	CHARACTERISTICS	CLASSIFICATION	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS
1	2	3	4	5	6	7	8	9	D * M C N	

	3. % of Elongation	MA	Mechanical	-do-	-do-	IS 1554 Pt-1 / IS 8130 & Approved Data Sheet	IS 1554 Pt-1 / IS 8130 & Approved Data Sheet	-do-	✓	P	V	-	
	Tinning (Conductor)	1. Size	MA	Dimensional	Plant Mfg. Std.	Plant Mfg. Std.	Mfrs Std	-do-	✓	P	V	-	(Applicable only for tin-coated copper conductor)
	2. Chemical test for tinning	CR	Chemical	-do-	-do-	IS 10810 Pt-4	IS-8130	-do-	✓	P	V	-	
	Stranding of wires	1. No. of wires	MA	Counting	Mfr's Plant Std.	Mfr's Plant Std.	Approved Data Sheet	-do-	✓	P	V	-	
	2. Resistance	CR	Electrical	-do-	-	-do-	-do-	-do-	✓	P	-	-	

ENGINEERING				QUALITY				BIDDER/SUPPLIER				FOR CUSTOMER REVIEW & APPROVAL				
BHEL																
Prepared by:		Sign & Date	Name	Checked by:		Sign & Date	Name	Sign & Date		Seal	Doc No:		Sign & Date		Name	Seal
Reviewed by:		Manish SHUKLA	MANISH SHUKLA	Reviewed by:		R.K. JAISWAL	R.K. JAISWAL				Reviewed by:					
		28/02/2020				24/2/2020										



MANUFACTURER/
SUPPLIER NAME & ADDRESS

STANDARD QUALITY PLAN

SPEC. NO : PE-RC-999-507-E004

DATE:

CUSTOMER :

QP NO.: PE-QP-999-507-E003, R-1

DATE:

PROJECT:

PO NO.:

DATE:

ITEM: 1. LT PVC CONTROL CABLE
2. LT HR PVC CONTRL CABLE
3. LT PVC POWER CABLE
4. LT HRPVC POWER CABLE

SYSTEM:

SECTION: II

SHEET 9 OF 17

SI. No.	COMPONENTS & OPERATIONS	CHARACTERISTICS	CLASSIFICATION	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS
1	2	3	4	5	6	7	8	9	D * M ** C N	

		3. Sequence, lay length & Direction	MA	Visual, Meas	one Sample of each size/lot	-	Mfrs Std.	Mfrs Std.	-do-	✓	P	-	-	
		4. Surface Finish	MA	Visual	100%	-	Surface shall be smooth	Surface shall be smooth	-do-	✓	P	-	-	
		5. Dimension	MA	Measurement	one Sample of each size/lot	-	Appd. Data Sheet	Appd. Data Sheet	-do-	✓	P	-	-	
		1. Surface finish	MA	Visual	100%	100%	Free from bulging	Free from bulging	Inspection report	✓	P	V	-	
		2. Insulation thickness	CR	Measurement	one Sample of each	-	Appd. data sheet	Appd. data sheet	-do-	✓	P	-	-	
		Core Insulation (No repair permitted)												

ENGINEERING				QUALITY			
Prepared by:	Sign & Date	Name	Checked by:	Sign & Date	Name		
Reviewed by:	Sign & Date	Name	Reviewed by:	Sign & Date	Name		
		DEVENDRA SINGH			KUNAL GANDHI		
		MANISH SHUKLA			R.K. JAISWAL		

BIDDER/SUPPLIER	
Sign & Date	Seal

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

28/07/2020

28/07/2020



MANUFACTURER/
SUPPLIER NAME & ADDRESS

STANDARD QUALITY PLAN

SPEC. NO : PE-RC-999-507-E004

DATE:

CUSTOMER :

QP NO.: PE-QP-999-507-E003, R-1

DATE:

PROJECT:

PO NO.:

DATE:

ITEM: 1.LT PVC CONTROL CABLE
2.LT HR PVC CONTRL CABLE
3.LT PVC POWER CABLE
4.LT HRPVC POWER CABLE

SYSTEM:

SECTION: II

SHEET 10 OF 17

Sl. No.	COMPONE NTS & OPERATIO NS	CHARACTERSTICS	CLA SS	TYPE OF CHECK	QUANTUM OF CHECK	REFEREN CE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS
1	2	3	4	5	6 M C/N	7	8	9	* D M C N	**

					size/lot									
		3. Concentricity #	CR	Measurement	-do-	-do-	Mfrs Std	Mfrs Std	Inspection Report	✓	P	V	-	# To be checked at starting & finish end of Extruded Length
		4 Dia over insulation	MA	Measurement	-do-	-	Approved Data Sheet	Approved Data Sheet	-do-	✓	P	-	-	
		5. Core identification	MA	Visual	100%	-	Appd. Data Sheet	Appd. Data Sheet	-do-	✓	P	-	-	
		6. TS & % Elongation	MA	Mechanical	100%	-	IS 1554 Pt-1/ IS 5831	IS 1554 Pt-1/ IS 5831	-do-	✓	P	-	-	

ENGINEERING				QUALITY	
Prepared by:	Sign & Date	Name	Checked by:	Sign & Date	Name
by: <i>Manish</i>	<i>28/04/2020</i>	MANISH SHUKLA	by: <i>R.K. JAISWAL</i>	<i>28/04/2020</i>	R.K. JAISWAL

BIDDER/SUPPLIER	
Sign & Date	Seal

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:	Sign & Date	Name	Seal



MANUFACTURER/
SUPPLIER NAME & ADDRESS

STANDARD QUALITY PLAN

SPEC. NO : PE-RC-999-507-E004

DATE:

CUSTOMER :

QP NO.: PE-QP-999-507-E003, R-1

DATE:

PROJECT:

PO NO.:

DATE:

ITEM: 1.LT PVC CONTROL CABLE
2.LT HR PVC CONTRL CABLE
3.LT PVC POWER CABLE
4.LT HRPVC POWER CABLE

SYSTEM:

SECTION: II

SHEET II OF 17

Sl. No.	COMPONENTS & OPERATIONS	CHARACTERISTICS	CLASSIFICATION	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS
1	2	3	4	5	6	7	8	9	* D M C N	**

		7. Spark Test or Water immersion test	CR	Electrical	100%	-	Mfr's Std.	Mfr's Std.	-do-	✓	P	-	-	
	Core laying	1. Dia over laid up core	MA	Measurement	one Sample of each size/lot	-	Approved Data Sheet	Approved Data Sheet	-do-	✓	P	-	-	
		2. Sequence of lay and lay length & direction for laid up core	MA	Visual meas	one Sample of each size/lot	-	IS 1554 Pt-1	IS 1554 Pt-	-do-	✓	P	-	-	
		3. Core identification	CR	Visual	one Sample of each size/lot	-	Appd. Data Sheet	Appd. Data Sheet	-do-	✓	P	-	-	

BHEL				QUALITY			
ENGINEERING		Name		Sign & Date		Name	
Prepared by:	Devi S. SINGH	Checked by:	Devi S. SINGH	Signature	28/02/2020	KUNAL GANDHI	R.K. JAISWAL
Reviewed by:	Manish SHUKLA	Reviewed by:	Manish SHUKLA	Signature	28/02/2020		

BIDDER/SUPPLIER		Seal	
Sign & Date		Seal	

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			



MANUFACTURER/ BIDDER/
SUPPLIER NAME & ADDRESS

STANDARD QUALITY PLAN

SPEC. NO : PE-RC-999-507-E004

DATE:

CUSTOMER :

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ITEM: 1.LT PVC CONTROL CABLE
2.LT HR PVC CONTRL CABLE
3. LT PVC POWER CABLE
4. LT HRPVC POWER CABLE

SYSTEM:

SECTION: II

SHEET 12 OF 17

SI. No.	COMPONENTS & OPERATIONS	CHARACTERISTICS	CLASSIFICATION	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS
1	2	3	4	5	6	7	8	9	* ** D M C N	

Inner Sheath Extrusion (if applicable)	1. Surface finish	MA	Visual	100%	-	Surface shall be smooth	Surface shall be smooth	-do-	✓	P	-	-	
	2. Sheath thickness	CR	Measurement	One sample of each size/lot	-	Approved Data Sheet	Approved Data Sheet	-do-	✓	P	-	-	
	3. Dia over inner sheath	MA	Measurement	-do-	-	Approved Data Sheet	Approved Data Sheet	-do-	✓	P	-	-	
	1. No. of wires/Strips	MA	Counting	At the start of the process	-	Mfr's Std	Mfr's Std	-do-	✓	P	-	-	
Armouring (if applicable)	2. Lay Direction	MA	Visual	-do-	-	IS 1554 Pt-1	IS 1554 Pt-1	-do-	✓	P	-	-	

ENGINEERING				QUALITY			
Prepared by:	Sign & Date	Name	Checked by:	Sign & Date	Name	Reviewed by:	Sign & Date
Manish	28/02/2020	MANISH SHUKLA	Manish	28/02/2020	MANISH SHUKLA	R.K. JAISWAL	

BIDDER/SUPPLIER		Sign & Date	Seal

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:	Sign & Date	Name	Seal



MANUFACTURER/
SUPPLIER NAME & ADDRESS

STANDARD QUALITY PLAN

SPEC. NO : PE-RC-999-507-E004

DATE:

CUSTOMER :

QP NO.: PE-QP-999-507-E003, R-1

DATE:

PROJECT:

PO NO.:

DATE:

ITEM: 1.LT PVC CONTROL CABLE
2.LT HR PVC CONTRL CABLE
3. LT PVC POWER CABLE
4. LT HRPVC POWER CABLE

SYSTEM:

SECTION: II

SHEET 14 OF 17

Sl. No.	COMPONENTS & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS
1	2	3	4	5	6 M C/N	7	8	9	* D M C N	**

		3. Dia over outer sheath	MA	Measurement	One sample of each size/lot	-	Appd. Data Sheet	Appd. Data Sheet	-do-	✓	P	-	-	
		4. Marking/ Colour / Embossing	MA	Visual	One sample of each size/lot	-	Appd. Data Sheet	Appd. Data Sheet	-do-	✓	P	-	-	
		Final Inspection (Internal)	CR	Electrical Test & measurement	100%	100%	IS 1554-I & Appd. Datasheet	IS 1554-I & Appd. Datasheet	Test Report	✓	P	V	✓	#: Refer Annexure-A to QP
		Final Inspection	MA	Visual, Measurement	See Remark	See Remark	IS 1554 Pt-1/ Appd. Data Sheet	Free from Bulging, Burnt particles, lumps, cuts & scratches/ Approved data sheet	Test Report	✓	P	W	W	

ENGINEERING				QUALITY			
Sign & Date	Name	Checked by:	Sign & Date	Name			
Prepared by: <i>[Signature]</i>	DEVENDRA SINGH		<i>[Signature]</i>	KUNAL GANDHI			
Reviewed by: <i>[Signature]</i>	MANISH SHUKLA		<i>[Signature]</i>	R.K. JAISWAL			

BIDDER/SUPPLIER	
Sign & Date	Seal

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

28/02/2020

28/2/2020

MANUFACTURER/
SUPPLIER NAME & ADDRESS

STANDARD QUALITY PLAN

SPEC. NO : PE-RC-999-507-E004

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QP NO.: PE-QP-999-507-E003, R-1

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ITEM: 1.LT PVC CONTROL CABLE
2.LT HR PVC CONTRL CABLE
3. LT PVC POWER CABLE
4. LT HRPVC POWER CABLE

SYSTEM:

SECTION: II

SHEET 15 OF 17

Sl. No.	COMPONENTS & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS
1	2	3	4	5	6 M C/N	7	8	9	* D M C N	** M C N

	2. Length	MA	Visual, Measurement	See Remark	See Remark	IS 1554 Pt-1/ Appd. Data Sheet	BHEL Spec./ Data Sheet	Test Report	✓	P	W	W	
	2. Dimensions	MA	Measurement	As per IS	As per IS	IS 1554 Pt-1/ Appd. Data Sheet	Appd. Data sheet	Test Report	✓	P	W	W	
	3. Armouring - Coverage No. of Wires/Strips	MA	Visual & Meas.	-do-	-do-	IS 1554 Pt-1/ Appd. Data Sheet	IS 1554 Pt-1/ Appd. Data Sheet	Test Report	✓	P	W	W	Refer Annexure-I to QP for sampling plan.
	4. Marking/Colour Coding	MA	Visual	-do-	-do-	IS 1554 Pt-1/ Appd. Data Sheet	IS 1554 Pt-1/ Appd. Data Sheet	Test Report	✓	P	W	W	
	6. Acceptance Tests (Refer Note-H)	CR	Phy & Elect. Tests FRLS Test	Sample #	Sample #	#:	#:	Test Report	✓	P	W	W	

ENGINEERING				QUALITY			
	Sign & Date	Name	Checked by:	Sign & Date	Name		
Prepared by:	<i>Devedendra Singh</i>	DEVENDRA SINGH		<i>R.K. Gandhi</i>	KUNAL GANDHI		
Reviewed by:	<i>Manish Shukla</i>	MANISH SHUKLA		<i>R.K. Jaishwal</i>	R.K. JAISWAL		

BIDDER/SUPPLIER			
	Sign & Date	Seal	

FOR CUSTOMER REVIEW & APPROVAL					
Doc No:	Sign & Date	Name	Reviewed by:	Approved by:	Seal

28/02/2020

28/02/2020



MANUFACTURER/ BIDDER/
SUPPLIER NAME & ADDRESS

STANDARD QUALITY PLAN

SPEC. NO : PE-RC-999-507-E004

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CUSTOMER :

QP NO.: PE-QP-999-507-E003, R-1

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DATE:

ITEM: 1.LT PVC CONTROL CABLE
2.LT HR PVC CONTRL CABLE
3. LT PVC POWER CABLE
4. LT HRPVC POWER CABLE

SYSTEM:

SECTION: II

SHEET 16 OF 17

Sl. No.	COMPONE NTS & OPERATIO NS	CHARACTERSTICS	CLA SS	TYPE OF CHECK	QUANTUM OF CHECK	REFEREN CE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS
1	2	3	4	5	6	7	8	9	* D M C N	**

	7. Type & FRLS Tests (Refer Note-H)	CR	Measurement	sample	sample	#:	#:	Test Report	✓	P	W	W
Packing	Sealing Identification	MA	Visual	100%	100%	As per IS	As per IS	Test Report	✓	P	W	-

NOTES: -

- (A) JOINTS IN WIRE SHALL BE AS PERMITTED BY MFRS STANDARD. VENDOR TO CERTIFY THE SAME.
- (B) NO REPAIR OF CORE INSULATION PERMITTED
- (C) CABLE ENDS SHALL BE SEALED AS PER VENDOR'S SPECIFICATION.
- (D) RECORD OF RAW MATERIAL, PROCESS & ALL STAGES SHALL BE CERTIFIED BY VENDORS QC. AND ARE LIABLE TO AUDIT CHECK BY PURCHASER.
- (E) FILLERS/DUMMY CORES ETC. SHALL BE AS PER APPROVED DATA SHEET
- (F) WHEREVER EXTENT OF CHECK FOR STAGE IS MENTIONED AS 'SAMPLE' & NOT DEFINED IN QP, THE SAME SHALL BE AS PER VENDORS SAMPLING PLAN.
- (G) VENDOR SHALL FURNISH COMPLIANCE CERTIFICATE TO THE INSPECTION AGENCY CONFIRMING THE PACKING AS PER IS/ BHEL SPECIFICATION.
- (H) FOR LISTS OF ROUTINE TESTS, ACCEPTANCE TESTS & TYPE TESTS REFER ANNEXURE TO QAP.

ENGINEERING				QUALITY				BIDDER/SUPPLIER				FOR CUSTOMER REVIEW & APPROVAL			
Prepared by:	Sign & Date	Name	Checked by:	Sign & Date	Name	Seal	Sign & Date	Doc No:	Sign & Date	Name	Seal	Reviewed by:	Sign & Date	Name	Seal
Reviewed by:	Manish SHUKLA	MANISH SHUKLA	Reviewed by:	28/09/2020	KUNAL GANDHI							Approved by:			

 MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS		STANDARD QUALITY PLAN		SPEC. NO. : PE-RC-999-507-E004	DATE:
CUSTOMER :		QP NO. : PE-QP-999-507-E003, R-1		DATE:	
PROJECT:		PO NO.:		DATE:	
ITEM: 1.LT PVC CONTROL CABLE 2.LT HR PVC CONTRL. CABLE 3. LT PVC POWER CABLE 4. LT HRPVC POWER CABLE		SYSTEM:		SECTION: II	
				SHEET 17 OF 17	

Sl. No.	COMPONE NTS & OPERATIO NS	CHARACTERSTICS	CLA SS	TYPE OF CHECK	QUANTUM OF CHECK	REFEREN CE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS
1	2	3	4	5	6	7	8	9	* D M C N	** M C N
(I) BHEL RESERVES THE RIGHT FOR CONDUCTING REPEAT TEST, IF REQUIRED.										
(J) AFTER PACKING AND PRIOR TO ISSUE OF MDCC, PHOTOGRAPHS OF COMPLETE CABLE (TO BE DISPATCHED) SHALL BE SENT TO BHEL- PURCHASE GROUP FOR REVIEW.										
(K) PROJECT SPECIFIC QP SHALL BE DEVELOPED BASED ON CUSTOMER REQUIREMENT.										

LEGENDS:
 *RECORDS, IDENTIFIED WITH "TICK"(✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION,
 ** M: SUPPLIER/ MANUFACTURER/ SUB-SUPPLIER, C: MAIN SUPPLIER/ BHEL/ THIRD PARTY INSPECTION AGENCY, N: CUSTOMER,
 P: PERFORM, W: WITNESS, V: VERIFICATION, AS APPROPRIATE
 MA: MAJOR, MI: MINOR, CR: CRITICAL, D: DOCUMENTATION

BHEL				BIDDER/ SUPPLIER				FOR CUSTOMER REVIEW & APPROVAL			
ENGINEERING				QUALITY				DOE NO.:			
Prepared by:	Sign & Date	Name	Checked by:	Sign & Date	Name	Seal		Reviewed by:	Sign & Date	Name	Seal
Reviewed by:	Manish SHUKLA	MANISH SHUKLA	Reviewed by:	R.K. JAISWAL	R.K. JAISWAL			Approved by:			

28/02/2020

28/2/2020

	ANNEXURE-I TO QP	CUSTOMER:	PROJECT TITLE	SPECIFICATION NUMBER: PE-RC-999-507-E004
		BIDDER/VENDOR:	QUALITY PLAN NUMBER : PE-QP-999-507-E003, R1	SPECIFICATION TITLE:
		SYSTEM	ITEM: 1. LT PVC CONTROL CABLE 2. LT HRPVC CONTROL CABLE 3. LT PVC POWER CABLE 4. LT HRPVC POWER CABLE	DOC. NO.

TYPE/ ACCEPTANCE/ ROUTINE TEST REQUIREMENTS

A. Type Test Conduction:

- Tests for which "T" is indicated in the 'Test Conduction Required As' column below shall be conducted as Type Test.
- Sampling:
 - Type test to be conducted on one size of cable for every lot of cable.
 - FRLS & Flammability Test to be conducted only on one sample/ lot.

B. Acceptance Test Conduction:

- Tests for which "A" is indicated in the 'Test Conduction Required As' column below shall be conducted as Acceptance tests.
- Sampling:

Sampling for acceptance tests shall be as per Appendix-B of IS: 1554 Part-I (control cable).
- Flammability Test to be conducted only on one sample/ lot.

C. Routine Test Conduction:

- Tests for which "R" is indicated in the 'Test Conduction Required As' column below shall be conducted as Routine tests.

D. Tests listed in S. No-7.0 & 8.0 shall be conducted only on one sample / lot.

NOTE

LOT shall be defined as per IS: 1554 Part-I (control cable).

S. No.	TEST	APPLICABLE FOR	TEST CONDUCTION REQUIRED AS	REFERENCE STANDARD	REMARKS
1.0	Tests for Conductor				
I.	Annealing test	For copper conductor	T, A	IS 10810 Pt 1	<i>In process records shall be furnished to inspector at the time of inspection.</i>
II.	Resistance test	For copper conductor	T, A, R	IS 10810 Pt 5	
2.0	Tests for Armour Wires/Strips				
I.	Measurement of dimensions	Applicable for GS wire/Strip	T,A	IS 10810 Pt 36	
II.	Tensile test	Applicable for GS wire/Strip	T, A	IS 10810 Pt 37	

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:		DEVENDRA SINGH	Checked by:		KUNAL GANDHI
Reviewed by:		MANISH SHUKLA	Reviewed by:		R.K. JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

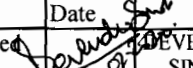
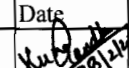
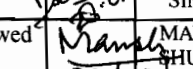
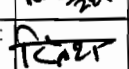
FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

	ANNEXURE-I TO QP	CUSTOMER:	PROJECT TITLE	SPECIFICATION NUMBER: PE-RC-999-507-E004
		BIDDER/VENDOR:	QUALITY PLAN NUMBER : PE-QP-999-507-E003, R1	SPECIFICATION TITLE:
		SYSTEM	ITEM: 1. LT PVC CONTROL CABLE 2. LT HRPVC CONTROL CABLE 3. LT PVC POWER CABLE 4. LT HRPVC POWER CABLE	DOC. NO.

S. No.	TEST	APPLICABLE FOR	TEST CONDUCTION REQUIRED AS	REFERENCE STANDARD	REMARKS
5.0	Flammability Tests				
I.	Flammability test for bunched cables	For complete cable	T	IS 10810 Pt 62/ IEC-60332 (Part-3-23-Cat-B)	Test & Category applicable as indicated in Datasheet-A
II.	Flammability test for single cable	For complete cable	T, A	IS: 10810 Pt 61 / IEC:60332 Part-1	
III.	Swedish chimney test	For complete cable	A	SEN SS 424 1475 (Class F3)	
IV.	Flammability test	For complete cable	A	IEEE: 60383	
6.0	Electrical Tests				
I.	High Voltage Test (Water immersion test)	On cores	T	IS 10810 Pt 45	
II.	High Voltage Test at room temperature	For complete cable	T, A, R	IS 10810 Pt 45	
III.	Insulation Resistance Test (Volume resistivity method)	For complete cable	T, A	IS 10810 Pt 43	
7.0	Anti-rodent and Termite Repulsion test	For PVC outer sheath only	A	Refer Note	Test applicable if indicated in Datasheet-A
8.0	Anti-Fungal Test	For PVC outer sheath only	A	--	
9.0	Special Tests				
I.	Hydrolytic Stability Test	For complete cable	**	ASTM D 3137:81	Test applicable if indicated in Datasheet-A
II.	Ultraviolet Radiation Test	For complete cable	**	BS EN ISO 4892-2	

**** These tests shall be conducted on one sample for the entire contract and duration of these tests shall be 14 days.**

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

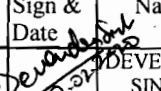
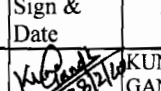
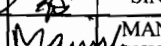
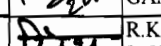
BHEL				
ENGINEERING		QUALITY		
	Sign & Date	Name	Sign & Date	Name
Prepared by:		DEVENDRA SINGH	Checked by:	 KUNAL GANDHI
Reviewed by:		MANISH SHUKLA	Reviewed by:	 R.K. JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
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Approved by:			

	ANNEXURE-I TO QP	CUSTOMER:	PROJECT TITLE	SPECIFICATION NUMBER: PE-RC-999-507-E004
		BIDDER/VENDOR:	QUALITY PLAN NUMBER : PE-QP-999-507-E003, R1	SPECIFICATION TITLE:
		SYSTEM	ITEM: 1. LT PVC CONTROL CABLE 2. LT HRPVC CONTROL CABLE 3. LT PVC POWER CABLE 4. LT HRPVC POWER CABLE	DOC. NO.

S. No.	TEST	APPLICABLE FOR	TEST CONDUCTION REQUIRED AS	REFERENCE STANDARD	REMARKS
III.	Elongation at break test	Applicable for GS wire/Strip only	T, A	IS 10810 Pt 37	
IV.	Torsion test	For GS round wire only	T, A	IS 10810 Pt 38	
V.	Winding / Adhesion Test	For GS strip only	T, A	IS 10810 Pt 39	
VI.	Resistivity test	Applicable for GS wire/Strip	T, A	IS 10810 Pt 42	
VII.	Uniformity of Zinc coating test	For G. S. wires/Strip only	T, A	IS 10810 Pt 40	
VIII.	Mass of Zinc coating test	For G. S. wires/Strip only	T, A	IS 10810 Pt 41	
IX.	Wrapping Test	For G. S. wires/Strip only	A	IS 10810 Pt 3	
3.0	Physical Tests for PVC Insulation & PVC sheath				
I.	Test for thickness	Applicable for PVC insulation, PVC inner sheath & PVC outer sheath	T, A	IS 10810 Pt 6	
II.	Tensile strength and elongation test at break	Applicable for PVC insulation & PVC outer sheath			
(a)	Before ageing		T, A	IS 10810 Pt 7	
(b)	After ageing		T, A	IS 10810 Pt 7	
III.	Ageing in air oven	Applicable for PVC insulation & PVC outer sheath	T	IS 10810 Pt 11	
IV.	Loss of mass in air oven test	Applicable for PVC insulation & PVC outer sheath	T	IS 10810 Pt 10	
V.	Hot deformation test	Applicable for PVC insulation & PVC outer sheath	T	IS 10810 Pt 15	
VI.	Heat shock test	Applicable for PVC insulation & PVC outer sheath	T	IS 10810 Pt 14	
VII.	Shrinkage test	Applicable for PVC insulation & PVC outer sheath	T	IS 10810 Pt 12	
VIII.	Thermal stability test	Applicable for PVC insulation & PVC outer sheath	T	IS 10810 Pt 60	
4.0	Improved Fire performance (FR-LSH) Tests				
I.	Oxygen index test	For PVC outer sheath only	T, A	IS 10810 Pt 58 / ASTM D 2863	Applicable for Inner Sheath also, if the same is indicated in Datasheet-A
II.	Smoke density test	For PVC outer sheath only	T, A	IS 10810 Pt 63 / ASTM D 2843	
III.	Acid gas generation test	For PVC outer sheath only	T, A	IS 10810 Pt 59 / IEC-754-1	
IV.	Temperature Index Test	For PVC outer sheath only	T	IS 10810 Pt 64 / ASTM D 2863	

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:		DEVENDRA SINGH	Checked by:		KUNAL GANDHI
Reviewed		MANISH	Reviewed by:		R.K.

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

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Doc No:			
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Reviewed by:			
Approved			

TYPICAL DRAWING OF CABLE DRUM PACKING

