

Ref. Enquiry No.: **PE/PG/RTC/E-6557/2020**

Dated: 12.11.2020

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

SUBJECT: TENDER ENQUIRY FOR FRAMEWORK AGREEMENT (RATE CONTRACT) OF LT PVC POWER CABLES AS PER TECHNICAL SPECIFICATION NO. PE-RC-999-507-E003, REV 00

OUR REF: TENDER ENQUIRY NO: PE/PG/RTC/E-6557/2020, DTD-12.11.2020

DUE DATE – 24.11.2020, BY 11.00AM

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://eprocurebhel.co.in> 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 POWER CABLES - Refer Technical specification no PE-RC-999-507-E003, 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.

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 11.00AM. Part-I bids shall be opened at 4.00PM on due date through e-procurement Portal.

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

a) <https://eprocurebhel.co.in/> b) www.bhel.com c) www.bhelpem.com

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 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".

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

MR SUMEET SAHAY
MANAGER/CMM
BHEL/PS-PEM
POWER PROJECT ENGINEERING INSTITUTE,
PLOT NO. 25, SECTOR - 16A, NOIDA (UP)
(OFF) 0120-4213532, 09999498202

Regd. Office:
BHEL House
Siri Fort
New Delhi-110049

Ref. Enquiry No.: **PE/PG/RTC/E-6557/2020**

Dated: 12.11.2020

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

TERMS AND CONDITIONS

1. This tender is being issued by BHEL PEM for Framework Agreement (Rate Contract) of LT PVC Power 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 and & NTPC Approval before price bid opening/RA.
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 3 vendors in ratio of 50:30:20 value wise at L1 FOR site price (Ex-works + freight) for this package. Splitting of Framework Agreement (Rate contract) between 3 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 and the same shall be informed to bidders through NIT.**
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% & 20% 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. In case only one vendor accepts the L1 rates, RC shall be done with 2 vendors in ratio of 70:30 RC value.**
7. PVC shall be applicable for the subject package. Base date for initial prices for this tender shall be **first October 2020**. 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>.

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 Class I local supplier/ Class II local supplier/ Non Local supplier and purchase preference to Class I local supplier is as defined in Public Procurement (Preference to Make India), Order 2017 dated 04.06.2020 issued by DPIT. In case of subsequent order issued by nodal ministry changing the definition of local content for item in NIT, the same shall be applicable even if issued after issue of this NIT but before opening of part-II bids against this NIT.”

MR SUMEET SAHAY
MANAGER/CMM
BHEL/PS-PEM
POWER PROJECT ENGINEERING INSTITUTE,
PLOT NO. 25, SECTOR - 16A, NOIDA (UP)
(OFF) 0120-4213532, 09999498202

Regd. Office:
BHEL House
Siri Fort
New Delhi-110049

Ref. Enquiry No.: **PE/PG/RTC/E-6557/2020**

Dated: 12.11.2020

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

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.**

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.

MR SUMEET SAHAY
MANAGER/CMM
BHEL/PS-PEM
POWER PROJECT ENGINEERING INSTITUTE,
PLOT NO. 25, SECTOR - 16A, NOIDA (UP)
(OFF) 0120-4213532, 09999498202

Regd. Office:
BHEL House
Siri Fort
New Delhi-110049

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

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.**

"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 **& NTPC Approval before price bid opening/RA.**
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 Power 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.)	ybsinghips@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".

Ref. Enquiry No.: **PE/PG/RTC/E-6557/2020**

Dated: 12.11.2020

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

OTHER TERMS AND CONDITIONS

1. Procurement of the subject package shall be done through e-procurement
2. Offers should be uploaded in two parts online at a) <https://eprocurebhel.co.in/> in as follows:
 - a) 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)
 - 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. AJAY JAIN, 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: AJAY JAIN/ CMM E-MAIL: ajayjain@bhel.in Ph. No. 0120- 4368986 , 9871002977	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
--	--

MR SUMEET SAHAY
MANAGER/CMM
BHEL/PS-PEM
POWER PROJECT ENGINEERING INSTITUTE,
PLOT NO. 25, SECTOR - 16A, NOIDA (UP)
(OFF) 0120-4213532, 09999498202

Regd. Office:
BHEL House
Siri Fort
New Delhi-110049

Ref. Enquiry No.: **PE/PG/RTC/E-6557/2020**

Dated: 12.11.2020

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

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.

SI No	Drawings/Document Description	Primary/ Secondary	Drawings / Document Number	Drg Sch for Vendors
1	Technical Data sheet – LT PVC Power 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 PVC Power Cables	Primary		
3	Quality Plan – LT PVC Power Cables	Primary		
4	Type test certificates – LT PVC Power Cables	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-E003

Following to be made the part of NIT.

- The end period specified is for completion of the deliveries. Deliveries to start progressively so as to meet the completion schedule.
 - The delivery conditions specified are for contractual LD purposes, however BHEL may ask for early deliveries without any compensation thereof.
 - Non-applicable drawings shall be decided during bid evaluation
 - Wherever schedule of drawings/documents submission / re-submission is stipulated in the Technical Specifications, same shall be superseded by delivery specified in NIT
- All other terms and conditions shall be as per GCC Rev 07 and Special Conditions of (Framework Agreement) Rate Contract. 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).
 - All the above Tender Documents shall automatically become a part of the Order/Contract after its finalization.
 - 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://eprocurebhel.co.in> 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.**
 - Bidders to submit their offers strictly in line with the form available at e-procurement portal.
 - Inspection shall be done by BHEL/ END CUSTOMER/Third party Agency (finalized by BHEL).
 - 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.
 - Non- registered bidder to submit the credentials required for Registration in BHEL PEM: -

MR SUMEET SAHAY
MANAGER/CMM
BHEL/PS-PEM
POWER PROJECT ENGINEERING INSTITUTE,
PLOT NO. 25, SECTOR - 16A, NOIDA (UP)
(OFF) 0120-4213532, 09999498202

Regd. Office:
BHEL House
Siri Fort
New Delhi-110049

Ref. Enquiry No.: **PE/PG/RTC/E-6557/2020**

Dated: 12.11.2020

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

"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 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.
26. Inline with Circular No. 15 of 2020-21 dated-08.09.2020 issued by SS&PCOM following terms will be mentioned in the NIT-
The evaluation currency for this tender shall be INR.
27. Restrictions under Rule 144(xi) of the General Financial Rules (GFRs), 2017
I. Any bidder from a country which shares a land border with India will be eligible to bid in this tender only if the bidder is registered with the Competent Authority.
II. "Bidder" (including the term 'tenderer', 'consultant' or 'service provider' in certain contexts) means any person or firm or company, including any member of a consortium or joint venture (that is an association of several persons, or firms or companies), every artificial juridical person not falling in any of the descriptions of bidders stated hereinbefore, including any agency branch or office controlled by such person, participating in a procurement process.
III. "Bidder from a country which shares a land border with India" for the purpose of this Order means
a. An entity incorporated, established or registered in such a country; or
b. A subsidiary of an entity Incorporated. established or registered in such a country; or
c. An entity substantially controlled through entities incorporated, established or registered in such a country; or
d. An entity whose beneficial owner is situated in such a country: or

MR SUMEET SAHAY
MANAGER/CMM
BHEL/PS-PEM
POWER PROJECT ENGINEERING INSTITUTE,
PLOT NO. 25, SECTOR - 16A, NOIDA (UP)
(OFF) 0120-4213532, 09999498202

Regd. Office:
BHEL House
Siri Fort
New Delhi-110049

Ref. Enquiry No.: **PE/PG/RTC/E-6557/2020**

Dated: 12.11.2020

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

- e. An Indian (or other) agent of such an entity; or
- f. A natural person who is a Citizen of such a country; or
- g. A consortium or joint venture where any member of the consortium or joint venture falls under any of the above.

IV. The beneficial owner for the purpose of (iii) above will be as under:

1. In case of a company or Limited Liability Partnership, the beneficial owner is the natural person(s), who, whether acting alone or together, or through one or more juridical person, has a controlling ownership Interest or who exercises control through other means,

Explanation-

a. "Controlling ownership interest" means ownership of or entitlement to more than twenty-five per cent. of shares or capital or profits of the company;

b. "Control" shall include the right to appoint majority of the directors or to control the management or policy decisions including by virtue of their shareholding or management rights or shareholder's agreements or voting agreements;

2. In case of a partnership firm, the beneficial owner is the natural person(s) who, whether acting alone or together, or through one or more juridical person, has ownership of entitlement to more than fifteen percent of capital or profits of the partnership;

3. In case of an unincorporated association or body of individuals, the beneficial owner is the natural person(s), who, whether acting alone or together, or through one or more juridical person, has ownership of or entitlement to more than fifteen percent of the property or capital or profits of such association or body of Individuals;

4. Where no natural person is Identified under (1) or (2) or (3) above, the beneficial owner is the relevant natural person who holds the position of senior managing official;

5. In case of a trust, the identification of beneficial owner(s) shall include identification of the author of the trust, the trustee, the beneficiaries with fifteen percent or more interest in the trust and any other natural person exercising ultimate effective control over the trust through a chain of control or ownership.

V. An Agent is a person employed to do any act for another, or to represent another in dealings with third person

Note- The above clause shall not be applicable for the bidders from those countries (even if sharing a land order with India) to which the Government of India (GoI) has extended lines of credit or in which the GoI is engaged in development work.

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

(Signature of official with Name & Designation)

MR SUMEET SAHAY
MANAGER/CMM
BHEL/PS-PEM
POWER PROJECT ENGINEERING INSTITUTE,
PLOT NO. 25, SECTOR - 16A, NOIDA (UP)
(OFF) 0120-4213532, 09999498202

Regd. Office:
BHEL House
Siri Fort
New Delhi-110049

Ref. Enquiry No.: **PE/PG/RTC/E-6557/2020**

Dated: 12.11.2020

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

Enclosure:

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

MR SUMEET SAHAY
MANAGER/CMM
BHEL/PS-PEM
POWER PROJECT ENGINEERING INSTITUTE,
PLOT NO. 25, SECTOR - 16A, NOIDA (UP)
(OFF) 0120-4213532, 09999498202

Regd. Office:
BHEL House
Siri Fort
New Delhi-110049

 ANNEXURE I TO NIT REF NO-PE/PG/RTC/E-6557/2020, DTD-12.11.2020 PRICE SCHEDULE FOR LT PVC POWER CABLES FRAMEWORK AGREEMENT (RATE CONTRACT)													
NAME OF VENDOR - (Please fill vendor's name)													
SL. NO.	ITEM CODE	ITEM DESCRIPTION	UOM	QUANTITY	DRUM LENGTH (IN METRE)	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)
1	2	3	4	5	6	7	8	9	10	11	12	13	14
A	1.1KV, Al conductor, PVC insulated, Galvanised Steel Round/Formed Wire Armoured for multi-core cables, (Non Magnetic Hard drawn Aluminium Round/Formed wire Armoured conforming to H4 grade for single core cables), INNER SHEATH: Extruded PVC compound conforming to type ST1 of IS: 5831 for multicore cable, & no inner sheath for single core cables, OVERALL SHEATH: Extruded FRLS PVC compound conforming to type ST1 of IS: 5831 & black in colour												
A1	507-29946-A	1C - 16- AL ARMOURED	Metres	5,000	500	8544	(0.0002 * X)/ 5000	Derived	(0.0002 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
A2	507-29984-A	1C - 35- AL ARMOURED	Metres	5,000	500	8544	(0.0003 * X)/ 5000	Derived	(0.0003 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
A3	507-29985-A	1C - 50- AL ARMOURED	Metres	2,000	500	8544	(0.00015 * X)/ 2000	Derived	(0.00015 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
A4	507-29986-A	1C - 70- AL ARMOURED	Metres	5,000	500	8544	(0.00046 * X)/ 5000	Derived	(0.00046 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
A5	507-29987-A	1C - 120- AL ARMOURED	Metres	5,000	500	8544	(0.00068 * X)/ 5000	Derived	(0.00068 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
A6	507-29988-A	1C - 150- AL ARMOURED	Metres	25,000	500	8544	(0.00402 * X)/ 25000	Derived	(0.00402 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
A7	507-29952-A	2C - 6- AL ARMOURED	Metres	75,000	1000	8544	(0.00418 * X)/ 75000	Derived	(0.00418 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
A8	507-29011-A	2C - 10- AL ARMOURED	Metres	149,500	500	8544	(0.01029 * X)/ 149500	Derived	(0.01029 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
A9	507-29953-A	2C - 16- AL ARMOURED	Metres	2,000	500	8544	(0.00014 * X)/ 2000	Derived	(0.00014 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
A10	507-29017-A	2C - 25- AL ARMOURED	Metres	16,000	500	8544	(0.0014 * X)/ 16000	Derived	(0.0014 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
A11	507-29954-A	2C - 35- AL ARMOURED	Metres	23,000	500	8544	(0.00236 * X)/ 23000	Derived	(0.00236 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
A12	507-29021-A	2C - 50- AL ARMOURED	Metres	2,000	500	8544	(0.00026 * X)/ 2000	Derived	(0.00026 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
A13	507-29955-A	2C - 70- AL ARMOURED	Metres	11,000	500	8544	(0.00183 * X)/ 11000	Derived	(0.00183 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
A14	507-29027-A	2C - 95- AL ARMOURED	Metres	8,000	500	8544	(0.00171 * X)/ 8000	Derived	(0.00171 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
A15	507-29956-A	2C - 120- AL ARMOURED	Metres	2,000	500	8544	(0.0005 * X)/ 2000	Derived	(0.0005 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
A16	507-29957-A	3C - 6- AL ARMOURED	Metres	168,000	1000	8544	(0.01074 * X)/ 168000	Derived	(0.01074 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
A17	507-29039-A	3C - 10- AL ARMOURED	Metres	84,500	500	8544	(0.00658 * X)/ 84500	Derived	(0.00658 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived

 ANNEXURE I TO NIT REF NO-PE/PG/RTC/E-6557/2020, DTD-12.11.2020 PRICE SCHEDULE FOR LT PVC POWER CABLES FRAMEWORK AGREEMENT (RATE CONTRACT)													
NAME OF VENDOR - (Please fill vendor's name)													
SL. NO.	ITEM CODE	ITEM DESCRIPTION	UOM	QUANTITY	DRUM LENGTH (IN METRE)	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)
1	2	3	4	5	6	7	8	9	10	11	12	13	14
A18	507-29958-A	3C - 16- AL ARMoured	Metres	74,500	500	8544	(0.00618 * X)/ 74500	Derived	(0.00618 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
A19	507-29047-A	3C - 25- AL ARMoured	Metres	203,000	500	8544	(0.02217 * X)/ 203000	Derived	(0.02217 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
A20	507-29959-A	3C - 35- AL ARMoured	Metres	37,500	500	8544	(0.00501 * X)/ 37500	Derived	(0.00501 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
A21	507-29049-A	3C - 50- AL ARMoured	Metres	125,500	500	8544	(0.02157 * X)/ 125500	Derived	(0.02157 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
A22	507-29960-A	3C - 70- AL ARMoured	Metres	43,000	500	8544	(0.00987 * X)/ 43000	Derived	(0.00987 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
A23	507-29051-A	3C - 95- AL ARMoured	Metres	48,000	500	8544	(0.01387 * X)/ 48000	Derived	(0.01387 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
A24	507-29961-A	3C - 120- AL ARMoured	Metres	86,000	500	8544	(0.02945 * X)/ 86000	Derived	(0.02945 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
A25	507-29031-A	3.5C - 25- AL ARMoured	Metres	46,000	500	8544	(0.0057 * X)/ 46000	Derived	(0.0057 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
A26	507-29962-A	3.5C - 35- AL ARMoured	Metres	93,500	500	8544	(0.0141 * X)/ 93500	Derived	(0.0141 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
A27	507-29035-A	3.5C - 50- AL ARMoured	Metres	27,500	500	8544	(0.00551 * X)/ 27500	Derived	(0.00551 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
A28	507-29963-A	3.5C - 70- AL ARMoured	Metres	287,500	500	8544	(0.07492 * X)/ 287500	Derived	(0.07492 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
A29	507-29037-A	3.5C - 95- AL ARMoured	Metres	44,000	500	8544	(0.0146 * X)/ 44000	Derived	(0.0146 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
A30	507-29964-A	3.5C - 120- AL ARMoured	Metres	15,500	500	8544	(0.00637 * X)/ 15500	Derived	(0.00637 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
A31	507-29965-A	4C - 6- AL ARMoured	Metres	100,000	1000	8544	(0.00718 * X)/ 100000	Derived	(0.00718 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
A32	507-29053-A	4C - 10- AL ARMoured	Metres	26,000	500	8544	(0.00221 * X)/ 26000	Derived	(0.00221 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
A33	507-29966-A	4C - 16- AL ARMoured	Metres	287,500	500	8544	(0.02877 * X)/ 287500	Derived	(0.02877 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
B	1.1KV, Cu conductor, PVC insulated, Galvanised Steel Round/Formed Wire Armoured for multi-core cables (Non Magnetic Hard drawn Aluminium Round/Formed Wire Armoured conforming to H4 grade for single core cables), INNER SHEATH: Extruded PVC compound conforming to type ST1 of IS: 5831 for multicore cable & no inner sheath for single core cables, OVERALL SHEATH: Extruded FRLS PVC compound conforming to type ST1 of IS: 5831 & black in colour												
B1	507-29001-A	1C - 16- CU ARMoured	Metres	2,000	500	8544	(0.00026 * X)/ 2000	Derived	(0.00026 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived

 ANNEXURE I TO NIT REF NO-PE/PG/RTC/E-6557/2020, DTD-12.11.2020 PRICE SCHEDULE FOR LT PVC POWER CABLES FRAMEWORK AGREEMENT (RATE CONTRACT)													
NAME OF VENDOR - (Please fill vendor's name)													
SL. NO.	ITEM CODE	ITEM DESCRIPTION	UOM	QUANTITY	DRUM LENGTH (IN METRE)	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)
1	2	3	4	5	6	7	8	9	10	11	12	13	14
B2	507-29967-A	1C - 35- CU ARMoured	Metres	5,000	500	8544	(0.00127 * X)/ 5000	Derived	(0.00127 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
B3	507-29968-A	1C - 70- CU ARMoured	Metres	5,000	500	8544	(0.00239 * X)/ 5000	Derived	(0.00239 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
B4	507-29015-A	2C - 2.5- CU ARMoured	Metres	209,000	1000	8544	(0.01438 * X)/ 209000	Derived	(0.01438 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
B5	507-29969-A	2C - 6- CU ARMoured	Metres	7,000	1000	8544	(0.00085 * X)/ 7000	Derived	(0.00085 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
B6	507-29970-A	2C - 35- CU ARMoured	Metres	25,000	500	8544	(0.0123 * X)/ 25000	Derived	(0.0123 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
B7	507-29043-A	3C - 2.5- CU ARMoured	Metres	1,156,000	1000	8544	(0.09634 * X)/ 1156000	Derived	(0.09634 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
B8	507-29055-A	4C - 2.5- CU ARMoured	Metres	31,000	1000	8544	(0.00317 * X)/ 31000	Derived	(0.00317 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
B9	507-29971-A	4C - 10- CU ARMoured	Metres	75,000	500	8544	(0.03146 * X)/ 75000	Derived	(0.03146 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
B10	507-29972-A	4C - 25- CU ARMoured	Metres	25,000	500	8544	(0.01758 * X)/ 25000	Derived	(0.01758 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
B11	507-29973-A	4C - 50- CU ARMoured	Metres	25,000	500	8544	(0.03302 * X)/ 25000	Derived	(0.03302 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
C	1.1KV, Al conductor, PVC insulated, INNER SHEATH: Extruded PVC compound conforming to type ST1 of IS: 5831 for multicore cable & no inner sheath for single core cables, UNARMoured, OVERALL SHEATH: Extruded FRLS PVC compound conforming to type ST1 of IS: 5831 & black in colour												
C1	507-29068-A	1C - 35- AL UNARMoured	Metres	45,000	500	8544	(0.00181 * X)/ 45000	Derived	(0.00181 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
C2	507-29076-A	1C - 120- AL UNARMoured	Metres	74,000	500	8544	(0.00765 * X)/ 74000	Derived	(0.00765 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
C3	507-29012-A	2C - 10- AL UNARMoured	Metres	141,500	500	8544	(0.00588 * X)/ 141500	Derived	(0.00588 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
C4	507-29930-A	2C - 16- AL UNARMoured	Metres	2,000	500	8544	(0.00009 * X)/ 2000	Derived	(0.00009 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
C5	507-29018-A	2C - 25- AL UNARMoured	Metres	19,500	500	8544	(0.00122 * X)/ 19500	Derived	(0.00122 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
C6	507-29974-A	2C - 35- AL UNARMoured	Metres	55,000	500	8544	(0.00426 * X)/ 55000	Derived	(0.00426 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
C7	507-29022-A	2C - 50- AL UNARMoured	Metres	5,000	500	8544	(0.00049 * X)/ 5000	Derived	(0.00049 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived

 ANNEXURE I TO NIT REF NO-PE/PG/RTC/E-6557/2020, DTD-12.11.2020 PRICE SCHEDULE FOR LT PVC POWER CABLES FRAMEWORK AGREEMENT (RATE CONTRACT)													
NAME OF VENDOR - (Please fill vendor's name)													
SL. NO.	ITEM CODE	ITEM DESCRIPTION	UOM	QUANTITY	DRUM LENGTH (IN METRE)	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)
1	2	3	4	5	6	7	8	9	10	11	12	13	14
C8	507-29975-A	2C - 70- AL UNARMoured	Metres	56,000	500	8544	(0.00733 * X)/ 56000	Derived	(0.00733 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
C9	507-29028-A	2C - 95- AL UNARMoured	Metres	78,000	500	8544	(0.0134 * X)/ 78000	Derived	(0.0134 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
C10	507-29141-A	2C - 120- AL UNARMoured	Metres	3,000	500	8544	(0.00064 * X)/ 3000	Derived	(0.00064 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
C11	507-29040-A	3C - 10- AL UNARMoured	Metres	292,000	500	8544	(0.0145 * X)/ 292000	Derived	(0.0145 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
C12	507-29936-A	3C - 16- AL UNARMoured	Metres	49,500	500	8544	(0.00292 * X)/ 49500	Derived	(0.00292 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
C13	507-29048-A	3C - 25- AL UNARMoured	Metres	325,000	500	8544	(0.02748 * X)/ 325000	Derived	(0.02748 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
C14	507-29938-A	3C - 35- AL UNARMoured	Metres	34,000	500	8544	(0.00357 * X)/ 34000	Derived	(0.00357 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
C15	507-29050-A	3C - 50- AL UNARMoured	Metres	313,500	500	8544	(0.0434 * X)/ 313500	Derived	(0.0434 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
C16	507-29976-A	3C - 70- AL UNARMoured	Metres	11,500	500	8544	(0.00211 * X)/ 11500	Derived	(0.00211 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
C17	507-29052-A	3C - 95- AL UNARMoured	Metres	88,000	500	8544	(0.02097 * X)/ 88000	Derived	(0.02097 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
C18	507-29977-A	3C - 120- AL UNARMoured	Metres	87,000	500	8544	(0.02514 * X)/ 87000	Derived	(0.02514 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
C19	507-29032-A	3.5C - 25- AL UNARMoured	Metres	67,500	500	8544	(0.00664 * X)/ 67500	Derived	(0.00664 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
C20	507-29036-A	3.5C - 50- AL UNARMoured	Metres	239,500	500	8544	(0.03883 * X)/ 239500	Derived	(0.03883 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
C21	507-29038-A	3.5C - 95- AL UNARMoured	Metres	28,500	500	8544	(0.00812 * X)/ 28500	Derived	(0.00812 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
C22	507-29944-A	3.5C - 120- AL UNARMoured	Metres	5,000	500	8544	(0.0018 * X)/ 5000	Derived	(0.0018 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
C23	507-29054-A	4C - 10- AL UNARMoured	Metres	5,000	500	8544	(0.0003 * X)/ 5000	Derived	(0.0003 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
C24	507-29978-A	4C - 16- AL UNARMoured	Metres	5,000	500	8544	(0.00037 * X)/ 5000	Derived	(0.00037 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
D	1.1KV, Cu conductor, PVC insulated, INNER SHEATH: Extruded PVC compound conforming to type ST1 of IS: 5831 for multicore cable & no inner sheath for single core cables, UNARMoured, OVERALL SHEATH: Extruded FRLS PVC compound conforming to type ST1 of IS: 5831 & black in colour												

बी.एच.एल. ANNEXURE I TO NIT REF NO-PE/PG/RTC/E-6557/2020, DTD-12.11.2020 PRICE SCHEDULE FOR LT PVC POWER CABLES FRAMEWORK AGREEMENT (RATE CONTRACT)													
NAME OF VENDOR - (Please fill vendor's name)													
SL. NO.	ITEM CODE	ITEM DESCRIPTION	UOM	QUANTITY	DRUM LENGTH (IN METRE)	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)
1	2	3	4	5	6	7	8	9	10	11	12	13	14
D1	507-29979-A	1C - 2.5 - CU UNARMoured (Red)	Metres	4000	1000	8544	(0.0001 * X)/ 4000	Derived	(0.0001 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
D2	507-29980-A	1C - 2.5 - CU UNARMoured (Black)	Metres	5000	1000	8544	(0.00012 * X)/ 5000	Derived	(0.00012 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
D3	507-29981-A	1C - 2.5 - CU UNARMoured (Green)	Metres	1000	1000	8544	(0.00002 * X)/ 1000	Derived	(0.00002 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
D4	507-29982-A	1C - 6 - CU UNARMoured	Metres	500	500	8544	(0.00002 * X)/ 500	Derived	(0.00002 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
D5	507-29983-A	1C - 120 - CU UNARMoured	Metres	500	500	8544	(0.00033 * X)/ 500	Derived	(0.00033 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
D6	507-29016-A	2C - 2.5 CU UNARMoured	Metres	842000	1000	8544	(0.0441 * X)/ 842000	Derived	(0.0441 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
D7	507-29121-A	2C - 6 CU UNARMoured	Metres	6000	1000	8544	(0.0006 * X)/ 6000	Derived	(0.0006 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
D8	507-29044-A	3C - 2.5 CU UNARMoured	Metres	2473000	1000	8544	(0.17192 * X)/ 2473000	Derived	(0.17192 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
D9	507-29125-A	3C - 6 CU UNARMoured	Metres	116000	1000	8544	(0.01627 * X)/ 116000	Derived	(0.01627 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
D10	507-29056-A	4C - 2.5 CU UNARMoured	Metres	15000	1000	8544	(0.0013 * X)/ 15000	Derived	(0.0013 * X)	Derived	% TO BE QUOTED	% TO BE QUOTED	Derived
E	GRAND TOTAL (A.1 TO D.10)									X= TO BE QUOTED (IN FIGURES)	Derived = Rs Y	Derived	Derived
										X= TO BE QUOTED (IN WORDS)			
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 E Column 11.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 500/750/1000 meters as indicated above. Tolerance on individual drum length shall be ±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 500/1000m, 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 500/1000m). 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 requirements over basic requirements, additional price implication over basic unit price shall be as per Annexure-1 to RC of 'BOQ-cum Price Schedule'.													
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													

		ANNEXURE I TO NIT REF NO-PE/PG/RTC/E-6557/2020, DTD-12.11.2020											
PRICE SCHEDULE FOR LT PVC POWER CABLES													
FRAMEWORK AGREEMENT (RATE CONTRACT)													
NAME OF VENDOR - (Please fill vendor's name)													
SL. NO.	ITEM CODE	ITEM DESCRIPTION	UOM	QUANTITY	DRUM LENGTH (IN METRE)	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)
1	2	3	4	5	6	7	8	9	10	11	12	13	14
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-E003													
11. In case of Reverse Auction, vendor has to quote their Ex Works price+ Freight , that is price quoted above at SI No-E, column 11 i.e. (Rs X) + Freight Value, Rs Y													
12. Quantity variation shall be +30%.													

**Annexure-1A to RC (BOQ-Cum-Price Schedule) of LT PVC Power Cable
(Detailed price break-up)**

NIT REF NO-PE/PG/RTC/E-6557/2020, DTD-12.11.2020

Sl. No.	Description	Percentage Implication of Basic Price
1	Inner sheath FRLSH in place of Non-FRLS	(+) 2.5 %
2	Outer sheath HR PVC Type ST2 in place of PVC Type ST1, Inner sheath HR PVC Type ST2 in place of PVC Type ST1 and Conductor insulation HR PVC Type C in place of PVC Type A	(+) 3.0 %
3	Cable type FR in place of FRLSH	(-) 1.0 %
4	Round wire armour in place of Strip/ Formed wire armour for 1C cable	(+) 10.0 %
5	Annealed tinned copper conductor Class 2 in place of plain annealed copper conductor Class 2	(+) 2.5 %
6	Inner Sheath for 1C Armoured Cable	(+) 5.0 %

 ANNEXURE-II: DEVIATION SHEET (COST OF WITHDRAWAL)									
PACKAGE:- LT PVC POWER CABLE- RATE CONTRACT (FRAMEWORK AGREEMENT)									
TENDER ENQUIRY REF NO- PE/PG/RTC/E-6557/2020, DTD-12.11.2020									
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-6557/2020, DTD-12.11.2020SPECIAL CONDITION OF
(FRAMEWORK AGREEMENT) RATE CONTRACT FOR LT PVC POWER 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-6557/2020, DTD-12.11.2020
TENTATIVE PROJECT LIST
FRAMEWORK AGREEMENT (RATE CONTRACT) - LT PVC POWER CABLES

Sl.No	Name of Project	
1	3x800 MW Patratu TPS	
2	3x660MW North Karanpura	
3	Bhilai FGD	
4	Ramagundam FGD	
5	Korba FGD	
6	Mauda FGD	
7	Barh FGD	
8	Nabinagar FGD	

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:

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.

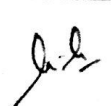
1.1.3 The Principal will exclude from the process all known prejudiced persons.

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 IPC/ PC 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 & 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 / Sub-contractors

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 organization.

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 this time, the same shall be binding and continue to be valid despite the lapse of this pact as specified as 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.

SUMIT SAHAY
सुमीत साहय (सी.एन.एम.) / Dy. Manager (CMM)
शरत भार्गव (सी.एन.एम.) / Sheral Heavy Electricals Ltd.
भारत केवी इलेक्ट्रिकल्स लिमिटेड / Bharat Heavy Electricals Ltd.
पावर सेक्टर - प्रोजेक्ट एंजिनियरिंग मैनेजमेंट
Power Sector - Project Engineering Management
एन.पी.ई. बिल्डिंग्स एंड एल.सी.पी. कॉम्प्लेक्स
NPE Bldg. HRE & LCP Complex
प्लॉट नं. 16 & 17, नोडा - 201301
Plot No. 16 & 17, Noida - 201301
For & On behalf of the Principal
(Office Seal)

For & On behalf of the Bidder/ Contractor
(Office Seal)

Place _____

Date _____

Witness: _____

(Name & Address) AJAY JAIN

BHEL-PEM, NOIDA

Witness: _____

(Name & Address) _____

		<u>PRICE VARIATION FORMULAE</u>	ANNEXURE A TO NIT REF NO- PE/PG/RTC/E- 6557/2020, DTD- 12.11.2020
---	--	--	--

**LT PVC POWER CABLE
FRAMEWORK AGREEMENT - RATE CONTRACT**

- 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>
- 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.
- Base date for prices (as per IEEMA):

Initial Price (As per IEEMA) for Al, Cu, CCo, PVCCo & Feo:

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

IEEMA TABLE FOR PRICE VARIATION CLAUSE FOR VARIOUS TYPE OF CABLE

Aluminium Conductor Cable

SI No	Cable Type	AIF (Single core unarmoured & Multi core armoured)	AIF (Single core armoured)	CCF Al	XLFAL(Single core)	XLFAL (Multi core)	Fe F	FeW	IEEMA Formula
1	LT PVC Power Cable	ALP	P1	P2	-	-	P3	P3 (Addition al)	$P = P_o + AIF(AL - ALo) + CCFAl(PVCC - PVCCo) + FeF(Fe - Feo)$

		<u>PRICE VARIATION FORMULAE</u>	ANNEXURE A TO NIT REF NO- PE/PG/RTC/E- 6557/2020, DTD- 12.11.2020
---	--	--	--

Copper Conductor Cable

SI No	Cable Type	CuF	AIF (Single core armoured)	CCFCu	XLFCU (Single core)	XLFCU (Multi core)	FeF	FeW	IEEMA Formula
1	LT PVC Power Cable	CUP	P4	P2	-	-	P3	P3 (Additional)	$P = P_o + CuF(Cu - Cu_o) + CCFCu(PVCC - PVCCo) + FeF(Fe - Fe_o) + AIF(AL - Alo)$

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 armou red)	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.



501, Kakad Chambers
132, Dr. Annie Besant Road, Worli
Mumbai 400 018
India

P: +91 22 2493 0532
F: +91 22 2493 2705
E: mumbai@ieema.org
www.ieema.org

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

New Delhi
Rishyamook Building, First Floor
85 A, Panchsukian Road
New Delhi 110001, India
P: +91 11 2336 3013/14
F: +91 11 2336 3015
E: delhi@ieema.org

Bangalore
204, Swiss Complex
33, Race Course Road
Bangalore 560001, India
P: +91 80 2220 1316/18
F: +91 80 2220 1317
E: bangalore@ieema.org

Kolkata
503 A, Oswal Chambers
2, Church Lane
Kolkata 700001, India
P: +91 33 6510 7856
F: +91 33 2213 1326
E: kolkata@ieema.org

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 'Instrumentaion 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

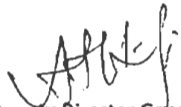
Tables References:

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



Indian Electrical & Electronics Manufacturer's Association
 501, Kakad Chambers P +91 22 2493 0532
 132, Dr. A. B. Road, Worli, F +91 22 2493 2705
 Mumbai - 400 018. E mumbai@ieema.org
 INDIA. W www.ieema.org

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

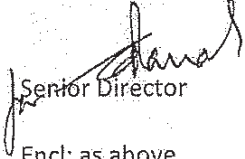
While replying to a query of a buyer it is observed that the polymer factor for LT XLPE Power Cables (both aluminium and copper) was incorrectly represented by Table P2.

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

prasad partners in implementation



HEAD OFFICE - DELHI
 Rishyamook Building, First Floor, 85 A, Panchsukian Road, New Delhi - 110001, INDIA.
 P +91 11 2336 3013 / 14 • F +91 11 2336 3015 • E delhi@ieema.org • W www.ieema.org



Indian Electrical & Electronics Manufacturer's Association
 501, Kakad Chambers P +91 22 2493 0532
 132, Dr. A. B. Road, Worli, F +91 22 2493 2705
 Mumbai - 400 018. E mumbai@ieema.org
 INDIA. W www.ieema.org

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.

proud partners in implementation



HEAD OFFICE - DELHI
 Rishyamook Building, First Floor, 85 A, Panchsheel Road, New Delhi - 110001, INDIA.
 P +91 11 2336 3013 / 14 • F +91 11 2336 3015 • E delhi@ieema.org • W www.ieema.org



Indian Electrical & Electronics Manufacturer's Association
 501, Kakad Chambers
 132, Dr. A. B. Road, Worli,
 Mumbai - 400 018.
 INDIA.
 P +91 22 2493 0532
 F +91 22 2493 2705
 E mumbai@ieema.org
 W www.ieema.org

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).

prc& partners in implementation



HEAD OFFICE - DELHI

Rishyamook Building, First Floor, 85 A, Panchsukla Road, New Delhi - 110001, INDIA.

P +91 11 2336 3013 / 14 • F +91 11 2336 3015 • E delhi@ieema.org • W www.ieema.org



Indian Electrical & Electronics Manufacturer's Association
 501, Kakad Chambers
 132, Dr. A. B. Road, Worli,
 Mumbai - 400 018.
 INDIA.
 P +91 22 2493 0532
 F +91 22 2493 2705
 E mumbai@ieema.org
 W www.ieema.org

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

proud partners in implementation



HEAD OFFICE - DELHI

Rishyamook Building, First Floor, 85 A, Panchsukla Road, New Delhi - 110001, INDIA.

P +91 11 2336 3013 / 14 • F +91 11 2336 3015 • E delhi@ieema.org • W www.ieema.org



Indian Electrical & Electronics Manufacturer's Association
 501, Kakad Chambers P +91 22 2493 0532
 132, Dr. A. B. Road, Worli, F +91 22 2493 2705
 Mumbai - 400 018. E mumbai@ieema.org
 INDIA. W www.ieema.org

IEEMA (PVC)/CABLE(R-1)/2017Effective from: 1st November 217

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

proud partners in implementation

**HEAD OFFICE - DELHI**

Rishyamook Building, First Floor, 85 A, Panchsukian Road, New Delhi - 110001, INDIA.

P +91 11 2336 3013 / 14 • F +91 11 2336 3015 • E delhi@ieema.org • W www.ieema.org

[Signature]
 Authorized Signatory

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

Effective from: 1st November 217

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

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

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

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

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

Effective from: 1st November 217

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	-	-	-	-	-	-	-	-

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

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	-	-	-	-	-	-

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

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

Effective from: 1st November 217

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



PRE - QUALIFYING REQUIREMENTS

ENQUIRY NO:

PROJECT:

RATE CONTRACT

PACKAGE:

LT PVC POWER CABLES

CRITERIA FOR EVALUATION - FINANCIAL :

Average annual financial turnover during the last Three Financial Years should not be less than
 Rupees Nineteen Crore Fifty One Lakh(s) Only

Amount (in Rs.)
Rs.19,51,00,000.00

Notes:-

a) The bidder has to submit financial accounts (audited, if applicable comprising of Audit report, Balance Sheet, Profit & Loss A/c Statement and Notes/Schedules pertaining to Turnover/Sales/Revenue), for last three years (or from the date of incorporation, whichever is less) as on tender due date to review the above criteria. In case the incorporation of vendor is less than 3 years, average annual financial turnover shall be calculated based on available information as below:-

i) If the accounts are available for ≤ 1 Financial Year, the Average Annual Turnover shall be calculated based on available information divided by 1 (One).

ii) If the accounts are available for >1 but ≤ 2 Financial Years, the Average Annual Turnover shall be calculated based on available information divided by 2 (Two).

iii) If the accounts are available for >2 but ≤ 3 Financial Years, the Average Annual Turnover shall be calculated based on available information divided by 3 (Three).

b) Foreign bidder is to submit a latest report from reputed third party business rating agency like Dun & Bradstreet, Credit reform etc. in addition to the documents mentioned at point (a) above for review of above criteria.

c) Other Income shall not be considered for arriving at Annual Turnover/Sales. For evaluation purpose, Turnover figure excluding taxes shall be considered.

d) For evaluation of foreign bidder, exchange rate (TT selling rate of SBI) as on scheduled date of tender opening (Part-I bid in case of two part bid) shall be considered.

	PRE-QUALIFICATION REQUIREMENTS FOR LT PVC POWER CABLE	PE-PQ-999-507-E013
		REVISION NO. 4 DATE 22/09/2020
		SHEET NO. 1 OF 1

ITEMS : LT PVC POWER Cable

SCOPE : Supply : YES; Erection & Commissioning : NO;

1.0	Vendor should be a manufacturer of LT power cables.
2.0	Availability of test reports of tests of LT PVC/HRPVC FRLS power 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 Power cables per month.
4.0	Manufactured and supplied at least one (1) km of FRLS cables.
5.0	Manufactured and supplied LT Power cable sizes of minimum 240 sq. mm for 3/3.5 core and minimum 630 sq. mm for single core cable.
6.0	Manufactured & supplied at least 500 km of LT Power cables in one or more orders and at least 100 km in one single order.
7.0	Minimum two (2) nos. purchase orders for LT PVC/HRPVC POWER 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 Digitally signed by ABHISHEK DN: cn=ABHISHEK, o=BHEL, ou=PEM, email=abhishek@bhel.in, c=IN Date: 2020.09.22 10:16:44 +05'30' ABHISHEK, MANAGER (CONVENOR)	REVIEWED BY  MANISH Digitally signed by MANISH DN: cn=MANISH, o=BHEL, ou=PEM, email=manishshukla@bhel.in, c=IN Date: 2020.09.22 10:27:38 +05'30' MANISH SHUKLA, SDGM (APPROVER)	APPROVED BY  DEBASISA RATH Digitally signed by DEBASISA RATH DN: cn=DEBASISA RATH, o=BHEL, ou=PEM, email=debasisa.rath@bhel.in, c=IN Date: 2020.09.22 14:11:08 +05'30' DEBASISA RATH, AGM (DH)
--	--	---

BHEL PEM-ELECTRICAL
PRE-QUALIFYING REQUIREMENTS FOR LT PVC POWER CABLE

ANNEXURE-I

PROJECT SPECIFIC CRITERIA AGAINST ENQUIRY

RATE CONTRACT FOR LT PVC POWER CABLES

The Bidder should have designed, manufactured, tested and supplied as on date 17.07.2017, the following:

1. At least 100 km of aluminium conductor, PVC insulated, PVC sheathed power cables of 1.1kV or higher grade in one single contract
2. At least one (1) km of flame retardant low smoke, PVC insulated, PVC sheathed, 1.1kV grade Power Cables in one single contract
3. At least one (1) km of 1C x 150 sq. mm or higher size PVC insulated, PVC sheathed, 1.1kV grade Power Cables in one single contract
4. 1.1kV or higher grade power cable of minimum 630sq.mm. conductor size.

Note: In case of any conflicts of Project Specific PQR with Main PQR, Bidder to furnish document meeting the stringent requirement between main PQR and project specific PQR.

[Dealing Engineer]

[Controlling Officer]

[Section Head]

[DH-Electrical]

VOLUME-II

TECHNICAL SPECIFICATION FOR LT PVC POWER CABLE

SPECIFICATION NO: *PE-RC-999-507-E003*

REVISION: 0



**BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA, UP (INDIA) – 201301**



TECHNICAL SPECIFICATION FOR
LT PVC POWER CABLE

SPECIFICATION NO. PE-RC-999-507-E003

VOLUME II

SECTION

REVISION 0

DATE: 18.9.2020

SHEET 1 OF 1

CONTENTS

<u>S. NO.</u>	<u>DESCRIPTION</u>	<u>NO. OF SHEETS</u>
1	CONTENT	01
2	SECTION – I	
	COMPLIANCE CERTIFICATE	01
	SPECIFIC TECHNICAL REQUIREMENTS	03
	DATA SHEET-A	03
	DATA SHEET-C	03
3	SECTION – II	
	STANDARD TECHNICAL SPECIFICATION	03
	QUALITY PLAN (ALONGWITH ANNEXURE A TO QP)	20
	TYPICAL DRG. FOR WOODEN DRUM	01
	TOTAL NO. OF SHEETS=	36
	(INCLUDING COVER/ SEPARATOR SHEETS)	



TECHNICAL SPECIFICATION FOR
LT PVC POWER CABLE

SPECIFICATION NO. PE-RC-999-507-E003

VOLUME II

SECTION I

REVISION 0

DATE: 18.9.2020

SECTION – I

SPECIFIC TECHNICAL REQUIREMENTS



TECHNICAL SPECIFICATION FOR
LT PVC POWER CABLE

SPECIFICATION NO. PE-RC- 999-507-E003

VOLUME II

SECTION I

REVISION 0

DATE: 18.9.2020

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 is 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 POWER CABLE

SPECIFICATION NO. PE-RC-999-507-E003

VOLUME II

SECTION I

REVISION 0

DATE: 18.9.2020

SHEET 1 OF 2

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 PVC Power 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 PVC Power 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

BHEL Standard Quality Plan (PE-QP-999-507-E003) shall be read as "QP. NO. 0000-999-QOE-S-041, REV-0". The quality plan no. 0000-999-QOE-S-041 R0 shall be read in conjunction with Annexure B (Quality Assurance & Inspection). However, Type testing and packing on cables shall be conducted as per attached BHEL QP (PE-QP-999-507-E003) along with Annexure-I to QP

5.0 DRAWINGS & DOCUMENTS TO BE SUBMITTED

- 5.1 After rate contract; following information shall be furnished by BHEL against specific project requirement: -
 - a) BOQ (Bill of Quantities)
- 5.2 After placement of order, following documents shall be submitted for specific project requirement for BHEL & customer's approval: -



TECHNICAL SPECIFICATION FOR
LT PVC POWER CABLE

SPECIFICATION NO. PE-RC-999-507-E003

VOLUME II

SECTION I

REVISION 0

DATE: 18.9.2020

SHEET 2 OF 2

Sl. No.	Drawing / Document Description	Drawing / Document no	Document Type	First Submission	Resubmission
1	Technical Data sheet – LT PVC Power cable	PE-V0-XXX-507-E121	Primary	Within 14 days of award of contract	Within 10 days of comments
2	Cross-sectional Drgs.- LT PVC Power Cable	PE-V0-XXX-507-E123	Primary	Within 14 days of award of contract	Within 10 days of comments
3	Quality Plan – LT PVC Power Cable	PE-V0-XXX-507-E914	Primary	Within 14 days of award of contract	Within 10 days of comments
4	Type test report - LT PVC Power Cable (previously conducted within 10 years)	PE-V0-XXX-507-E916	Primary	Within 14 days of award of contract	Within 10 days of comments
5	Type test report - LT PVC Power Cable (conducted for this contract)	PE-V0-XXX-507-E917	Secondary	Within 1 week from conducting type test	Within 1 week of comments

5.3 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.



DOCUMENT TITLE

TECHNICAL SPECIFICATION FOR
LT PVC POWER CABLE

SPECIFICATION NO. PE-RC-999-507-E003

VOLUME II

SECTION I

REVISION 0

DATE: 18.9.2020

SHEET 1 OF 3

DATA SHEET-A

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, IEC-754-1, IEC:60332 (Part-1), IEC:60332-3-23, IEEE:60383, ASTMD 3137:81	
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	FAULT CHARACTERISTICS		
	Fault Level	50kA RMS	
6.0	CONDUCTOR		
(a)	Material	Aluminium	Copper
	Grade and Class	Stranded, Compacted, H2 Grade	Stranded, plain annealed high conductivity, Class 2 (Project specific requirement shall be informed later)
(b)	Standard Applicable	IS: 8130	
(c)	Shape	Aluminium	Copper
		Circular/ Shaped – as per IS	Circular/ Shaped – as per IS
(d)	Min. number and diameter of strands for main and neutral conductor [Neutral conductor cross section w.r.t main conductor shall be as per Table-1 of IS:1554 (Part-1)]	As per Table-2 of IS: 8130	
7.0	INSULATION		
(a)	Material	Extruded PVC Type-A (Project specific requirement shall be informed later)	
(b)	Standard Applicable	IS: 5831	
(c)	Continuous withstand temperature	70°C (Project specific requirement shall be informed later)	
(d)	Short-circuit withstand temperature	160°C (Project specific requirement shall be informed later)	
(e)	Method of application	By extrusion; sleeve extrusion not permitted	
(f)	Nominal Thickness of insulation	As per Table-2 of IS: 1554 (Part-1)	
8.0	CORE IDENTIFICATION	Colour coding as per IS 1554	
9.0	INNER SHEATH		
(a)	Material	Extruded PVC Type ST-1 (Project specific requirement shall be informed later)	
(b)	Standard Applicable	IS:1554 (Part-1), IS: 5831	
(c)	Colour	Black	
(d)	Whether FR-LSH	No (Project specific requirement shall be informed later)	
(e)	Thickness of inner sheath	As per Table-4 of IS: 1554 (Part-1)	
(f)	Inner sheath applicable for single core cable	No (Project specific requirement shall be informed later)	



DOCUMENT TITLE

TECHNICAL SPECIFICATION FOR
LT PVC POWER CABLE

SPECIFICATION NO. PE-RC-999-507-E003

VOLUME II

SECTION I

REVISION 0

DATE: 18.9.2020

SHEET 2 OF 3

(g)	Fillers	Acceptable
(h)	Material of fillers (if permitted)	Same as inner sheath (Material of filler to be compatible with that of inner sheath)
(i)	Method of application	
(1)	Multi-core cables:	
(i)	With fillers	Pressure/ Vacuum extruded
(ii)	Without fillers	Pressure extruded
(2)	Single-core cables:	NOT APPLICABLE
10.0	ARMOUR	
(a)	Applicable	Yes/No (As specified in BOQ cum price schedule)
(b)	Material:	Wherever armouring is applicable
(i)	Single core cables	Non Magnetic Hard drawn Aluminium Round Wire / Formed Wire armoured conforming to H4 grade to IS: 8130 (as specified in BOQ cum price schedule)
(ii)	Multi-core cables	Galvanised Steel Round Wire / Galvanised Steel Formed Wire/Strip, conforming to (i) Type 'a' / 'b' as per Table-5 of IS 1554 Part-I and (ii) IS 3975 (as specified in BOQ cum price schedule) (Project specific requirement for Type 'a' or 'b' shall be informed later)
(iii)	Standard Applicable	Dimension as per IS: 1554 (Part-1) Table-5 and tolerance on dimension as per IS:3975
(c)	Minimum Coverage	90%
(d)	Gap between armour wires	Shall not exceed one armour wire space (No cross-over/ over-riding)
(e)	Breaking load of joint	95 % of normal armour
(f)	Paint on joint	Zinc rich paint shall be applied on armour joint surface of G.S. wire / formed wire
11.0	OUTERSHEATH	
(a)	Material	Extruded PVC Type ST-1 as per IS:5831 (Project specific requirement shall be informed later)
(b)	Colour	Black
(c)	Whether FR-LSH	Yes (Project specific requirement shall be informed later)
(d)	Method of application	Extruded
(e)	Thickness of outer sheath	As per IS: 1554 (Part-1)
(f)	Marking	Cable size (cross section area and no. of cores), voltage grade and Reference IS @ 1m (by embossing) Word "PVC", "FR-LSH" @ 1m (by embossing) Manufacturer's name and/ or trade name, and year of manufacture @ 1m (by embossing) 'BHEL' and 'CUSTOMER' name @1m (by embossing) Progressive sequential marking of length of the cable in metres @ 1m (by embossing/ printing) <i>Further customer specific marking requirement (if any) shall be informed later.</i> The embossing shall be progressive, automatic, in line and marking shall be legible and indelible
12.0	FR-LSH CHARACTERISTICS	



DOCUMENT TITLE

TECHNICAL SPECIFICATION FOR
LT PVC POWER CABLE

SPECIFICATION NO. PE-RC-999-507-E003

VOLUME II

SECTION I

REVISION 0

DATE: 18.9.2020

SHEET 3 OF 3

(a)	Oxygen index	Min 29 (As per IS 1554-I /ASTMD 2863)
(b)	Temperature index	Min. 250°C (As per IS 1554-I /ASTMD 2863)
(c)	Acid gas generation	Max. 20% by weight (As per IS 1554-I /IEC-60754-1)
(d)	Smoke density rating	Max. 60% (As per IS 1554-I /ASTM D 2843)
(e)	Flammability Test	
(i)	Flammability test for single cable	YES As per IEC-60332 Part-1
(ii)	Flammability test for bunched cables	YES As per IEC-60332 Part-3-23, CAT-B
(iii)	Flammability test as per IEEE: 60383	YES
(iv)	As per Swedish Chimney test SEN-SS-424-1475-F3	YES
(f)	Special Tests	
I.	Hydrolytic Stability Test	No (Refer Clause no 3.4 of Section-II)
II.	Ultraviolet Radiation Test	No (Refer Clause no 3.4 of Section-II)
13.0	Anti-rodent and Termite repulsion Test	YES
14.0	Anti-Fungal Test	No
15.0	TOLERANCE ON OUTER DIAMETER	$\pm 2\text{mm}$
16.0	MINIMUM BENDING RADIUS	
(a)	Single core cables	15 x O.D.
(b)	Multi core cables	12 x O.D.
17.0	SAFE PULLING FORCE	
(a)	Aluminium conductor cable	30 N/ sq. mm.
(b)	Copper conductor cable	50 N/ sq. mm.
18.0	CABLE DRUMS	
(a)	Type of Drum	Wooden as per IS 10418
(b)	Standard drum length	500m ($\pm$) 5% / 1000m ($\pm$) 5% (Project specific requirement shall be informed later)
(c)	Painting	Entire surface to be painted
(d)	Outermost Layer	To be covered with waterproof polyethylene
(e)	Construction details	Clause no 4.2 of Section-II of this technical specification
(f)	Particular details on Drum	Clause no 4.3 of Section-II of this technical specification Further customer specific marking requirement (if any) shall be informed later
(g)	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. (Refer typical drawing of cable drum packing, attached in section -II)
19.0	Sea Worthy packing	No

	DOCUMENT TITLE TECHNICAL SPECIFICATION FOR LT PVC POWER CABLE	SPECIFICATION NO. PE-RC-999-507-E003
		VOLUME II
		SECTION I
		REV NO. 0 DATE 18.9.2020
		SHEET 1 OF 3

DATASHEET C

GUARANTEED TECHNICAL PARTICULARS
(TO BE SUBMITTED BY SUCCESSFUL BIDDER)

S.No.		Unit	Description
A	GENERAL	-	
1	Name of manufacturer	-	
2	Place of Manufacture	-	
3	Current rating of cables conforms to	-	
4	Short circuit rating conforms to	-	
5	Formula for calculating short circuit current for different duration	-	
6	Permissible conductor temperature		
	(a) Maximum continuous rating	deg. C	
	(b) Short circuit rating	deg. C	
7	(a) Installation Conditions at site		
	i) Ambient air temperature	deg. C	
	ii) Ground temperature	deg. C	
	iii) Depth of laying of cables buried in ground	cm	
8	CHARACTERISTICS OF FRLS SHEATH		
	(a) Oxygen index	%	
	(b) Temperature index	deg. C	
	(c) Acid gas generation	%	
	(d) Smoke density rating	%	
9	CABLE DRUMS		
	(a) Type & construction	-	
	(b) Standard drum length	Mtr	
	(c) Tolerance on drum length	%	
B	INFORMATION TO BE FILLED IN FOR EACH SIZE CABLE IN THE FORM OF TABLE		
1	No. of cores x size	No. x sq.mm	
2	Voltage grade (Uo/U)	kV	
3	Base current ratings (*) based on Sl. (A) 7.0		
	(a) In air	Amp	
	(b) In ground	Amp	
	(c) ducts	Amp	

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			



DOCUMENT TITLE

TECHNICAL SPECIFICATION FOR
LT PVC POWER CABLE

SPECIFICATION NO. PE-RC-999-507-E003

VOLUME II

SECTION I

REV NO. 0 DATE 18.9.2020

SHEET 2 OF 3

4	Short circuit rating for 1 sec duration	kA	
5	(a) D.C. resistance of conductor at 20 deg C (main / neutral)	ohm/km	
	(b) A.C. resistance of conductor at 90 deg. C (main / neutral)	ohm/km	
	(c) Reactance of cable at Normal frequency	ohm/km	
	(d) Electrostatic capacitance of cable at normal frequency	μF/km	
6	CONDUCTOR		
	(a) Material type	-	
	(b) Grade	-	
	(c) No & dia of wires in each core before stranding	no x mm	
	(d) Shape	-	
7	INSULATION		
	(a) Material	-	
	(b) Nominal thickness (main / neutral)	mm	
	(c) Minimum thickness (main / neutral)	mm	
	(d) Minimum volume resistivity at 27 deg. C	Ohm-cm	
	(e) Minimum volume resistivity at 90 deg. C	Ohm-cm	
8	INNERSHEATH		
	(a) Material	-	
	(b) Whether FRLS	-	
	(c) Thickness (min.)	mm	
	(d) Method of application for multi-core cables	-	
	(e) Type and shape of fillers (if used)	-	
	(f) Colour	-	
9	ARMOUR		
	(a) Material	-	
	(b) Type of armour	-	
	(c) Size/ dimensions (Nominal dia of wire)	mm	
	(d) Minimum no. of round / formed wires	No.	
	(e) Minimum coverage	%	
	(f) Gap between armour wire/strip	-	
	(g) Breaking load of joint	-	
	(h) Maximum resistivity of GS formed / Round wire	Ohm-cm	
	(i) Maximum resistivity of Aluminium round wire	Ohm-cm	
10	OUTERSHEATH		
	(a) Material	-	
	(b) Whether FRLS	-	
	(c) Minimum thickness	mm	

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			

	DOCUMENT TITLE TECHNICAL SPECIFICATION FOR LT PVC POWER CABLE	SPECIFICATION NO. PE-RC-999-507-E003
		VOLUME II
		SECTION I
		REV NO. 0 DATE 18.9.2020
		SHEET 3 OF 3

	(d) Colour	-	
	(e) Method of application	-	
11	DIAMETERS		
	(a) Diameter of insulated conductor	mm	
	(b) Cable diameter under armour	mm	
	(c) Cable diameter over armour	mm	
	(d) Overall diameter of cable	mm	
	(e) Tolerance on overall diameter	(±) mm	
12	Ovality	mm	
13	Minimum bending radius	x O.D	
14	Safe Pulling Force	N/mm ²	
15	Weight of cable	kg./km	
16	Dimension of drum	mm	
17	Shipping weight (approx.)	kg	
18	Cable marking on outer sheath	-	
19	Marking on drum	-	

(*) For single core cables, the continuous current rating shall be furnished separately for armour earthed at one end and at both ends.

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			



TECHNICAL SPECIFICATION FOR
LT PVC POWER CABLE

SPECIFICATION NO. PE-RC-999-507-E003

VOLUME II

SECTION II

REVISION 0

DATE: 18.9.2020

SECTION-II

STANDARD TECHNICAL REQUIREMENTS



TECHNICAL SPECIFICATION FOR LT PVC Power Cable

SPECIFICATION NO. PE-RC-999-507-E003

VOLUME II

SECTION II

REVISION 0

DATE: 18.9.2020

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 POWER 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 POWER 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-01) as attached with the specification without any deviations. At contract stage (project specific), 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



TECHNICAL SPECIFICATION FOR
LT PVC Power Cable

SPECIFICATION NO. PE-RC-999-507-E003

VOLUME II

SECTION II

REVISION 0

DATE: 18.9.2020

Sheet 2 of 2

finish or coating to avoid rusting during transit and storage. BIS certification mark shall be stamped on each cable drum.

- 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.

		Item: 1.1 KV Power (XLPE & PVC) Insulated FRLS cables		STANDARD QUALITY PLAN (CONFORMING TO CODE: IS 1554 PART 1, IS 7098 Part-I AND NTPC TECHNICAL SPECIFICATION)			QP. NO. 0000-999- QOE- S-041 REV-00 DATE : 03-02-12 Page 1 of 11 VALID UP TO: 02-02-15		REVIEWED BY INDERJIT SINGH VIKRAM TALWAR RAJEEV GARG		 APPROVED BY Anumol A.K. Garg Dt.			
Sl. No	Component & Operations	Characteristics	Class	Type of check	Quantum of check M C/N		Reference Document	Acceptance Norms	Record Format	Agency D* M C N				Remarks
1	2	3	4	5	6		7	8	9	10				11
Instructions: 1) Cable manufacturer to maintain records to show co- relation of raw materials to finished cables i.e raw material batch/ lot no. should be traceable to the cable drum. 2) Cable manufacturer to maintain all quality control records identified as per all QP stages enumerated below whether it is identified for NTPC verification or witness or not.														
A	Raw material/ Brought out Items													
1.01	Aluminum	1. Make	MA	Verify	100%	--	MANUFACTURER APPROVED SOURCES	MANUFACTURE R APPROVED SOURCES	QCR		V	--	--	
		2. Resistivity	MA	Elect	As per Cable Mnfr Std.	--	IS5082	IS5082	--do--		P	--	--	
1.02	PVC / XLPE/compound for insulation	1. Make	MA	Verify	--do--	100%	MANUFACTURER APPROVED SOURCES	MANUFACTURE R APPROVED SOURCES	--do--		V	V	--	
		2. Type/ Grade	MA	Verify	100%	100%	NTPC ADS	NTPC ADS	--do--		V	V	V	
		3. All acceptance test as per manufacturer norms including thermal stability test for PVC insulation	MA	Verify	As per manufacturer norms	As per manufacturer norms	NTPC ADS	NTPC ADS	--do--		V	V	V	Refer note 1
1.03	PVC Compound for Inner sheath	1. Make	MA	Verify	--do--	--do--	MANUFACTURER APPROVED sources	MANUFACTURE R APPROVED sources	--do--		V	V	V	
		2. Type/ Grade	MA	Verify	--do--	--do--	NTPC ADS	NTPC ADS	--do--		V	V	V	
1.04	Steel wire / Formed Wire (As applicable)	1. Make	MA	Verify	--do--	--do--	MANUFACTURER APPROVED sources	MANUFACTURE R APPROVED sources	--do--		V	V	V	
		2. Dimension	MA	Meas	1 sample from each size / lot	--	NTPC APPROVED DATA SHEET & IS 3975	NTPC APPROVED DATA SHEET & IS 3975	--do--		P	--	--	
		3. All acceptance tests as per IS 3975	MA	Verify	As per IS 3975	--	IS 3975	IS 3975	Supplier TC		V	V	--	
1.05	PVC compound for Sheath	1. Make	MA	Verify	As per manufacturer norms	100%	MANUFACTURER APPROVED sources	MANUFACTURE R APPROVED sources	QCR		V	V	--	
		2. Type / Grade	MA	Verify	100%	100%	NTPC ADS	NTPC ADS	QCR		V	V	V	
		3. All acceptance test as per manufacturer norms	MA	Verify	As per manufacturer norms	As per manufacturer norms	NTPC ADS	NTPC ADS	QCR		V	V	V	Refer note 1

LEGEND:- *RECORDS, IDENTIFIED WITH "TICK" UNDER COLUMN "D" SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION.

-M:MANUFACTURER/SUPPLIER, C:MAIN SUPPLIER, N:NTPC, P:PERFORM W:WITNESS,V:VERIFICATION AS APPROPRIATE, CHP: NTPC SHALL IDENTIFY IN COLUMN "N" AS "W"

FORMAT NO:QS-01-QA1-P-10/F3-R1

Sl. No		Component & Operations	Characteristics	Class	Type of check	Quantum of check		Reference Document	Acceptance Norms	Record Format	Agency				Remarks
						M	C/N				D*	M	C	N	
1		2	3	4	5	6		7	8	9	10				11
			4. Thermal Stability	MA	Chem	One sample / Batch	--	NTPC ADS	NTPC ADS	QCR		P	--	--	
			5. Oxygen Index	MA	Chem	--do--	--	NTPC ADS/ IS 10810 Part 58	NTPC ADS/ IS 10810 Part 58	--do--		P	--	--	
			6. Acid Gas Emission	MA	Chem	One sample / Batch	--	NTPC ADS / IEC60754	NTPC ADS / IEC60754	QCR		P	--	--	
1.06	Wooden Drum		1. Dimension	MI	Meas	Manuf. Std.	--	IS 10418	IS10418	--do--		P	--	--	
			2. Anti termite treatment	MI	Chem	Cable manuf. std	--	CABLE MANUF. STD.	CABLE MANUF. STD.	COC		V	V	V	COC from drum manuf.
1.07	Steel Drum		1. Dimension	MI	Meas	--do--	--	--do--	--do--	QCR		P	--	--	
			2. Surface finish	MI	Meas	--do--	--	--do--	--do--	--do--		P	--	--	
B Process & Stage Inspection															
2.01	Wire Drawing		1. Surface finish	MA	Visual	One sample/Settin g of each size	--	SHOULD BE SMOOTH & FREE FROM SCRATCHES	SHOULD BE SMOOTH & FREE FROM SCRATCHES	QCR		P	--	--	
			2. Wire Diameter	MA	Meas	--do--	--	NTPC ADS	NTPC ADS	--do--		P	--	--	
			3. Tensile test	CR	Mech	--do--	--do--	--do--	--do--	--do--		P	V	V	Refer Sl. No.3.03(iii)
			4. Wrapping test	CR	Mech	--do--	--do--	--do--	--do--	--do--		P	V	V	--do--
2.02	Bunching / stranding		1. No. of wires	MA	Meas	--do--	--	NTPC ADS	NTPC ADS	--do--		P	--	--	
			2. Dia of wire	MA	Meas	--do--	--	--do--	--do--	--do--		P	--	--	
			3. Dimension of Conductor	MA	Meas	--do--	--	--do--	--do--	--do--		P	--	--	
			4. Direction of lay	MA	Visual	--do--	--	--do--	--do--	--do--		P	--	--	
			5. Records of strand breakage / welding during conductor stranding	MA	Verify	--do--	--	IS 8130	IS8130	--do--		P	--	--	
			6. Surface finish	MA	Visual	--do--	--	--do--	--do--	--do--		P	--	--	
			7. DC Resistance	CR	Meas	--do--	--	IS8130/NTPC ADS	IS8130/ NTPC ADS	--do--		P	--	--	
2.03	Insulation extrusion		1. Surface finish	MA	Visual	One sample/Settin g of each size	--	NTPC spec	SHOULD BE SMOOTH. NO POROSITY IS PERMITTED.	QCR		P	--	--	XLPE/ PVC compound shall be preferably loaded in to extruder by suction method.



LEGEND: *RECORDS, IDENTIFIED WITH "TICK" UNDER COLUMN "D" SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION.

-M: MANUFACTURER/SUPPLIER, C: MAIN SUPPLIER, N: NTPC, P: PERFORM W: WITNESS, V: VERIFICATION AS APPROPRIATE, CHP: NTPC SHALL IDENTIFY IN COLUMN "N" AS "W"

FORMAT NO: QS-01-QAI-P-10/F3-R1

Sl. No		Component & Operations	Characteristics	Class	Type of check	Quantum of check		Reference Document	Acceptance Norms	Record Format	Agency				Remarks
1		2	3	4	5	M	C/ N	7	8	9	D*	M	C	N	11
			2.Colour of cores	MA	Visual	One sample/Settin g of each size	-	NTPC ADS	NTPC ADS	QCR		P	--	--	
			3.Thickness	CR	Meas	--do--	--	NTPC ADS	NTPC ADS	--do--		P	--	--	
			4.Spark Test	CR	Elect	100%	100%	CABLE MANUF. STD.	No FAILURE	--do --		P	V	V	1.Spark test failure record is to be verified. 2.Core repairing not permitted
			5. Hot Set	CR	Mech	One sample/Settin g of each size	--	IS 7098- Part I	IS 7098- Part I	--do--		P	--	--	Sample is to be taken from both top & bottom end
2.04	Laying up		1. Core sequence	MA	Visual	--do--	--	IS 1554 (Part I) & IS 7098- Part I	IS 1554 (Part I) & IS 7098- Part I	--do--		P	--	--	
			2. Direction of lay	MA	Visual	--do--	--	--do--	--do--	--do--		P	--	--	
			3. Dia over laid up core	MA	Meas	--do--	--	NTPC ADS	NTPC ADS	--do--		P	--	--	
2.05	Inner Sheath		1.Colour	MA	Visual	-do--	-	--do--	--do--	--do--		P	--	--	
			2. Surface Finish	MA	Visual	100%	-	NTPC SPECIFICATION	FISH EYE, BLOW HOLE NOT PERMITTED	--do--		P	--	-	
			3.Thickness	MA	Meas	One sample/Settin g of each size	--	NTPC ADS	NTPC ADS	--do--		P	--	--	
			4.Dia over inner sheath	MI	Meas	--do--	-	--do--	--do--	--do--		P	--	--	
2.06	Armouring (As Applicable)		1.Dimension	MA	Meas	--do--	-	--do--	--do--	--do--		P	--	--	
			2.No. of wires / strip	MA	Meas.	--do--	-	--do--	--do--	--do--		P	--	--	
			3. Direction of lay	MA	Visual	--do--	--	IS 1554 (Part I) & IS 7098- Part I	IS 1554 (Part I) & IS 7098- Part I	QCR		P	--	--	

LEGEND:- "RECORDS, IDENTIFIED WITH "TICK" UNDER COLUMN "D" SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION.

-M:MANUFACTURER/SUPPLIER, C:MAIN SUPPLIER, N:NTPC, P:PERFORM W:WITNESS,V:VERIFICATION AS APPROPRIATE, CHP: NTPC SHALL IDENTIFY IN COLUMN "N" AS "W"

FORMAT NO:QS-01-QAI-P-10/F3-R1

		Item: 1.1 KV Power (XLPE & PVC) FRLS Insulated cables	STANDARD QUALITY PLAN (CONFORMING TO CODE: IS 1554 PART 1, IS 7098 Part-I AND NTPC TECHNICAL SPECIFICATION)				QP. NO. 0000-999- QOE- S-041 REV-00 DATE: 03-02-12 Page 4 of 11 VALID UP TO: 02-02-15		REVIEWED BY INDERJIT SINGH VIKRAM TALWAR RAJEEV GARG		 APPROVED BY A.K. Garg Dt. _____			
Sl. No	Component & Operations	Characteristics	Class	Type of check	Quantum of check		Reference Document	Acceptance Norms	Record Format	Agency				Remarks
					M	C/ N				D*	M	C	N	
1	2	3	4	5	6		7	8	9	10				11
		4.Coverage & Quality of armouring	MA	Meas.	100%	--	Min. area of coverage of armouring shall be 90%. The gap between amour wires / formed wires shall not exceed one amour wire/ formed wire space & there shall be no cross over/ over riding of amour wire / formed wire. Zn rich paint shall be applied on amour joint surface of G.S. Wire /formed wire. The breaking load of amour wire joint shall not be less than 95% of that amour wire / formed wire. (As per NTPC specification)		QCR		P	--	--	
		5 Dia over armouring	MA	Meas.	One sample/Settin g of each size	--	NTPC ADS		--do--		P	--	--	
2.07	Outer Sheath	1. Surface finish	MA	Visual	100%	--	Pimple, Fish Eye, Burnt particles, Blow Hole not permitted. Repairing on outer sheath not permitted. (As per NTPC specification)		--do--		P	--	--	PVC FRLS compound shall be preferably loaded in to extruder by suction method.
		2.Colour of sheath	MA	Visual	One sample/Settin g of each size	--	NTPC ADS	NTPC ADS	--do--		P	--	--	
		3. Dia over outer sheath	MA	Meas	--do--	--	NTPC ADS	NTPC ADS	--do--		P	--	--	
		4.Thickness of outer sheath	CR	Meas	--do--	-	--do--	--do--	--do--		P	--	--	
		5. Embossing quality	MA	Visual	100%	-	Drum no., IS1554-I / IS7098-1,Cable size, Voltage grade & Words "FRLS" at every 5 meter is to be embossed. Embossing shall be automatic, in line & marking shall be legible & indelible. (As per NTPC specification)		--do--		P	--	--	Drum no. on cable may be embossed/print ed
		6. Sequential marking	MA	Visual	Full length	--	Sequential marking of length of cable in meter at every one meter is to be embossed / printed. Embossing / printing shall be progressive, automatic, in line & marking shall be legible & indelible. (A s per NTPC specification)		--do--		P	--	--	
C	Finished Cables													
3.01	Type test reports clearance from NTPC Engineering	All type tests as per NTPC specification	CR	Doc.	100%	100%	NTPC SPECIFICATION / NTPC ADS / IS 1554 (PartI) & IS 7098- Part I	NTPC SPECIFICATION / NTPC ADS / IS 1554 (PartI) & IS 7098- Part I	--do--	✓	P	V	V	

LEGEND:- *RECORDS, IDENTIFIED WITH "TICK" UNDER COLUMN "D" SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION.

-M:MANUFACTURER/SUPPLIER, C:MAIN SUPPLIER, N:NTPC, P:PERFORM W:WITNESS,V:VERIFICATION AS APPROPRIATE, CHP: NTPC SHALL IDENTIFY IN COLUMN "N" AS "W"

FORMAT NO:QS-01-QAI-P-10/F3-R1

Sl. No		Component & Operations	Characteristics	Class	Type of check	Quantum of check		Reference Document	Acceptance Norms	Record Format	Agency				Remarks
1		2	3	4	5	6	7	8	9	10	11	12	13	14	15
3.02		Routine Tests	1.High Voltage test at room temperature	CR	Elect	100%	100%	NTPC ADS / IS 1554 (Part I) & IS 7098- Part I	NTPC ADS / IS 1554 (Part I) & IS 7098- Part I	Test certificate	✓	P	W	W	Refer note 2
			2.Conductor Resistance	CR	Elect	100%	100%	NTPC ADS / IS 1554 (Part I) & IS 7098- Part I	NTPC ADS / IS 1554 (Part I) & IS 7098- Part I	Test certificate	✓	P	W	W	Refer note 2
3.03 Acceptance Tests															
3.03 (i)		Construction of finished Cable	1. OD of Cable	MA	Meas.	Each type & size of cables as per sampling plan of IS 1554 (Part I) & IS 7098- Part I		NTPC ADS	NTPC ADS	--do--	✓	P	W	W	
			2. Laying of core	CR	Visual	--do--		NTPC ADS / IS 1554 (Part I) & IS 7098- Part I	NTPC ADS / IS 1554 (Part I) & IS 7098- Part I	--do--	✓	P	W	W	
			3. Core Identification	CR	Visual	--do--		--do--	--do--	--do--	✓	P	W	W	
			4. Colour of outer sheath	MA	Visual	--do--		NTPC ADS	NTPC ADS	--do--	✓	P	W	W	
			5. Inner sheath thickness	CR	Meas	- do -		--do--	--do--	--do--	✓	P	W	W	
			6. Inner sheath colour	MA	Visual	- do -		- do -	- do -	--do--	✓	P	W	W	
3.03 (ii)		Armour wires/ Formed wires (if applicable)	1.Dimensions	CR	Meas	--do--		NTPC ADS /IS1554(PartI)/IS3975	NTPC ADS /IS1554(PartI) /IS3975	--do--	✓	P	W	W	
			2. No. of wires/ formed wire	CR	Mech	-- do --		--do--	--do--	--do--	✓	P	W	W	
			3. Tensile test	CR	Mech	--do--		--do--	--do--	--do--	✓	P	W	W	
			4. Elongation test	CR	Mech	--do--		--do--	--do--	--do--	✓	P	W	W	
			5.Torsion test (for round wires only)	CR	Mech	--do--		--do--	--do--	--do--	✓	P	W	W	
			6. Wrapping test	CR	Mech	--do--		--do--	--do--	--do--	✓	P	W	W	
			7. Resistance test	CR	Mech	--do--		--do--	--do--	--do--	✓	P	W	W	



LEGEND:- *RECORDS, IDENTIFIED WITH "TICK" UNDER COLUMN "D" SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION.

-M:MANUFACTURER/SUPPLIER, C:MAIN SUPPLIER, N:NTPC, P:PERFORM W:WITNESS,V:VERIFICATION AS APPROPRIATE, CHP: NTPC SHALL IDENTIFY IN COLUMN "N" AS "W"

FORMAT NO:QS-01-QAI-P-10/F3-R1

Sl. No		Component & Operations	Characteristics	Class	Type of check	Quantum of check M C/N	Reference Document	Acceptance Norms	Record Format	Agency				Remarks
1		2	3	4	5	6	7	8	9	10				11
			8. Mass of Zinc coating	CR	Meas	Each type & size of cables as per sampling plan of IS 1554 (Part 1) & IS 7098-Part 1	NTPC ADS /IS1554(Part1)/IS3975	NTPC ADS /IS1554(Part1) /IS3975	Test certificate	✓	P	W	W	
			9. Uniformity of Zinc Coating	CR	Chem.	--do--	--do--	--do--	--do--	✓	P	W	W	
			10. Adhesion test	CR	Mech	--do--	--do--	--do--	--do--	✓	P	W	W	
			11. Freedom from defects	CR	Visual	--do--	--do--	--do--	--do--	✓	P	W	W	
3.03 (iii)	Conductor		1. Resistance Test	CR	Elect	--do--	--do--	--do--	--do--	✓	P	W	W	
			2. Tensile test (For aluminum conductor only)	CR	Mech	Each type & size of cables as per sampling plan of IS 1554 (Part 1)/7098(Part-1)	NTPC ADS/ IS 8130	NTPC ADS/ IS 8130	--do--	✓	P	W	W	Test report of manufacturer to be reviewed as per Sl. No. 2.01 for Tensile test & wrapping test (for Aluminum) in case this test is not applicable for cable under inspection as per IS 8130 cl. 6.2
			3. Wrapping test (For aluminum conductor only)	CR	Mech	--do--	--do--	--do--	--do--	✓	P	P	W	--do--



LEGEND:- *RECORDS, IDENTIFIED WITH "TICK" UNDER COLUMN "D" SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION.

-M:MANUFACTURER/SUPPLIER, C:MAIN SUPPLIER, N:NTPC, P:PERFORM W:WITNESS,V:VERIFICATION AS APPROPRIATE, CHP: NTPC SHALL IDENTIFY IN COLUMN "N" AS "W"

FORMAT NO:QS-01-QAI-P-10/F3-R1

Sl. No		Component & Operations	Characteristics	Class	Type of check	Quantum of check M C/N	Reference Document	Acceptance Norms	Record Format	Agency				Remarks	
1		2	3	4	5	6	7	8	9	10	D*	M	C	N	11
3.03 (IV)	PVC/XLPE/Insulation & PVC Sheath	1. Thickness of insulation & PVC Sheath	CR	Meas	Each type & size of cables as per sampling plan of IS 1554 (Part 1)/IS7098(Part-1)	NTPC ADS/ IS 1554(PartI) & IS 7098 Part I	NTPC ADS/ IS 1554(PartI) & IS 7098 Part I	Test Certificate	✓	P	W	W			
		2. Tensile strength & elongation at break of insulation & outer sheath (before ageing)	CR	Mech	Each type & size of cables as per sampling plan of IS 1554 (Part 1)/IS7098(Part-1)	NTPC ADS/ IS 1554(PartI) & IS 7098 Part I	NTPC ADS/ IS 1554(PartI) & IS 7098 Part I	Test Certificate	✓	P	W	W	Refer Note 3 Also		
		3. Tensile strength & elongation at break of insulation & outer sheath (after Ageing)	CR	Mech	Refer Note 3	--do--	--do--	--do--	✓	P	W	W	Refer Note 3 ath)		
		4. Insulation resistance (Volume resistivity method)	CR	Elect	Each type & size of cables as per sampling plan of IS 1554 (Part 1) & IS 7098-Part I	--do--	--do--	--do--	✓	P	W	W			
		5. High voltage test at room temperature	CR	Elect	Each type & size of cables as per sampling plan of IS 1554 (Part 1) & IS 7098-Part I	--do--	--do--	--do--	✓	P	W	W			
		6. Hot Set test (for XLPE insulation only)	CR	Phy	--do--	--do--	--do--	--do--	✓	P	W	W			
		7. Thermal stability on PVC Insulation and outer sheath	CR	Chem	One sample of each offered lot of all offered sizes	--do--	--do--	--do--	✓	P	W	W			

LEGEND:- *RECORDS, IDENTIFIED WITH "TICK" UNDER COLUMN "D" SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION.

-M:MANUFACTURER/SUPPLIER, C:MAIN SUPPLIER, N:NTPC, P:PERFORM W:WITNESS,V:VERIFICATION AS APPROPRIATE, CHP: NTPC SHALL IDENTIFY IN COLUMN "N" AS "W"

FORMAT NO:QS-01-QAI-P-10/F3-R1

Sl. No		Component & Operations	Characteristics	Class	Type of check	Quantum of check		Reference Document	Acceptance Norms	Record Format	Agency				Remarks
1		2	3	4	5	6		7	8	9	10				11
						M	C/N				D*	M	C	N	
			8.Oxygen index Test on outer sheath	CR	Chem	One sample of each offered lot of all offered sizes		NTPC ADS / IS10810 Part 58	NTPC A.D.S	--do--	✓	P	W	W	
			9.Smoke density rating test on outer sheath	CR	Chem	One sample of each offered lot of all offered sizes		NTPC ADS & ASTM D2843	NTPC ADS	--do--	✓	P	W	W	
			10.Acid gas generation test on outer sheath	CR	Chem	One sample of each offered lot of all offered sizes		NTPC ADS & IEC 60754-1	NTPC ADS	Test Certificate	✓	P	W	W	
			11.Flammability test on completed cable	CR	Chem	Refer Note 4	Refer Note 4	NTPC ADS & IEC 60332 Part-3 (Category-B)	NTPC ADS	--do--	✓	P	W	W	
			12.Surface finish & length measurement.	CR	Visual & Meas	One length of each size	One length of each size	(1) Drum no. (2) IS1554-1 /IS7098-1, Cable size, Voltage grade & Words " FRLS" at every 5 meter is to be embossed. Embossing shall be automatic, in line & marking shall be legible & indelible. (3) Sequential marking of length of cable in meter at every one meter is to be embossed / printed. Embossing / printing shall be progressive, automatic, in line & marking shall be legible & indelible.	--do--	✓	P	W	W		Pimple, Fish Eye, Burnt particles, Blow Hole etc. not permitted. Repairing on outer sheath not permitted.
			13. Sequence of cores armour coverage, gap between two consecutive armour/ formed wire	CR	Visual & Meas	One length of each size	One length of each size	Min. area of coverage of armouring shall be 90%. The gap between armour wires / formed wires shall not exceed one armour wire/ formed wire space & there shall be no cross over/ over riding of armour wire / formed wire. Zn rich paint shall be applied on armour joint surface of G.S. Wire /formed wire	--do--	✓	P	W	W		
4	Packing	1. Sealing	MA	Visual	100%	100%		(1)IS1554(Part-I) & IS 7098-Part I (2) The surface of the drum and the outer most cable layer shall be covered with water proof cover. (3) Both the ends of cables shall be properly sealed with heat shrinkable PVC/ rubber caps secured by "U" nails.	QCR	✓	P	--	--		
4.01	Identification	NTPC Sealing	MA	Visual	100%	100%		Sealing shall be visible	QCR	✓	P	V	V		

LEGEND:- *RECORDS, IDENTIFIED WITH "TICK" UNDER COLUMN "D" SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION.

-M:MANUFACTURER/SUPPLIER, C:MAIN SUPPLIER, N:NTPC, P:PERFORM W:WITNESS,V:VERIFICATION AS APPROPRIATE, CHP: NTPC SHALL IDENTIFY IN COLUMN "N" AS "W"

FORMAT NO:QS-01-QAI-P-10/F3-R1

		Item: 1.1 KV Power (XLPE & PVC) Insulated FRLS cables	STANDARD QUALITY PLAN (CONFORMING TO CODE: IS 1554 PART 1, IS 7098 Part-I AND NTPC TECHNICAL SPECIFICATION)			QP. NO. 0000-999- QOE- S-041 REV-00 DATE : 03-02-12 Page 9 of 11 VALID UP TO: 02-02-15	REVIEWED BY Inderjit Singh Vikram Talwar Rajeev Garg	 APPROVED BY Dr. A.K. Garg						
Sl. No	Component & Operations	Characteristics	Class	Type of check	Quantum of check		Reference Document	Acceptance Norms	Record Format	Agency				Remarks
					M	C/N					D*	M	C	N
1	2	3	4	5	6		7	8	9		10			11
Notes:														
1) If the compound manufacturer is carrying out Ageing test , test report of compound manufacturer is to be reviewed. If the compound manufacturer is not carrying out ageing test, then cable manufacturer is to carry out ageing test & test report is to be reviewed (quantum of ageing test sample shall be one sample /batch)														
2) (a) In case of manufacturers / supplier who have supplied cables in the past through Corporate Centre/ Regional Offices :- Routine Test of manufacturer internal test report are to be verified by NTPC at the time of final inspection. 2(b) In case of manufacturers / supplier WHO HAVE NOT SUPPLIED cables in the past through Corporate Centre/ Regional Offices ,- Routine Test are to be witnessed by Main Contractor & NTPC. This is in addition to manufacturer internal test report to be verified by NTPC at the time of final inspection.														
3) Refer table on page 10 & 11 of 11 for Sampling & Acceptance criteria.														
4) For PVC insulated LT power cable :- For cables with OD less than equal to 30 mm, any size of cable may be clubbed together. For cables where OD is more than 30 mm, clubbing to be done for cables having similar ODs. For XLPE insulated LT Power cable: Clubbing to be done for cables having similar ODs.														
LEGEND: NTPC ADS: NTPC approved data sheet, QCR: quality control records of cable manufacturer, CABLE MANUF STD- cable manufacturer's internal plant standard, MI: minor, MA: major, CR: critical, COC- certificate of conformance														

		Item: 1.1 KV Power (XLPE & PVC) Insulated FRLS cables		STANDARD QUALITY PLAN (CONFORMING TO CODE: IS 1554 PART 1, IS 7098 Part-I AND NTPC TECHNICAL SPECIFICATION)		QP. NO. 0000-999- QOE- S-041 REV-00 DATE : 03-02-12 Page 10 of 11 VALID UP TO: 02-02-15		REVIEWED BY INDERJIT SINGH VIKRAM TALWAR RAJEEV GARG		APPROVED BY Approved A.K. Garg Do..... 				
Sl. No	Component & Operations	Characteristics	Class	Type of check	Quantum of check		Reference Document	Acceptance Norms	Record Format	Agency				Remarks
					M	C/N					D*	M	C	N
1	2	3	4	5	6		7	8	9	10				11

Sampling & Acceptance Criteria

Criteria	Manufacturer experience prerequisite	Condition	Testing procedure	Remarks
Samples as per relevant IS from every size/ type of cable in the offered lot shall be tested for Tensile Strength & Elongation (before ageing). The values will be compared with corresponding values mentioned in the Type Test report accepted by NTPC. These values of Tensile Strength & Elongation (before ageing) should be within +/- 15% tolerance (final values should be more than the minimum values indicated in relevant standard) of the Type Test report	In case of Manufacturers/ Supplier who have supplied cables in the past through Corporate Centre / Regional offices	In case of sizes/ type which meet the criteria	1 Sample of PVC insulation & outer sheath per type of cables offered which have met the criteria, will be put on accelerated ageing test (refer IRS specification no. IRS: S-63/2007 Rev 3.0). The samples shall be aged in air oven at temperature of 130°C +/- 2°C for 5 hours. 1 Sample of XLPE insulation per type of cables offered which have met the criteria, will be put on ageing test as per IS 7098. After wards the samples shall be tested for Tensile Strength & Elongation. Acceptance norms shall be as per relevant IS. This test shall be witnessed by NTPC.	In case the samples do not meet the requirement in accelerated ageing test then 1 sample of that size/ type will be put on ageing test as per IS.
		In case of size /type which do not meet the criteria	Particular size/ type will be put on ageing test as per IS. This test shall be witnessed by NTPC.	

LEGEND:- *RECORDS, IDENTIFIED WITH "TICK" UNDER COLUMN "D" SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION.

-M:MANUFACTURER/SUPPLIER, C:MAIN SUPPLIER, N:NTPC, P:PERFORM W:WITNESS,V:VERIFICATION AS APPROPRIATE, CHP: NTPC SHALL IDENTIFY IN COLUMN "N" AS "W"

FORMAT NO:QS-01-QA1-P-10/F3-R1

		Item: 1.1 KV Power (XLPE & PVC) Insulated FRLS cables		STANDARD QUALITY PLAN (CONFORMING TO CODE: IS 1554 PART I, IS 7098 Part-I AND NTPC TECHNICAL SPECIFICATION)			QP. NO. 0000-999- QOE- S-041 REV-00 DATE: 03-02-12 Page 11 of 11 VALID UP TO: 02-02-15		REVIEWED BY INDERJIT SINGH VIKRAM TALWAR RAJEEV GARG					
Sl. No	Component & Operations	Characteristics	Class	Type of check	Quantum of check		Reference Document	Acceptance Norms	Record Format	Agency				Remarks
					M	C/N					D*	M	C	N
1	2	3	4	5	6		7	8	9		10			11
				In case of Manufacturers/ Supplier WHO HAVE NOT SUPPLIED cables in the past through Corporate Centre / Regional offices	In case of size /type which meet the criteria	1 Sample per type out of all sizes which have met the criteria, will be put on aging test and witnessed by NTPC as per relevant IS								
					In case of size/ type which do not meet the criteria	Particular size / type will be put on ageing test as per IS. This test shall be witnessed by NTPC								

LEGEND:- *RECORDS, IDENTIFIED WITH "TICK" UNDER COLUMN "D" SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION.

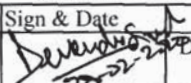
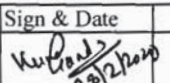
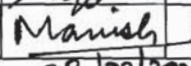
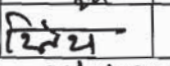
-M:MANUFACTURER/SUPPLIER, C:MAIN SUPPLIER, N:NTPC, P:PERFORM W:WITNESS,V:VERIFICATION AS APPROPRIATE, CHP: NTPC SHALL IDENTIFY IN COLUMN "N" AS "W"
 FORMAT NO:QS-01-QAI-P-10/F3-R1

	MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO : PE-RC-999-507-E003	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 16 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	*	**				
					M	C/N				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. |

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

	MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO : PE-RC-999-507-E003	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.	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					

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

28/02/2020

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

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

	ANNEXURE-I TO QP	CUSTOMER:	PROJECT TITLE	SPECIFICATION NUMBER: PE-RC-999-507-E003
		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
- 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

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	In process records shall be furnished to inspector at the time of inspection.
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	

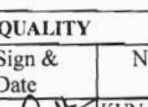
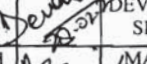
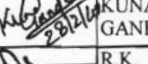
BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:		DEVENDRA SINGH	Checked by:		KUNAL GANDHI
Reviewed by:		MANISH SHUKLA	Reviewed by:		R.K. JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

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

	ANNEXURE-I TO QP	CUSTOMER:	PROJECT TITLE	SPECIFICATION NUMBER: PE-RC-999-507-E003
		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 by:		MANISH	Reviewed by:	 R.K.

BIDDER/ SUPPLIER
Sign & Date
Seal

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

	ANNEXURE-I TO QP	CUSTOMER:	PROJECT TITLE	SPECIFICATION NUMBER: PE-RC-999-507-E003
		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:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

ANNEXURE B TO QAP

CLAUSE NO.

QUALITY ASSURANCE



LT Power Cables

Attributes / Characteristics	Item / Components / Sub System Assembly	Make, Type & T.C as per relevant standard	Dimension/surface finish	Mechanical properties	Chemical Composition	Spark Test(as applicable)	Electrical properties	Hot Set Test/ Eccentricity & Ovality	Lay length & Sequence	Armour coverage, cross over, looseness, gap between two	Sequential marking/ Batch marking/ surface finish/ cable length	T.S & elongation before & after ageing on outer sheath & insulation	Thermal stability	Anti termite coating on wooden	Constructional requirements feature as per NTPC specification	Routine & Acceptance Tests as per relevant standard & NTPC specification	FRLS Tests
	Aluminum (IS-8130)	Y	Y	Y	Y		Y										
	XLPE Compound (IS-7098)	Y		Y			Y	Y				Y					
	PVC insulation Compound (IS: 5831)	Y		Y			Y					Y	Y				
	FRLS PVC Compound (IS-5831, ASTM-D2843, IS10810(Part 58), IEC-60754 Part-1)	Y		Y								Y	Y				Y
	Extrusion & curing /Manufacturing of Core (PVC / XLPE)		Y			Y	Y						Y				
	Core Laying								Y								
	Armour wire/strip	Y	Y	Y													
	Inner sheath	Y	Y														
	Armouring		Y						Y								
	Outer Sheathing		Y								Y						
	Power Cable (Finished) (IS-5831, ASTM-D2843, IS10810(Part 58), IEC-60754 Part-1, IEC 60332 part III cat B)								Y	Y	Y	Y	Y	Y	Y	Y	Y
	Wooden drum(IS-10418) /Steel Drum		Y											Y	Y		

Notes:

1. This is an indicative list of tests / checks. The manufacturer is to furnish a detailed Quality Plan indicating the practice and procedure along with relevant supporting documents.
2. Make of all major Bought out items will be subject to NTPC approval.

ROUTINE TESTS	Following routine tests shall be carried out on each drum of finished cables for all types (PVC / XLPE insulated) & sizes.	
1)	Conductor Resistance test	
2)	High voltage test	
ACCEPTANCE TESTS	Following Acceptance tests shall be carried out on each size of each type (PVC / XLPE insulated) of cables, in the offered lot.	
A) For Conductor (as per sampling plan mentioned in IS: 1554 / 7098)		
	1)	Annealing test (Copper)
	2)	Tensile Test (Aluminum)
	3)	Wrapping Test (Aluminum)
	4)	Resistance test
B) For Armour Wires / Formed Wires (If applicable) (as per sampling plan mentioned in IS: 1554 / 7098)		
	1.	Measurement of Dimensions
	2.	Tensile Tests
	3.	Elongation Test
	4.	Torsion Test For Round wires only
	5.	Wrapping Test
	6.	Resistance Test
	7.	Mass of Zinc coating test For G S wires / Formed wires only
	8.	Uniformity of Zinc coating For G S wires / Formed wires only
	9.	Adhesion test For G S wires / Formed wires only
	10.	Freedom from surface defects
C) For PVC / XLPE insulation & PVC Sheath (as per sampling plan mentioned in IS: 1554 / 7098)		
	1)	Test for thickness
	2)	Tensile strength & Elongation before ageing (for tests after ageing see “D”)
	3)	Hot set test (For XLPE insulation)

D) Ageing test:

	Criteria	Condition	Test Requirements	Remarks
PVC insulation & outer sheath:	Samples as per relevant IS, from each size of cables in the offered lot, shall be tested for tensile strength & elongation (before ageing). Tensile & elongation testing shall preferably be done with a computerized machine. The values will be compared with corresponding values mentioned in the Type Test report accepted by NTPC. These values of Tensile Strength & Elongation (before ageing) should be within +/- 15% of the corresponding values of Type Test report. (Please note that test values should be more than the minimum values indicated in relevant standard).	All sizes which meet the criteria	The size which has maximum negative deviation from type test report values will be put on accelerated ageing test. The samples shall be aged in air oven at temperature of 130°C +/- 2°C for 5 hours and tested for TS & elongation. Acceptance norms shall be as per IS.	In case the size does not meet the requirement in accelerated ageing test then all sizes (which had met the criteria) will be put on ageing test as per IS.
		Sizes which do not meet the criteria	Every size will be put on ageing test as per IS.	----
XLPE insulation	Samples as per relevant IS, from each size of cables in the offered lot, will be put on ageing test as per IS.			

E) Following tests will be carried out on completed cables as per IS on each size of each type (PVC / XLPE insulated)

	1)	Insulation resistance test (Volume resistivity method)
	2)	High voltage test

F) Following tests shall be carried out on only one size of offered lot (comprising of all sizes & types)

	1)	Thermal stability test on PVC insulation and outer sheath
	2)	Oxygen index test on outer sheath

	3)	Smoke density rating test on outer sheath
	4)	Acid gas generation test on outer sheath
G) Flammability test as per IEC 60332 - Part- 3 (Category- B) on completed cables as per following sampling plan:		
		This test will be carried out using composite sampling i.e. irrespective of size; cables of one particular type (i.e. armoured PVC insulated, unarmoured PVC insulated, armoured XLPE insulated, unarmoured XLPE insulated) will be bunched together, as per calculations in line with the IEC. All sizes of PVC & XLPE insulated, armoured & unarmoured cables shall be covered. For one particular type, cables with OD less than or equal to 30 mm shall be clubbed together in touching formation while cables with OD greater than 30 mm shall be clubbed together leaving a gap equal to OD of cable having least diameter. Cable OD shall be taken as nominal overall diameter as per NTPC approved datasheet.
H) Following tests shall be carried on one length of each size of each type (PVC / XLPE insulated) of offered lot:		
	1)	Constructional / dimensional check, surface finish, length measurement, sequence of cores, armour coverage, Gap between two consecutive armour wires / formed wires, Sequential marking, drum / Batch (outer sheath extrusion batch)number marking on sheath
	2)	Measurement of Eccentricity & Ovality

TYPICAL DRAWING OF CABLE DRUM PACKING

