Bharat Heavy Electricals Limited

(A Govt. Of India Undertaking)

Ref. Enquiry No.: PE/PG/PA1/E-6727/2021 dt. 10/8/2021

DUE DATE
нл/08/2021
BY 02:00 P.M.

Dear Sir / Madam,

Subject: Tender Enquiry for "LT PVC POWER CABLE" as per Technical Specification No. PE-TS-434-507-E003 - Rev. 00 for 3X800 MW PVUNL PATRATU TPP PHASE-I.

BHEL invites your offer for design, manufacture, inspection and testing at manufacturer's works, proper packing & delivery to site of **LT PVC POWER CABLE** conforming to the specification.

Your best quotation / offer shall be submitted in two parts strictly as per Clause-2.0 of the "**Instructions to Bidders**" of GCC, Rev. 07, in line with our terms and conditions, online via e-procurement system on **https://eprocurebhel.co.in/nicgep/app.**

S. No.	PROJECT	ITEM DESCRIPTION	TECHNICAL SPECIFICATION NO.
1.	3X800 MW PVUNL PATRATU TPP PHASE-I	LT PVC POWER CABLE	PE-TS-434-507-E003 - Rev. 00

It shall be the responsibility of the bidder to ensure that the tender is submitted **on or before the due date** by **02:00 P.M.** Part-I bids shall be opened at **04:30 P.M.** on the due date.

Note: 1. Detailed Tender documents / Corrigenda, addenda, amendments, time extensions, clarifications etc. can be downloaded / accessed from the following websites: -

a. https://eprocurebhel.co.in/nicgep/app
b. www.bhel.com
c. www.bhelpem.com

ENQUIRY TERMS AND CONDITIONS:

Please refer GCC, Rev. 07 which is available on **https://www.bhelpem.com/Documents/GCC/GCCRev07.pdf**. Bidders are requested to go through the same while submitting the offer.

1. Offers should be submitted separately in two parts **online through e-procurement system** as follows:
   Part-I: TECHNO-COMMERCIAL BID **Part-II: PRICE BID**
   For detailed instructions, please see Clause No. 1.0 & 2.0 of "Instructions to Bidders (Vol-I, GCC Rev. 07)".

2. Bidders to note that following form the part of tender documents & will become a part of the Order / Contract after its finalisation:
   a. General Conditions of Contract (GCC), Rev. 07 comprising of Instructions to Bidders and General Commercial Terms & Conditions.
   b. Technical Specification.
   c. Special Conditions of Contract (SCC, Rev. 00).

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Mgr./PG-III, BHEL/PS-Project Engineering Management,
Power Project Engineering Institute,
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d. NTPC's Main & Sub-supplier questionnaire.
e. Enquiry Letter with Terms & Conditions.
f. Technical PQR.
g. Integrity Pact.
h. Format for Local Content Certification.

3. Tenders shall be submitted strictly in accordance with the requirements of the above mentioned tender documents. Deviations (Technical as well as Commercial), if any, shall be listed out separately in Annexure-II (Cost of withdrawal) of GCC, Rev. 07 along with reasons for taking such deviations. Any deviations (Technical as well as Commercial) not mentioned in the Annexure-II (Cost of withdrawal) and standard pre-printed terms & conditions shown separately or found hidden in the offer, will not be taken cognizance of. Bidders to note all the points mentioned in "Notes" of Annexure-II to GCC, Rev. 07.

4. 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.

5. For this procurement, the local content to categorize a supplier as a 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 in India), (PPP-MII) Order 2017 dt. 04/06/2020 issued by DPIIT. In case of subsequent orders issued by the nodal ministry, changing the definition of local content for the items of the NIT, the same shall be applicable even if issued after issue of this NIT, but before opening of Part-II bids against this NIT.

   Regarding verification of local content, the local supplier at the time of tender, bidding or solicitation shall be required to provide certification as per para 9 of PP-MII order revision dt. 16.09.2020.

6. Bidders has to ensure compliance to Ministry of Power (MoP) Order No. 25-11/6/2018-PG dt. 02/07/2020 & Order No. 11/05/2018-Coord. dt. 23/07/2020, if applicable & Ministry of Finance (MoF) Order (Public Procurement No. 1 & 2) F. No. 6/18/2019/PPD dt. 23/07/2020 including subsequent orders, if any.

7. Bidder has to submit "Model Certificate for Tenders" as per Annexure-III of Ministry of Finance (MoF) Order (Public Procurement No. 1 & 2) F. No. 6/18/2019/PPD dt. 23/07/2020 including subsequent orders, if any.

8. **Only Class-I Local Suppliers are eligible to bid in this tender.**

9. As per Department of Expenditure (DoE) OM No. 6/9/2020-PPD dt. 24/08/2020, it is mandatory for all the bidders to provide their GeM Seller ID.

10. Prices shall be firm till completion of the contract.

11. All correspondence thereof, shall be addressed to the following:

NIMESH MALLIK, DY. ENGR., PG-III	**SWAPNIL KUMAR, MGR., PG-III**
E-MAIL: nimeshmallik@bhel.in	**E-MAIL: swapnilkumar@bhel.in**
Ph. No. +91-120-4368799; Mob: +91-9654713649	**Ph. No. +91-120-4213563; Mob: +91-9953160482**

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12. **Bidder to note that this is a conditional Open (Indian) Tender enquiry. Hence, Reverse Auction (Part-II) shall be subject to following: -**
    i. Techno-commercial qualification / recommendation of bidder by BHEL-PEM.
    ii. Approval of bidder by Customer: - Approval shall be taken up by BHEL with customer based on the credentials / reference list. Hence, Bidders are requested to submit the following (as part of their credentials) on or before Part-I opening: -
        - Reference list indicating P.O. details, customer name, P.O. date, execution date etc.
        - Performance certificate issued by the clients.
        - NTPC's Main & Sub-supplier questionnaire (enclosed with enquiry) and submit all the supportive documents against details furnished therein (signed & stamped on each page)
    iii. **Pre-Qualifying Requirements: -** Bids of only those bidders shall be evaluated who meet the Technical pre-qualifying requirements.

    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 e-mail Id etc. In case the same found not available, Purchaser has right to reject such document from evaluation.

13. PVC shall be applicable for Order Qty. as per the attached Price Variation Formulae. PVC shall be payable within agreed contractual delivery period. In case delay is attributable to vendor, for the payment purpose, the PVC shall be calculated based on rates applicable as on the date of expiry of contractual delivery date or actual delivery date whichever is beneficial to BHEL.

14. For the bidders (who are not registered with BHEL-PEM), Online Registration Portal is operational in BHEL. Non-registered Vendors, who wish to apply for registration with BHEL-PEM, have to apply through Online Registration Portal available at www.bhelpem.com→vendor section→Online Supplier Registration. All credentials and/or documents duly signed and stamped related to 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.

15. The nature of package is "Divisible.

16. Integrity Pact: - Integrity pact is applicable for subject package. 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. A panel of Independent External Monitors (IEMs) have been appointed by BHEL with the approval of CVC. The names of the IEMs in panel are as follows:
    I. Sh. Arun Chandra Verma, IPS (Retd.) - acverma1@gmail.com
    II. Sh. Virendra Bahadur Singh, IPS (Retd.) - vbsinghips@gmail.com

    The IP as enclosed is to be submitted (duly signed by authorized signatory) along with techno-commercial 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.

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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 above. 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."

17. The Evaluation Currency for this tender will be INR.

18. BHEL shall be finalizing this tender with Reverse Auction. Bidders to quote suitably. Bidders to note that this clause will supersede Cl. No. 13 of 'Instruction to Bidders' of GCC-Rev. 07.

"BHEL shall be resorting to Reverse Auction (RA) (Guidelines as available on www.bhel.com) for this tender. RA shall be conducted among the techno commercially qualified bidders. Price bids of all techno-commercially qualified bidders shall be opened and same shall be considered for 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."

19. MSME / Start-up Vendors to submit applicable documents along with their offer for availing the benefits as per GOI guidelines. Further PEM is already registered with RXIL (TReDS) Platform. You are requested to get registered with RXIL (TReDS) Platform to avail the facility as per GOI guidelines.

20. **Delivery Schedule: -** Within Four (04) months from date of CAT-1 approval of Primary drawings / documents, subjected to drawing / document submission / re-submission schedule as per Annexure-II **OR** 4 months from the date of manufacturing clearance, whichever is later.

In case of any delay in submission / re-submission of "PRIMARY" drawings / 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.

Further, following to be noted: -
a) The end period specified is for completion of the deliveries. Deliveries to start progressively so as to meet the completion schedule.
b) The delivery conditions specified are for contractual LD purposes, however, BHEL may ask for early deliveries without any compensation thereof.
c) Non-applicable drawings shall be decided during bid evaluation.
d) Wherever schedule of drawings / documents submission / re-submission is stipulated in the Technical Specifications, same shall be superseded by delivery specified in NIT.

21. Overall (%) variation in contract values (due to changes in the scope) shall be limited to +/- 30%. This will prevail over the quantity variation Cl. No. 6.0 of GCC, Rev. 07.

22. MSME bidders will have to furnish the UAM details.

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23. Bidders are requested to refer Performance Bank Guarantee (PBG) format & rules in line with GCC, Rev. 07 and adhere to it while furnishing PBG. In case any benefit with respect to BG reduction is provided by the end customer for Patratu project, then similar benefit shall be passed onto the bidders for subject tender as well.

24. Bidder agrees to submit performance security required for execution of the contract within the time period mentioned. In case of delay in submission of performance security, enhanced performance security which would include interest (SBI rate + 6%) for the delayed period, shall be submitted by the bidder. Further, if performance security is not submitted till such time the first bill becomes due, the amount of performance security due shall be recovered from the bills along with due interest.

25. Lump sum Evaluation shall be done on Total Cost to BHEL basis (excluding GST).

"In 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 bidders.
In case more than one bidder happens to occupy L-1 status even after soliciting discounts, the L-1 bidder shall be decided by a toss / draw of lots, in the presence of respective bidder(s) or their representative(s). Ranking will be done accordingly. BHEL's decision in such situation shall be final and binding."

26. The offers of the bidders who are on the banned list (list of banned firms available on http://www.bhel.com) and also the offers of the bidders, who engage the services of the banned firms, shall be rejected.

27. The Bidder along with its associate / collaborators / sub-contractors / sub-vendors / consultants / service providers shall strictly adhere to BHEL Fraud Prevention Policy displayed on BHEL website http://www.bhel.com and shall immediately bring to the notice of BHEL Management about any fraud or suspected fraud as soon as it comes to their notice.

28. Bidders participating in subject tender will necessarily have to buy class III DSCs (Digital Signature Certificate) issued by the certifying authorities in India. Basic procedure /checklist is uploaded on "www.bhel.com" for participating in tender enquires through e-procurement.

29. This item/package/system falls under the list of items defined in Para 3 of Ministry of Finance guidelines dt. 20.09.2016 (procurement of items related to public safety, health, critical security operations and equipment etc.) & hence criteria of prior experience / turnover shall be same for all the bidders including startup / MSME.

30. Bidders to declare that they will not enter into any illegal or undisclosed agreement or understanding, whether formal or informal with other Bidder(s). 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.

In case, the bidder is found having indulged in above activities, suitable action shall be taken by BHEL as per extant policies / guidelines.

31. **Due to COVID-19 pandemic condition prevailing in the country, BHEL-PEM may go for Remote Inspection of offered items, if required. Vendors are requested to be equipped with the facilities / gadgets as indicated in the guidelines attached to take up the inspection REMOTELY.**

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32. All terms and conditions shall be as per NIT, SCC of project and GCC - Rev. 07. In the event of any contradiction, the terms and conditions mentioned, the order of preference shall be as mentioned in Cl. No. 36 of GCTC of GCC - Rev. 07.

33. Please note that for technical bid, detailed offers are to be submitted including the following: -
- Acceptance of GCC, Rev. 07 & Special Conditions of Contract (SCC).
- Along with your offer, please submit a copy of this letter duly signed & stamped on each page as token of acceptance of all terms & instructions conveyed.
- Technical PQR documents.
- Integrity Pact.
- Local Content Certification.
- NTPC's Main & Sub-Supplier Questionnaire.

Thanking You.

Yours Sincerely,

SWAPNIL KUMAR

Digitally signed by SWAPNIL KUMAR
DN: c=IN, o=BHARAT HEAVY ELECTRICALS LIMITED, ou=BHEL / PS-PEM- Noida, postalCode=201301, st=Uttar Pradesh, 2.5.4.20=0cdbbbf5acf39f5fbaf3cba5ef57c2a560cb29d2207012b200ef1ed2c2fd050a, cn=SWAPNIL KUMAR
Date: 2021.08.10 09:06:52 +05'30'

Swapnil Kumar
(Manager / PG-III / BHEL-PEM)

Enclosures:

1. Technical Specification No. PE-TS-434-507-E003 - Rev. 00.
2. Project SCC, Rev. 00.
3. Technical PQR.
4. NTPC's Main & Sub-supplier questionnaire.
5. Format for Local Content Certification.
6. Guidelines for Remote Inspection.
7. Integrity Pact.

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Validate Print Help

Item Rate BoQ

Tender Inviting Authority: Bharat Heavy Electricals Limited-Project Engineering Management, Noida

Name of Work: BOQ cum PRICE SCHEDULE OF LT PVC POWER CABLE FOR 3X800 MW PVUNL PATRATU TPP PHASE-I

Tender Enquiry No.: PE/PG/PA1/E-6727/2021 dt. 10/08/2021

Name of the Bidder/ Bidding Firm / Company :	

NOTES:

1) Quantities indicated below shall be known as Order Quantities. The variation in quantities shall be as per NIT.
2) The bidder shall indicate the unit price of each type and size of cables listed as per the BOQ-Cum-Price Schedule. The unit prices shall apply for adjustment of variation in quantity as stipulated above.
3) Overall tolerance on total dispatched quantity of each size shall be (-) 2% and (+) 0% . Cables consumed for testing and inspection shall be to bidder's account.
4) Standard drum length shall be as per BOQ cum price schedule against each size of cable. Tolerance on individual drum length shall be ±5%. 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. The overall tolerance limits stipulated above shall continue to apply (in case short lengths are accepted).
5) In case 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 implication.
6) Bidder shall indicate unit price of cables inclusive of type test charges, No separate charges shall be payable for type tests.
7) Bidder shall qoute for all sizes/types of cables as per specification, failing which their offer shall be rejected.
8) Delivery schedule of ordered quantites and subsequent lots shall be as per NIT.
9) Following requirement of BHEL-Trichy is also included in the BOQ for which LOI shall by placed by BHEL-PEM: -

a. 3C x 2.5 Sq.mm [CU] UNARMOURED - 1,31,000 Meter
b. 3C x 16 Sq.mm [AL] UNARMOURED - 5,000 Meter

NUMBER #	TEXT #	NUMBER #	TEXT #	NUMBER	TEXT #	NUMBER #	NUMBER	NUMBER	NUMBER	TEXT	NUMBER	NUMBER	NUMBER #	NUMBER #	TEXT #
S. No.	Item Description	Quantity	Units	HSN Code	Quoted Currency in INR / Other Currency	UNIT EX-WORKS PRICE In Figures To be entered by the Bidder	TOTAL EX-WORKS PRICE	FREIGHT RATE	FREIGHT AMOUNT	GST TYPE	GST RATE	GST AMOUNT	TOTAL AMOUNT Without Taxes TOTAL EX-WORKS + FREIGHT)	TOTAL AMOUNT With Taxes (TOTAL EX-WORKS + FREIGHT + GST)	TOTAL AMOUNT In Words
1	2	4	5	7	12	13	14	15	16	18	20	21	53	54	55
1	1.1KV, Al conductor, PVC insulated, Galvanised Steel Round/Formed Wire Armoured for multi-core cables, (Non Magnetic Hard drawn Aluminium Round 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 - **3.5C - 25- AL ARMOURED**	12000	Mtrs.	**85444920**	**INR**		**0.0000**		**0.0000**			**0.0000**	**0.000**	**0.000**	INR Zero Only
2	1.1KV, Al conductor, PVC insulated, Galvanised Steel Round/Formed Wire Armoured for multi-core cables, (Non Magnetic Hard drawn Aluminium Round 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 - **3.5C - 50- AL ARMOURED**	4000	Mtrs.	**85444920**	**INR**		**0.0000**		**0.0000**			**0.0000**	**0.000**	**0.000**	INR Zero Only
3	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 - **3C - 2.5- CU ARMOURED**	1000	Mtrs.	**85444920**	**INR**		**0.0000**		**0.0000**			**0.0000**	**0.000**	**0.000**	INR Zero Only
4	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 - **1C - 35- AL UNARMOURED**	15000	Mtrs.	**85444920**	**INR**		**0.0000**		**0.0000**			**0.0000**	**0.000**	**0.000**	INR Zero Only
5	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 - **1C - 120- AL UNARMOURED**	19000	Mtrs.	**85444920**	**INR**		**0.0000**		**0.0000**			**0.0000**	**0.000**	**0.000**	INR Zero Only
6	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 - **2C - 10- AL UNARMOURED**	13000	Mtrs.	**85444920**	**INR**		**0.0000**		**0.0000**			**0.0000**	**0.000**	**0.000**	INR Zero Only

7	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 - **2C - 35- AL UNARMOURED**	10000	Mtrs.	**85444920**	**INR**		**0.0000**		**0.0000**			**0.0000**	**0.000**	**0.000**	INR Zero Only
8	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 - **2C - 70- AL UNARMOURED**	16000	Mtrs.	**85444920**	**INR**		**0.0000**		**0.0000**			**0.0000**	**0.000**	**0.000**	INR Zero Only
9	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 - **2C - 95- AL UNARMOURED**	15000	Mtrs.	**85444920**	**INR**		**0.0000**		**0.0000**			**0.0000**	**0.000**	**0.000**	INR Zero Only
10	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 - **3C - 10- AL UNARMOURED**	44000	Mtrs.	**85444920**	**INR**		**0.0000**		**0.0000**			**0.0000**	**0.000**	**0.000**	INR Zero Only
11	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 - **3C - 16- AL UNARMOURED** **(BHEL-Trichy Qty. - 5000 Mtrs.)**	5000	Mtrs.	**85444920**	**INR**		**0.0000**		**0.0000**			**0.0000**	**0.000**	**0.000**	INR Zero Only
12	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 - **3C - 25- AL UNARMOURED**	30000	Mtrs.	**85444920**	**INR**		**0.0000**		**0.0000**			**0.0000**	**0.000**	**0.000**	INR Zero Only
13	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 - **3C - 50- AL UNARMOURED**	15000	Mtrs.	**85444920**	**INR**		**0.0000**		**0.0000**			**0.0000**	**0.000**	**0.000**	INR Zero Only
14	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 - **3C - 95- AL UNARMOURED**	12000	Mtrs.	**85444920**	**INR**		**0.0000**		**0.0000**			**0.0000**	**0.000**	**0.000**	INR Zero Only
15	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 - **3.5C - 25- AL UNARMOURED**	11000	Mtrs.	**85444920**	**INR**		**0.0000**		**0.0000**			**0.0000**	**0.000**	**0.000**	INR Zero Only
16	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 - **3.5C - 50- AL UNARMOURED**	39000	Mtrs.	**85444920**	**INR**		**0.0000**		**0.0000**			**0.0000**	**0.000**	**0.000**	INR Zero Only
17	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 - **3.5C - 95- AL UNARMOURED**	6000	Mtrs.	**85444920**	**INR**		**0.0000**		**0.0000**			**0.0000**	**0.000**	**0.000**	INR Zero Only
18	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, OVERALL SHEATH: Extruded FRLS PVC compound conforming to type ST1 of IS: 5831 & black in colour - **2C - 2.5- CU UNARMOURED**	88000	Mtrs.	**85444920**	**INR**		**0.0000**		**0.0000**			**0.0000**	**0.000**	**0.000**	INR Zero Only

19	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, OVERALL SHEATH: Extruded FRLS PVC compound conforming to type ST1 of IS: 5831 & black in colour - **3C - 2.5- CU UNARMOURED** **(BHEL-Trichy Qty. - 1,31,000 Mtrs.)**	304000	Mtrs.	**85444920**	**INR**		**0.0000**		**0.0000**			**0.0000**	**0.000**	**0.000**	INR Zero Only
Total in Figures													**0.000**	**0.000**	INR Zero Only
Quoted Rate in Words		**INR Zero Only**													

Validate | Print | Help

Item Rate BoQ

Tender Inviting Authority: Bharat Heavy Electricals Limited-Project Engineering Management, Noida

Name of Work: COST OF WITHDRAWAL FOR LT PVC POWER CABLE FOR 3X800 MW PVUNL PATRATU TPP PHASE-I

Tender Enquiry No.: PE/PG/PA1/E-6727/2021 dt. 10/08/2021

Name of the Bidder/ Bidding Firm / Company :	

ANNEXURE-II (COST OF WITHDRAWAL)

(This BOQ template must not be modified/replaced by the bidder and the same should be uploaded after filling the relevent columns, else the bidder is liable to be rejected for this tender. Bidders are allowed to enter the Bidder Name and Values only)

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 details 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 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 of GCC, Rev. 07 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 withdrawl 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 accepted.
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 seperately 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 descrepancy in the nature of impact (positive / negative), positive will be considered for evaluation and negative for ordering.

NUMBER #	TEXT #	TEXT #	NUMBER #	NUMBER	TEXT	TEXT	TEXT	TEXT	NUMBER #	TEXT #
Sl. No.	Item Description	Quoted Currency in INR / Other Currency	Cost of withdrawal of deviation to be entered by the bidder in Rs.	Page no.	Technical specification/tender document clause no.	Reference of price schedule of which cost of withdrawal of deviation is applicable	Nature of cost of withdrawal of deviation (positive/Negative)	Reasons for quoting deviation	TOTAL AMOUNT Without Taxes in Rs.	Total FOR site Price In Words
1	2	12	13	23	24	30	31	36	53	55
1.01	**TECHNICAL DEVIATION**									
1.02	Technical deviation	**INR**							**0.000**	INR Zero Only
1.03	Technical deviation	**INR**							**0.000**	INR Zero Only
1.04	Technical deviation	**INR**							**0.000**	INR Zero Only
1.05	Technical deviation	**INR**							**0.000**	INR Zero Only
2	**COMMERCIAL DEVIATION**									
2.01	Commercial deviation	**INR**							**0.000**	INR Zero Only
2.02	Commercial deviation	**INR**							**0.000**	INR Zero Only
2.03	Commercial deviation	**INR**							**0.000**	INR Zero Only
2.04	Commercial deviation	**INR**							**0.000**	INR Zero Only
Total in Figures									**0.00**	Zero Only

Quoted Rate in Words	**INR Zero Only**

VOLUME II

3 X 800 MW NTPC PATRATU TPP

TECHNICAL SPECIFICATION

FOR

LT PVC POWER CABLES

SPECIFICATION NO: ***PE-TS-434-507-E003***

REVISION: **0**

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

CONTENTS

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

SECTION – I

SPECIFIC TECHNICAL REQUIREMENTS

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.

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 placement of order, documents shall be submitted for BHEL & customer’s approval as specified in NIT.

5.2 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.

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
(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	
(b)	Standard Applicable	IS: 5831	
(c)	Continuous withstand temperature	70°C	
(d)	Short-circuit withstand temperature	160°C	
(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	
(b)	Standard Applicable	IS:1554 (Part-1), IS: 5831	
(c)	Colour	Black	
(d)	Whether FR-LSH	No	
(e)	Thickness of inner sheath	As per Table-4 of IS: 1554 (Part-1)	
(f)	Inner sheath applicable for single core cable	No	
(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 'b' as per Table-5 of IS 1554 Part-I and (ii) IS 3975 (as specified in BOQ cum price schedule)
(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
(b)	Colour	Black
(c)	Whether FR-LSH	Yes
(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 @ 5m (by embossing) Word "PVC", "FR-LSH" @ 1m (by embossing) Manufacturer's name and/ or trade name, and year of manufacture @ 5m (by embossing) 'BHEL' and 'NTPC' name @5m (by embossing) Progressive sequential marking of length of the cable in metres @ 1m (by embossing/ printing) *Further customer specific marking requirement (if any) shall be informed later.* The embossing shall be progressive, automatic, in line and marking shall be legible and indelible
12.0	FR-LSH CHARACTERISTICS	
(a)	Oxygen index	Min 29 (As per IS 1554-I /ASTMD 2863/IS 10810 part 58)
(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	± 2mm
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	Steel/Wooden as per IS 10418
(b)	Standard drum length	1000m (±) 5%
(c)	Painting	Entire surface to be painted
(d)	Outermost Layer	To be covered with waterproof polyethylene
(e)	Construction details	Cables shall be supplied in non-returnable wooden or steel drums of heavy construction. 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 I rubber caps secured by 'U' nails so as to eliminate ingress of water during transportation, storage and erection. Wood preservative anti-termite treatment shall be applied to the entire drum. Each drum shall carry manufacturer's name, purchaser's name, address and contract number, item number and type, size and length of cable and net gross weight stencilled on both sides of the drum. An arrow and suitable accompanying wording shall be marked on one end of the reel indicating the direction in which it should be rolled.Entire surface of each drum to be painted, outermost Layer To be covered with waterproof polyethylene
(f)	Particular details on Drum	The cable drums should carry the following details in printed form: a) Manufacturer's name or trade mark, purchasers name, address & contact no. b) Type of cable & voltage grade c) Year of manufacture d) Type of insulation e.g. PVC e) No. of core and size of cables

		f) Cable code g) Length of cable on drum h) No. of length on drum, if more than one i) Direction of rotation, by arrow j) Approx. gross mass. k) IS/IEC number and ISI mark A tag containing same information shall be attached to the leading edge of the cable.
(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

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	

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	

	(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.

SECTION-II

STANDARD TECHNICAL REQUIREMENTS

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 napthenates / zinc napthenates (refer IS: 401) and anti-termite. The surface of the drum and the outer most cable layer shall be covered with water proof cover. Both the ends of the cables shall be properly sealed with heat shrinkable PVC/ rubber caps secured by 'U' nails so as to eliminate ingress of water during transportation, storage and erection. Dimensions of wooden drums shall be as per IS 10418. All ferrous parts shall be treated with suitable rust protective

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

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.

एनटीपीसी NTPC	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 अनुमोदित Approved 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
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	MANUFACTURER 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	MANUFACTURER 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	MANUFACTURER 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	MANUFACTURER 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	Verfy	As per manufacturer norms	100%	MANUFACTURER APPROVED sources	MANUFACTURER 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:VERFICATION AS APPROPRIATE, CHP: NTPC SHALL IDENTIFY IN COLUMN "N" AS "W"

एनटीपीसी NTPC	Item: 1.1 KV Power (XLPE & PVC) Insulated FRLS cables	STANDARD QUALITY PLAN (CONFORMING TO CODE: IS 1554 PART 1 , IS 7098 Part-1 AND NTPC TECHNICAL SPECIFICATION)	QP. NO. 0000-999- QOE- S-041 REV-00 DATE : 03-02-12 Page 2 of 11 VALID UP TO: 02-02-15	REVIEWED BY INDERJIT SINGH VIKRAM TALWAR RAJEEV GARG	APPROVED BY Approved 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
		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/Setting 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/Setting 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.

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NTPC	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 3 of 11 VALID UP TO: 02-02-15	REVIEWED BY INDERJIT SINGH VIKRAM TALWAR RAJEEV GARG	APPROVED BY 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
		2.Colour of cores	MA	Visual	One sample/Setting 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/Setting 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/Setting 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	--	--	

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एनटीपीसी NTPC	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 4 of 11 VALID UP TO: 02-02-15	REVIEWED BY INDERJIT SINGH VIKRAM TALWAR RAJEEV GARG	APPROVED BY 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
		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/Setting 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/Setting 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/printed
		6. Sequencial marking	MA	Visual	Full length	--	Sequencial 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 (Partl) & IS 7098- Part I	NTPC SPECIFICATION / NTPC ADS / IS 1554 (Partl) & IS 7098- Part I	--do--	✓	P	V	V	

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एनटीपीसी NTPC	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 5 of 11 VALID UP TO: 02-02-15	REVIEWED BY INDERJIT SINGH VIKRAM TALWAR RAJEEV GARG	APPROVED BY Approved 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
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 certific ate	✓	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 certific ate	✓	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 1) & 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	

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	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 6 of 11 VALID UP TO: 02-02-15	REVIEWED BY INDERJIT SINGH VIKRAM TALWAR RAJEEV GARG	APPROVED BY 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
		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(PartI)/IS3975	NTPC ADS /IS1554(PartI) /IS3975	Test certific ate	✓	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 IS 1554 (Part I)/7098(Part-I)		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--

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एनटीपीसी NTPC	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 7 of 11 VALID UP TO: 02-02-15	REVIEWED BY INDERJIT SINGH VIKRAM TALWAR RAJEEV GARG	APPROVED BY A.K. Garg

Sl. No	Component & Operations	Characteristics	Class	Type of check	Quantum of check M	Quantum of check C/ N	Reference Document	Acceptance Norms	Record Format	Agency D*	Agency M	Agency C	Agency N	Remarks
1	2	3	4	5	6		7	8	9	10				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 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 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	

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एनटीपीसी NTPC	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 8 of 11 VALID UP TO: 02-02-15	REVIEWED BY INDERJIT SINGH VIKRAM TALWAR RAJEEV GARG	APPROVED BY 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
		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 & ASTMD2843	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	

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NTPC	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 &11of 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**

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:VERFICATION AS APPROPRIATE, CHP: NTPC SHALL IDENTIFY IN COLUMN "N" AS "W"

NTPC	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 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

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:VERFICATION AS APPROPRIATE, CHP: NTPC SHALL IDENTIFY IN COLUMN "N" AS "W"

एनटीपीसी NTPC	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 11 of 11 VALID UP TO: 02-02-15	REVIEWED BY INDERJIT SINGH VIKRAM TALWAR RAJEEV GARG	APPROVED BY 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
				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:VERFICATION AS APPROPRIATE, CHP: NTPC SHALL IDENTIFY IN COLUMN "N" AS "W"

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	CHARACTERSTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	*	AGENCY			REMARKS
					M	C/N				D	M	C	N	
1	2	3	4	5	6		7	8	9		**			
		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:			
	Sign & Date	Name		Sign & Date	Name	Seal			Sign & Date	Name	Seal
Prepared by:	28/02/2020	DEVENDRA SINGH	Checked by:	28/2/2020	KUNAL GANDHI			Reviewed by:			
Reviewed by:	28/02/2020	MANISH SHUKLA	Reviewed by:	24/2/2020	R.K. JAISWAL			Approved by:			

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	CHARACTERSTICS	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 BESED ON CUSTOMER REQUIREMENT.

LEGENDS:
*RECORDS, INDENTIFIED 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		
	Sign & Date	Name		Sign & Date	Name
Prepared by:	28-02-2020	DEVENDRA SINGH	Checked by:	28/2/2020	KUNAL GANDHI
Reviewed by:	28/02/2020	MANISH SHUKLA	Reviewed by:	28/2/2020	R.K. JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

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

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

1. Tests for which "T" is indicated in the 'Test Conduction Required As' column below shall be conducted as Type Test.

2. Sampling:
   a) Type test to be conducted on one size of cable for every lot of cable.
   b) FRLS & Flammability Test to be conducted only on one sample/ lot.

B. Acceptance Test Conduction:

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

2. Sampling:
   Sampling for acceptance tests shall be as per Appendix-B of IS: 1554 Part-I

3. Flammability Test to be conducted only on one sample/ lot.

C. Routine Test Conduction:

1. 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 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.

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 / ASTMD 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 / ASTMD 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 / ASTMD 2863	

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

BHEL	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:			

CLAUSE NO.	QUALITY ASSURANCE	NTPC

LT Power Cables

Item / Components / Sub System Assembly \ Attributes / Characteristics	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
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 130ºc+/- 2ºc 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

BHEL	**PRE-QUALIFICATION REQUIRMENTS FOR LT PVC POWER CABLE**	PE-PQ-999-507-E013 REVISION NO. 03 DATE 29/04/2016 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.

NOTE:
Supplier to comply to "general points of PQR" available at http://bhelpem.com/vensection/PMD/PMD.aspx
In case supplier is not OEM, the offer shall be evaluated as per point no 1 of "general points of PQR".

PREPARED BY	REVIEWED BY	APPROVED BY
Manish Shukla 29/04/16	29/4/16.	M 29.4.16
NAME: MANISH SHUKLA	NAME: RAJNISH GOYAL	NAME: MEENA KESRI
DESIGNATION: SR. MGR	DESIGNATION: AGM	DESIGNATION: AGM & DH (E)

BHEL PEM-ELECTRICAL

PRE-QUALIFYING REQUIREMENTS FOR LT PVC POWER CABLE

ANNEXURE –I

PROJECT SPECIFIC CRITERIA AGAINST ENQUIRY

PROJECT: 3X800MW NTPC PATRATU TPP

The bidder should have manufactured and supplied following cables prior to the date of 08.09.18.

(a) At least 100 km of aluminum conductor, XLPE insulated, PVC sheathed power cables of 1.1kV or higher grade in one single contract.

(b) At least 100 km of aluminum conductor, PVC insulated, PVC sheathed power cables of 1.1kV or higher grade in one single contract.

(c) At least one (1) Km of flame retardant low smoke cables.

(d) 1.1kV or higher grade power cable of minimum 630sq.mm. Conductor size

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

Manmohan Mahapatra

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[DH-Electrical]

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=Po+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=Po+AIF(AL-Alo) + XLFAL(CC-CCo) +CCFAI(PVCC-PVCCo) + FeF(Fe-Feo)
3.	LT PVC Power Cable	ALP	P1	P2	-	-	P3	P3 (Additional)	P=Po+AIF(AL-Alo) + CCFAI(PVCC-PVCCo) + FeF(Fe-Feo)
4.	LT HRPVC Power Cable	ALP	P1	P2	-	-	P3	P3 (Additional)	P=Po+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
I	HT XLPE Power cable	CUP	H4	H2	XL3	XL4	H3	H5	P=Po+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=Po+CuF(Cu-Cuo) + XLFCU(CC-CCo) + CCFCu (PVCC-PVCCo) + FeF(Fe-Feo) + AIF(AL-Alo)

S no.	Cable type	CuF	AIF (single core armoured)	CCFCu	XLFCU (Single core)	XLFCU (Multi core)	FeF	FeW	IEEMA Formula
3	LT PVC Power Cable	CUP	P4	P2	--	--	P3	P3 (Additional)	P=Po+CuF(Cu-Cuo) + CCFCu (PVCC-PVCCo) + FeF(Fe-Feo) + AIF(AL-Alo)
4	LT HRPVC Power Cable	CUP	P4	P2	--	--	P3	P3 (Additional)	P=Po+CuF(Cu-Cuo) + CCFCu (PVCC-PVCCo) + FeF(Fe-Feo) + AIF(AL-Alo)
5	LT XLPE Control Cable	CUC	--	P5	--	XL2	P6	P6 (Additional)	P=Po+CuF(Cu-Cuo) + XLFCU(CC-CCo) + CCFCu (PVCC-PVCCo) + FeF(Fe-Feo)
6	LT PVC Control Cable	CUC	--	P5	--	--	P6	P6 (Additional)	P=Po+CuF(Cu-Cuo) + CCFCu (PVCC-PVCCo) + FeF(Fe-Feo)
7	LT HRPVC Control Cable	CUC	--	P5	--	--	P6	P6 (Additional)	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 (Additional)	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 (Additional)	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 (Additional)	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 (Additional)	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)

Annexure-II

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. IIEMA (PVC) /Instrumentation Cable/2014 effective from dtd 01.07.2014.

(ii) All other tables shall be as per IEEMA circular No. 35//DIV/CAB/05/ dated 24.04.2018.

Terms used in PVC formulae:

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

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

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

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

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

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

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IEEMA (PVC)/Instrumentation Cable/2014 **Effective from: 1st July 2014**

Material Price Variation Clause For Instrumentation Cables

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

Terms used in price variation formulae:

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

Po 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.

Cu_o 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.

Fe_o 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.

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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 = Po + CuF (Cu – Cuo) + FeF (Fe – Feo)

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

Copper Factors for Instrumentation Cables - CuF

Cu POS

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

Copper Factors for Instrumentation Cables - CuF

Cu PIS

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

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

Steel Factors for Instrumentation Cables - FeF

Fe PIS

Pair Instrumentation Individual and Over all Screen Cables

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

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Cir. No. 35/DIV/ CAB/05/ 24th April 2018

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

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

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

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

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

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

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

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

Senior Director

Encl: as above

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

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

AlF Variation factor for aluminium

Al Price of Aluminiujm. 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.

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

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

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XLPE COMPOUND

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

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

XLFAL Variation factor for XLPE compound for aluminum conductor cable.
XLFCU Variation factor for XLPE compound for Copper conductor cable.

STEEL

FeF Variation factor for steel

FeW Variation factor for round wire steel armouring

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

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

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

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

Notes

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

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

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Price variation formulae for 'Power Cables'

A. Aluminum conductor PVC insulated 1.1 kV power cables

P = Po + AlF (AL – Alo) + CCFAl (PVCc – PVCco) + FeF (Fe - Feo)

For unarmourd 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 = Po + CuF (Cu – Cuo) + CCFCu (PVCc – PVCco) + Fef (Fe – Feo) + AlF (Al – Alo)

For steel armoured cables; AlF = 0 For aluminium armoured cables; FeF = 0
For unarmoured cables; FeF, AlF = 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 = Po + 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 = Po + AlF (AL – Alo) +XLFAL(CC-Cco)+ CCFAl (PVCc – PVCco) + FeF (Fe - Feo)

For unarmourd 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 (CCFAl)
P3	Steel armour
XL1	XLPE Compound (XLFAL)

E. Copper conductor XLPE insulated 1.1 kV power cables

P = Po + CuF (Cu – Cuo) + XLFCU (CC-Cco)+ CCFCu (PVCc – PVCco) + Fef (Fe – Feo) + AlF (Al – Alo)

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

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For unarmoured cables; FeF, AlF = 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 = Po + CuF (Cu – Cuo) + XLFCU (CC-Cco)+ CCFCu (PVCc-PVCco) + FeF (Fe-Feo)

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 = Po + AlF (Al – Alo) + XLFAL(CC-Cco)+CCFAl (PVCc – PVCco) + FeF (Fe – Feo)

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

Table Refernces:

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 = Po + CuF (Cu – Cuo) + XLFCU (CC-Cco)+ CCFCu (PVCc – PVCco) + FeF (Fe – Feo) + AlF (Al – Alo)

For steel armoured cables; AlF = 0 For aluminium armoured cables; FeF = 0
For unarmoured cables; FeF, AlF = 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 = Po + CuF (Cu – Cuo)
Table CUsdc Copper Conductor

Authorized Signatory

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	1.036	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

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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 CUsdc

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

TABLE CUC

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

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

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TABLE P1

VARIATION FACTOR FOR ALUMINIUM (AIF)

ALUMINIUM ARMOURED SINGLE CORE PVC INSULATED 1.1 KV CABLES

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

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TABLE P2

VARIATION FACTOR FOR PVC COMPOUND (CCFAI/CCFCu)

PVC INSULATED 1.1 KV POWER CABLES WITH COPPER/ALUMINIUM CONDUCTOR

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

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TABLE P3

VARIATION FACTOR FOR STEEL (FeF)

PVC INSULATED 1.1 KV POWER CABLES WITH COPPER/ALUMINIUM CONDUCTOR

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

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TABLE P3 (Additional)

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

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

TABLE P5

VARIATION FACTOR FOR PVC COMPOUND (CCFCu)
PVC INSULAYTED 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 217

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 Effective from: 1st November 217

TABLE P6 (Additional)

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

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	-	-	-	-	-	-	-	-

TABLE XL1
VARIATION FACTOR FOR XLPE COMPOUND (XLFAL/XLFCU)
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								

TABLE XL2
VARIATION FACTOR FOR XLPE COMPOUND (XLFCU)
XLPE INSULAYTED 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

TABLE XL3

VARIATION FACTOR FOR XLPE(XLFAL/XLFCU)

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 (CCF1Al / CCF1Cu)

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

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

Note : XLPE factors include Semicons for Conductor & Insulation screen

TABLE H1

VARIATION FACTOR FOR ALUMINIUM (AlF)

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 (CCFAl / 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

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

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

PEM / PG-III, BHEL, Noida

SPECIAL CONDITIONS OF CONTRACT (SCC) Rev-0

3 x 800 MW PVUNL PATRATU TPP PHASE-I (Job No. 434)

These Conditions shall be read and construed along with General Conditions of Contract (GCC) rev.06 & GST related Corrigendum to GCC rev.06, to be enclosed along with the tender enquiry. In case of any conflict or inconsistency, the conditions given in SCC shall prevail over the GCC and its corrigendum.

Sl No.	Title	Description
1.	Project Name	3 x 800 MW PVUNL PATRATU TPP PHASE-I (EPC)
2.	Nature of project & Type of Bidding	Non-Mega & ICB (International Competitive Bidding)
3.	Customer Order Ref No	01/PVUNL-CS-9585-001-2/NOA-FC dated 08.03.2018 01/PVUNL-CS-9585-001-2/NOA-SC dated 08.03.2018 01/PVUNL-CS-9585-001-2/NOA-TC dated 08.03.2018
4.	BHEL's Customer	PATRATU VIDYUT UTPADAN NIGAM LIMITED (subsidiary of NTPC Limited in joint venture with JBVNL)
5.	**PVUNL GST No.**	**20AAICP3718K1ZH**
6.	Customer Consultants	No consultant
7.	Consignee Address (Bill To)	For supply package: BHEL, Power Sector-Project Engineering Management, Power Project Engineering Institute, Plot No. 25, Sector-16A, Noida, Uttar Pradesh-201301. **GSTIN: 09AAACB4146P2ZC** **For turnkey packages** (where BHEL-PEM will issue only the LOA and Purchase Order shall be issued by BHEL-PSWR): Construction Manager, BHEL site office, Patratu Vidyut Utpadan Njigam Ltd , PO: PTPS , Patratu , Ramgarh, Jharkhand - 829119 **BHEL PSWR GSTIN No.- 27AAACB4146P1ZF**
8.	Delivery Address (Ship To)	Construction Manager, Bharat Heavy Electricals Limited, Patratu Vidyut Utpadan Njigam Ltd, PO: PTPS , Patratu , Ramgarh ,Jharkhand - 829119
9.	BHEL Site Office Address	Construction Manager, Bharat Heavy Electricals Limited, Patratu Vidyut Utpadan Njigam Ltd , PO: PTPS , Patratu , Ramgarh, Jharkhand - 829119
10.	Location of Plant	Site is Located just outside the coal belt of South Karanpura in Ramgarh District of Jharkhand State. The nearest Railway Station is Patratu which is at a distance of about 4 km on Barkakhana-Barwadih Railway line. **District: Ramgarh (state- Jharkhand)** **Next big cities to site: Ranchi** **Nearest Railway Station: - Patratu** **Nearest Airport: Ranchi (45 km by road from site)**
11.	Mode of Dispatch	Air, Road, Rail & Sea Transportation For indigenous supplies: By Rail/Road on door delivery and freight pre-paid basis. For imported supplies: On C&F basis. Transit Insurance will be in BHEL scope
12.	Road Permit /E-waybill	Road Permit / E-way bill, to be arranged by Supplier/ transporter/ BHEL (as per GOI mandate).
13.	BHEL GSTIN Details	For supply packages: BHEL-PEM is registered in the State of Uttar Pradesh with GSTIN 09AAACB4146P2ZC

Gaurav 08/5/18

		For Turnkey packages: BHEL PSWR GSTIN No.- 27AAACB4146P1ZF
14.	Transit Insurance	In BHEL Scope. For each dispatch, vendor shall inform the following to the Underwriter under intimation to BHEL-PEM and BHEL Site office: (i) Policy No. (ii) Consignee Name. (iii) Consignment Details (items with their weights and value (in INR). (iv) Project Name and P.O. No. (v) LR No. and date, Dispatch origin and destination details, Invoice No. Vendors to intimate the underwriters quoting the insurance Policy No. as mentioned in Purchase Order.
15.	Dispatch intimation	Yes in writing, Not less than 30 (Thirty) days prior to date of shipment and dispatch details to be sent to: BHEL Site office (As mentioned in Sl. No. 9) BHEL PEM Noida (As mentioned in NIT) At the point of dispatch, vendor must furnish docs required as given below through Email / Fax i. Vendor's invoice ii. LR / RR / GR / Courier Receipt iii. Packing List/ Challan indicating the items dispatched (with their weights) iv. Insurance intimation letter informing the underwriters about the dispatches v. MDCC (of BHEL / NTPC) as applicable vi. Photograph of packing / boxes showing dispatch marking as per Sl. No. 26
16.	Document required for Vendor's payment.	**For materials originating from Indian territory** For claiming the payment against dispatch, MRC & Freight, documents as mentioned in GCC rev 06 & its corrigendum shall be submitted by vendor to BHEL. Original money receipt must be submitted for Freight payment. **Packing List** must comply to Clause No. ~~19.3 of General Commercial~~ Terms & ~~Conditions of~~ GCC rev.06. Description of items in packing list shall be as per PO such that proper correlation between PO & packing list must be furnished. Soft copy of documents for claiming payment shall be submitted by vendor as advance copy. **For materials originating from non-Indian Territory** Three (3) original and Three (3) copies of clean bill of lading or One (1) clean original Airway Bill & Three (3) copies, in case of air freight. One (1) original and Three (3) copies of signed Invoices One (1) original and Three (3) copies of Packing List (clearly showing number of packages, gross weight and net weight). Three (3) copies of certificate of country of origin. Copy of MDCC from BHEL / NTPC (as applicable) Three (3) copies of inspection certificate, if any, issued by the customer/his authorized representative. Three (3) of certificate from the vendor to the effect that drawings and catalogues for customs clearance purpose have been kept with the packages for shipment. Three (3) copies of certificate from the vendor to the effect that the contents in each case are not less than that entered in the invoices and guaranteed as new and as per the relevant technical specifications. Shipping Specification – One (1) copy. Quality Certificate – One (1) copy. Approved Test Certificates, if any. - Three (3) copies. Guarantee Certificate – One (1) Original + One (1) copy.

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		Inspection Reports – One (1) Original + One (1) copy. PVC Calculation and copy of all applicable indices, if PVC applicable. – Two (2) copies.
17.	Material Receipt Certificate (MRC)	A) For supply packages- BHEL-PEM will arrange MRC from BHEL site B) For Turnkey (Supply + Erection & Commissioning) – Original MRC duly signed by customer (PVUNL) & BHEL site is to be arranged by Vendor.
18.	Buyer and Paying Authority	For packages where PEM will issue the Purchase Order: **BHEL PEM** will be the paying authority. For packages where BHEL-PEM will issue only the LOA and Purchase Order shall be issued by BHEL-PSWR: **BHEL Patratu Site will be the paying Authority.**
19.	Demurrage charges	Demurrage charges shall be paid by supplier/ vendor only to the transporter. No claim shall be acceptable to BHEL in this regard.
20.	Unloading, Storage & Movement of material at site	a) By BHEL site office for supply packages. b) By vendors for Turnkey i.e. Supply and E&C packages
21.	Concessional custom duty against Essentiality certificate (EC)	The project has been qualified through Project Import route. Accordingly, the benefits applicable to PI project would be granted for this project In this regard applicable documents such as Essentiality certificate will be issued by NTPC (ultimate customer). Under this, Concessional rate of Customs Duty shall be applicable on the Import Contents of the supplier respectively. Based on the above EC, Customs Duty Benefits will be passed on to the vendor. The Bidder to indicate the Import contents i.e. list of the item, Currency of Import and Country of Import including CIF value in their offers. BHEL shall inform, the availability of CIF value for a particular package, if any, at the time of NIT. The benefits availed in Concessional Customs Duty must be passed on to BHEL in their offer. Vendor shall inform BHEL and provide the necessary documents to obtain required certificates from BHEL to avail exemption. Obtaining custom duty benefit in line with the Essentiality Certificate issued shall be in vendor's scope.
22.	Taxes & Duties (For Domestic Vendor)	As per General Conditions of Contract (GCC rev 06) & GST related Corrigendum to GCC rev.06
23. a	Taxes & Duties (For Order Directly to Foreign Bidders)- supply packages	In case of foreign vendors, quoted prices & Dispatches shall be on C & F (Port-Chennai) basis and the Taxes & duties in the country of dispatch shall be borne by Foreign vendor.
23. b	Taxes & Duties (For Order Directly to Foreign Bidders)- Turnkey packages	Complete responsibility of import including (but not limited to) import clearance, all taxes and duties in the country of export (origin), all taxes and duties in India shall be to vendor's account.
24.	Inspection Agency	BHEL/ BHEL approved 3rd party inspection agencies and/or NTPC/ Customer Agency as applicable.
25.	Inspection procedure for Domestic supplies	<u>For Domestic supplies</u> Vendor shall raise inspection call at least 15 business days in advance on BHEL CQS website to applicable inspection agency (as mentioned in PO/LOI or to be informed later) and submit copy of inspection call to BHEL-PEM for arranging NTPC inspection/Joint inspection on the proposed date, as applicable. MDCC shall be issued on the basis of clear inspection report (CQIR). <u>For Foreign supplies</u> In case of Foreign supplies, if NTPC approved 3rd party inspection agency does not participate in the inspection, test certificates & inspection reports duly accepted by the agreed Inspection agency shall be submitted in soft copy to BHEL-PEM. The same shall be reviewed by PEM and then, sent to NTPC for clearance. The dispatch clearance (MDCC) by NTPC/ BHEL as applicable shall be given to the foreign supplier or representative in India after acceptance of above test certificates.

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26.	Packing, Identification & marking [if not specified in NIT]	Each box shall be marked with Capital Letters in "Red" indicating the **PEM SUPPLY (Main Supply/ Commissioning Spares/ Mandatory Spares) for** 3 x 800 MW PVUNL PATRATU TPP. **NOTE:** Main supply item and items for commissioning spares must be packed separately. Each package delivered under the Contract shall be marked by supplier and such marking must be distinct and in English language (all previous irrelevant markings being carefully obliterated). Such marking shall show the description and quantity of contents, the name and address of consignee, the Gross weight and Net weight of the package, the name of the Supplier, PEM P.O. reference number, with a distinctive number of mark sufficient for purposes of identification. Besides above necessary, packing shall bear a special marking `TOP', `BOTTOM', 'DO NOT TURN OVER", "KEEP DRY", "HANDLE WITH CARE", etc **IMPORTANT: -** • Two copies of respective standard manufacturer's erection instruction/operation instruction manual shall be kept in each package / container for immediate reference by BHEL site and same shall be reflected in packing slip also • The Packing list details for the consignment must be put inside the Box/Boxes. Items like pumps, Valves, Hoists, Cranes etc shall essentially have O&M Manuals and E&C guidelines duly enclosed in the packing box. Certificate to such effect shall also be reflected in packing slip. Mandatory spares shall be properly packed separately in separate box painted in Red, indicating **Mandatory Spares in bold letters** and each spare shall be properly tagged giving details i.e. item number of the equipment in line with the CUSTOMER approved BBU for Mandatory spares & Number per item (to match the description given ~~in the packing slip) to facilitate their proper~~ identification by PVUNL/ NTPC. One Copy of Packing list must be put inside the Box along with Manufacturing drawing no. reference, Catalogue reference etc.
27.	Submission of Final Drgs/Docs alongwith O&M Manual, Type Test Certificates (if any)	As per GCC rev.06/ Technical Specification/Kick-off meeting.

	Prepared by	Checked by	Reviewed by	Vetted by	Approved by
Name	Gaurav Garg				16/05/18
Designation	Sr. Engr/ PG III	DGM/ PG III	DGM/ PG III	Finance	AGM & DH/ PG III
Signature	Gaurav 08/5/18				DEEPAK GUPTA

CORPORATE QUALITY ASSURANCE/ कॉरपोरेट गुणवत्ता आश्वासन

MAIN CONTRACTOR'S PROPOSAL CUM EVALUATION REPORT

मुख्य संविदाकार प्रस्ताव सह मुल्यांकन रिपोर्ट

Ref No: संदर्भ सं.:			***Date:*** तिथिः		
i.	***Main Contractor*** मुख्य संविदाकार				
ii.	***Project*** परियोजना				
iii.	***Package Name*** पैकेज का नाम		***Package No*** पैकेज सं.		
iv.	***Proposed Item/Scope of Sub-contracting*** उप-संविदा(अनुबंध) का प्रस्तावित मद/ दायरा				
v.	***Item covered under*** *निम्नलिखित के अंतर्गत शामिल मद*	***Schedule-1*** */अनुसूची-* ***1***		***As per contract clause No-*** *अनुबंध के अनुसार खंड सं.--* ***-***	
		Schedule-2 *अनुसूची-* ***-2***			
vi.	***If item is Schedule-1 and proposed sub-vendor is indigenous, Main Contractor to explain how the contractual provisions will be fulfilled*** /यदि मद अनुसूची **-1** है और प्रस्तावित उप-विक्रेता स्वदेशी है, तो मुख्य संविदाकार को स्पष्ट करना होगा कि संविदा/अनुबंध के प्रावधान कैसे पूरे किए जाएंगे				
vii.	***Name and Address of the proposed Sub-vendor's works*** /प्रस्तावित सब-वेंडर का नाम तथा पता				
viii.	***PO placement date/ Start of manufacturing (if self-manufactured) as per L2 network*** **पीओ नियोजन की तिथि / एल-** 2 **नेटवर्क के अनुसार विनिर्माण (यदि स्व-निर्मित है) की शुरुआत**				

ix.	***Item Description (Type/Size/Rating/Scope of Sub-Contracting)*** मद का विवरण (प्रकार / आकार / रेटिंग / उप-अनुबंध का दायरा)	***Total quantity of proposed item envisaged in this package (Nos/ Running Meters/ Kgs/ Tons etc)*** इस पैकेज में परिकल्पित प्रस्तावित मद की कुल मात्रा (संख्या / क्रियाशील मीटर / किलोग्राम / टन आदि)	***Quantity proposed to be procured from proposed sub-vendor (Nos/ Running Meters /Kgs /Tons etc)*** प्रस्तावित उप-विक्रेता (संख्या / क्रियाशील मीटर / किलोग्राम / टन आदि) से खरीदी जाने वाली मात्रा	***Timeline for quantity requirements as per project schedule & whether the proposed Sub-vendor equipped with adequate capacity to supply proposed order quantity in time*** / परियोजना समय सूची के अनुसार मात्रा आवश्यकताओं के लिए समय-सीमा और क्या प्रस्तावित उप-विक्रेता समय पर प्रस्तावित मांग की मात्रा की आपूर्ति करने में पूरी तरह से सक्षम है

x.	***Supply experience of the proposed sub-vendor (including supplies to Main Contractor, if any) for similar item/scope of sub-contracting, for last 3 years (Note:- Only relevant experience details w.r.t. proposed item/scope of subcontracting to be brought out here)*** पिछले **3** वर्षों के लिए उप-अनुबंध के समान मद / दायरे के लिए प्रस्तावित सब-वेंडर (मुख्य संविदाकार हेतु आपूर्ति, यदि कोई हो, सहित) का आपूर्ति अनुभव (नोट: - उप-अनुबंध के प्रस्तावित मद / दायरे के संबंध में केवल प्रासंगिक अनुभव के विवरण का उल्लेख हो

CORPORATE QUALITY ASSURANCE/ कॉरपोरेट गुणवत्ता आश्वासन

MAIN CONTRACTOR'S PROPOSAL CUM EVALUATION REPORT

मुख्य संविदाकार प्रस्ताव सह मुल्यांकन रिपोर्ट

	Project/Package परियोजना/पैकेज	***Customer Name*** ग्राहक का नाम	***Supplied Item (Type/Rating/Model /Capacity/Size etc)*** आपूर्तित मद (प्रकार/रेटिंग /मॉडल /क्षमता/आकार आदि)	***PO ref no/date*** पीओ संदर्भ सं. /तिथि	***Supplied Quantity*** आपूर्ति की मात्रा	***Date of Supply*** आपूर्ति की तिथि

We confirm that as per our assessment, the proposed sub-vendor has requisite capabilities & supply experience and is suitable for supplying the proposed item/scope of sub-contracting/हम अपने आकलन के अनुसार इस बात की पुष्टि करते हैं कि, प्रस्तावित उप-विक्रेता के पास अपेक्षित क्षमता और आपूर्ति करने का अनुभव है और उप-अनुबंध के दायरे /प्रस्तावित मद की आपूर्ति के लिए उपयुक्त है।

Name: नाम:		***Desig:*** पद:		***Contact No:*** दूरभाष सं.:		***Sign:*** हस्ताक्षर:		***Date:*** तिथि:	

Company's Seal/Stamp:- कंपनी का मुहर:-

एनटीपीसी NTPC	**CORPORATE QUALITY ASSURANCE/ कॉरपोरेट गुणवत्ता आश्वासन** **SUB-VENDOR QUESTIONNAIRE/ सब-वेंडर प्रश्नावली**

i.	***Item/Scope of Sub-contracting*** **उप-संविदा(अनुबंध) का मद/ दायरा**			
ii.	***Address of the registered office*** पंजीकृत कार्यालय का पता		***Details of Contact Person*** संपर्क व्यक्ति का विवरण ***(Name, Designation, Mobile, Email)*** (नाम, पदनाम, मोबाइल, ईमेल)	
iii.	***Name and Address of the proposed Sub-vendor's works where item is being manufactured*** प्रस्तावित उप-विक्रेता के कार्यों का नाम और पता, जहां मद का निर्माण किया जा रहा है		***Details of Contact Person:*** संपर्क व्यक्ति का विवरण ***(Name, Designation, Mobile, Email)*** (नाम, पदनाम, मोबाइल, ईमेल)	
iv.	***Annual Production Capacity for proposed item/scope of sub-contracting*** **उप-संविदा(अनुबंध)** के प्रस्तावित मद / दायरे के लिए वार्षिक उत्पादन क्षमता			
v.	***Annual production for last 3 years for proposed item/scope of sub-contracting*** **उप-संविदा(अनुबंध)** के प्रस्तावित मद / दायरे के लिए पिछले 3 वर्षों का वार्षिक उत्पादन			
vi.	***Details of proposed works*** **प्रस्तावित कार्यों का विवरण**			
1.	***Year of establishment of present works*** वर्तमान फैक्टरी की स्थापना का वर्ष			
2.	***Year of commencement of manufacturing at above works*** उपरोक्त फैक्टरी में निर्माण कार्य शुरू होने का वर्ष			
3.	***Details of change in Works address in past (if any*** पूर्व में फैक्टरी स्थल में परिवर्तन का विवरण (यदि कोई हो)***)***			
4.	***Total Area*** कुल क्षेत्र			
	Covered Area शामिल क्षेत्र			
5.	***Factory Registration Certificate*** फैक्टरी पंजीकरण प्रमाण पत्र		***Details attached at Annexure – F2.1*** विवरण अनुलग्नक- एफ 2.1 पर संलग्न है	
6.	***Design/ Research & development set-up*** डिजाइन / अनुसंधान और विकास सेटअप ***(No. of manpower, their qualification, machines & tools employed etc.)*** (श्रमिकों की संख्या, उनकी योग्यता, मशीन और उपलब्ध उपकरण आदि)		***Applicable / Not applicable if manufacturing is as per Main Contractor/purchaser design)*** ***Details attached at Annexure – F2.2*** ***(if applicable)*** लागू / लागू नहीं, अगर विनिर्माण मुख्य संविदाकार / खरीददार के डिजाइन के अनुसार है) विवरण अनुलग्नक –एफ 2.2 पर संलग्न है। (यदि लागू हो)	
7.	***Overall organization Chart with Manpower Details (Design/Manufacturing/Quality etc)*** मैनपावर विवरण के साथ समग्र संगठन का चार्ट(डिजाइन / विनिर्माण / गुणवत्ता आदि)		***Details attached at Annexure – F2.3*** विवरण अनुलग्नक – F2.3 में संलग्न है।	

8.	***After sales service set up in India, in case of foreign sub-vendor(Location, Contact Person, Contact details etc.)*** भारत में बिक्री सेवा की स्थापना के बाद, विदेशी उप-विक्रेता के मामले में(स्थल , संपर्क व्यक्ति, संपर्क विवरण आदि)	***Applicable / Not applicable*** लागू / लागू नहीं ***Details attached at Annexure – F2.4*** विवरण अनुलग्नक -2.4 पर संलग्न है ।
9.	***Manufacturing process execution plan with flow chart indicating various stages of manufacturing from raw material to finished product including outsourced process, if any*** फ्लोचार्ट सहित विनिर्माण प्रक्रिया निष्पादन योजना , जिसमें आउटसोर्स प्रक्रिया, यदि कोई हो, सहित कच्चे माल से तैयार उत्पाद तक विनिर्माण के विभिन्न चरणों को दर्शाया गया हो,	***Details attached at Annexure – F2.5*** विवरण अनुलग्नक - F2.5में संलग्न है ।
10.	***Sources of Raw Material/Major Bought Out Item*** कच्चे माल के स्रोत / खरीदे हुए मुख्य मद	***Details attached at Annexure – F2.6*** विवरण अनुलग्नक - F2.6में संलग्न है।
11.	***Quality Control exercised during receipt of raw material/BOI, in-process , Final Testing, packing*** कच्चे माल / खरीदे हुए मद, प्रक्रियाबद्ध, अंतिम परीक्षण, पैकिंग करते समय गुणवत्ता नियंत्रण	***Details attached at Annexure – F2.7*** विवरण अनुलग्नक - F2.7 पर संलग्न है
12.	***Manufacturing facilities*** ***(List of machines, special process facilities, material handling etc.)*** विनिर्माण सुविधा(मशीनों की सूची , विशेष प्रक्रिया सुविधाएं, सामग्री रख-रखाव आदि)	***Details attached at Annexure – F2.8*** विवरण अनुलग्नक - F2.8में संलग्न है ।
13.	***Testing facilities (List of testing equipment)*** परीक्षण सुविधाएं(परीक्षण उपकरण की सूची)	***Details attached at Annexure – F2.9*** विवरण अनुलग्नक – F2. 9 में संलग्न है ।
14.	***If manufacturing process involves fabrication then-*** यदि निर्माण प्रक्रिया में फेब्रिकेशन की गई है तो- ***List of qualified Welders*** पात्र वेल्डर की सूची ***List of qualified NDT personnel with area of specialization*** विशेषज्ञता के क्षेत्र सहित पात्र एनडीटी कार्मिकों की सूची	***Applicable / Not applicable*** लागू / लागू नहीं ***Details attached at Annexure – F2.10*** विवरण अनुलग्नक - F2.10में संलग्न है। ***(if applicable)*** लागू / लागू नहीं
15.	***List of out-sourced manufacturing processes with Sub-Vendors' names & addresses*** सब-वेंडर द्वारा बाह्य स्रोतों (उनके नाम और पते सहित)से करवाएं गए निर्माण प्रक्रियाओं की सूची	***Applicable / Not applicable*** लागू / लागू नहीं ***Details attached at Annexure. –F2.11*** विवरण अनुलग्नक - F2.10में संलग्न है। ***(if applicable)*** (यदि लागू हो)
16.	***Supply reference list including recent supplies*** नवीनतम आपूर्ति सहित आपूर्ति संदर्भ सूची	***Details attached at Annexure – F2.12*** विवरण अनुलग्नक - F2.12 में संलग्न है । ***(as per format given below)*** (नीचे दिए गए प्रारूप के अनुसार)

Project/ package परियोजना /पैकेज	***Customer Name*** ग्राहक का नाम	***Supplied Item (Type/Rating/Model /Capacity/Size etc)*** आपूर्ति की गई वस्तु (प्रकार / रेटिंग / मॉडल / क्षमता / आकार आदि)	***PO ref no/date*** पीओ संदर्भ सं. / तिथि	***Supplied Quantity*** आपूर्ति की मात्रा	***Date of Supply*** आपूर्ति की तारीख

17.	***Product satisfactory performance feedback letter/certificates/End User Feedback*** उत्पाद के संतोषजनक प्रदर्शन संबंधी फीडबैक पत्र / प्रमाण पत्र / अंतिम उपयोगकर्ता फ़ीडबैक	***Attached at annexure - F2.13*** अनुलग्नक F2. 3पर संलग्न है

18.	***Summary of Type Test Report (Type Test Details, Report No, Agency, Date of testing) for the proposed product (similar or higher rating)*** प्रस्तावित उत्पाद (एक समान या उच्च रेटिंग वाले) के लिए टाइप टेस्ट रिपोर्ट (टाइप टेस्ट विवरण, रिपोर्ट संख्या, एजेंसी, जांच की तारीख) का सारांश नोट: - रिपोर्ट प्रस्तुत करने की आवश्यकता नहीं है ***Note:- Reports need not to be submitted***	***Applicable / Not applicable*** लागू / लागू नहीं ***Details attached at Annexure – F2.14*** विवरण अनुलग्नक - F2.1 4में संलग्न है ***(if applicable)*** (यदि लागू हो)
19.	***Statutory / mandatory certification for the proposed product*** प्रस्तावित उत्पाद के लिए वैधानिक / अनिवार्य प्रमाणीकरण	***Applicable / Not applicable*** लागू / लागू नहीं ***Details attached at Annexure – F2.15 (if applicable)*** (यदि लागू हो)
20.	***Copy of ISO 9001 certificate*** आईएसओ 9001 प्रमाण पत्र की प्रति ***(if available***(यदि उपलब्ध हो)	***Attached at Annexure – F2.16*** अनुलग्नक में संलग्न - F2.1 6 है
21.	***Product technical catalogues for proposed item (if available)*** प्रस्तावित मद के लिए उत्पाद तकनीकी कैटलॉग (यदि उपलब्ध हो)	***Details attached at Annexure – F2.17*** विवरण अनुलग्नक - F2.1 7 में संलग्न है

Name: ***नाम:***		***Desig:*** ***पद:***		***Sign:*** ***हस्ताक्षर:***		***Date:*** ***तिथि:***	

Company's Seal/Stamp:- कंपनी की मुहर / मोहर: -

Guidelines for Remote Inspection of PEM BOIs

1) OBJECTIVE:

To lay down the procedure for carrying out Remote Inspection of Bought-out Items (BOIs) for PEM suppliers wherever applicable.

2) SCOPE:

It will cover suppliers for packages of PEM BOIs for various project requirements.

Invitation is sent to the suppliers for remote inspection on applications like MS Teams, Webex, etc. by BHEL.

3) MINIMUM REQUIREMENTS AT SUPPLIER'S WORKS:

i. Uninterrupted internet services

ii. Good internet bandwidth (Min 100 Mbps)

iii. Good resolution camera (2 nos) – one preferably CCTV (static at one place) and one hand hold (moving)

iv. Smart phone with minimum 8MPi camera front and back both with optical zoom facility suitable for using web applications like Webex, MicroSoft (MS) Teams, etc.

v. Computer and Scanner with good resolution

vi. Digital signatures of supplier's Quality Engineer

vii. Availability of web applications like Webex, MicroSoft (MS) Teams, as required.

viii. All Test certificates, internal test reports, calibration reports, etc. for the items offered for inspection.

ix. Availability of the above to be submitted to BHEL two days in advance before inspection.

x. Dedicated team from supplier side for facilitating inspection requirements.

xi. For ensuring proper visibility, the suggested Portable lighting sources (torch/ electric LED bulb of minimum 15 W) with no glare is to be ensured at offered job, location for remote inspection/testing. This is to be verified before start of the inspection.

xii. The GPS location co-ordinates or any method to locate inspection location shall be captured indicating the location of the Vendor-Premises of remote inspection/testing.

4) MINIMUM REQUIREMENTS AT BHEL and CUSTOMER LOCATION :

i. Uninterrupted internet services

ii. Suitable internet bandwidth

iii. Digital signatures wherever required.

iv. Availability of web applications like Webex, MS Teams, etc. as required.

v. Clearance from customer for conducting remote inspection

5) PROCEDURE:

i. Supplier will raise the inspection call in BHEL - CQIR portal.

ii. Supplier shall ensure availability of minimum requirements at supplier's works as mentioned above at point 3.

iii. Before starting the inspection, the supplier shall submit the documents (TCs, internal test reports and calibration certificates as per approved QAP) two days before the date of inspection for review by BHEL and supplier shall coordinate with BHEL and if found satisfactory, inspection shall be considered for remote.

iv. Prior to commencement of remote inspection a pre inspection meeting shall be organised by BHEL inspector with supplier to ascertain the readiness for remote inspection.

6) During inspection, supplier shall share the location on Google maps for verifying the address of the manufacturer. Location may be captured by BHEL as screenshot.

i. Inspection shall be on the basis of approved Quality Plans and associated reference documents mentioned.

ii. For witnessing inspection, supplier shall bring the mobile video camera near to the surface of the equipment or as per requirement of the inspector for clarity in viewing the test/ equipment which shall be the responsibility of supplier. Supplier shall ensure that proper lighting in available during live video streaming.

iii. Before start of the inspection, inspector shall ensure that all instruments shall have valid calibration report. Supplier shall ensure use of digital instruments preferably for inspection to the extent possible.

iv. Details of suppliers's dedicated team handling the remote inspection shall also be incorporated in the CQIR.

v. All details of inspection/ testing referred documents shall be mentioned in the CQIR. Recording of remote inspection shall be maintained by the BHEL inspector and this recording (unedited) shall be maintained at BHEL system for a minimum period of 3 years or till the warranty period whichever is later.

vi. PEM (Engineering) shall accord final technical clearance, in case of any deviation in inspected item noticed during inspection.

vii. Inspection shall be conducted by PEM-Q&BE assigned inspector along with PEM-Engg (if required). CQIR shall be prepared and maintained by PEM-Q&BE.

viii. PG will issue MDCC on the basis of acceptance of inspected items along with accepted packing photographs as per contract provisions.

7) **UNDERTAKING BY VENDOR:** Material inspected through remote inspections is meeting all technical requirements of BHEL. In case of any discrepancy from the above procedure/ material inspected, if found later, vendor will replace the materials without any cost implication to BHEL.

8) Vendor shall provide the signed and stamped of the above guidelines to BHEL as a token of acceptance.

Letter head of Company (<Rs. 10 Cr value)

Ref…… Date…….

To,

Bharat Heavy Electricals Limited PEM,

PPEI Building, Plot No 25, Sector -16A,

Noida (U.P)-201301

Subject: -Certification regarding local content

Reference: Tender Enquiry No-……

Name of Package: ……..

Dear Sir,

We hereby certify that items offered by us of ……..(package name)…….……for……(Project Name/Rate contract)…….. meets the requirement of minimum local content in line with Cl. No……. of NIT No……. dated……. and the Public Procurement (Preference to Make in India), Order 2017 dated-15.06.2017, 28.05.2018, 29.05.2019 , 04.06.2020 &16.09.2020.

Local Content- .....%

We further confirms that details of location at which the local value addition is made will be our registered works at ……(address of the works)

Yours very truly

……..(authorized signatory of company)

……..(firm name)