



Bid Number/बोली क्रमांक (बिड संख्या):
GEM/2024/B/4650423
Dated/दिनांक : 17-02-2024

Bid Document/ बिड दस्तावेज़

Bid Details/बिड विवरण	
Bid End Date/Time/बिड बंद होने की तारीख/समय	27-02-2024 15:00:00
Bid Opening Date/Time/बिड खुलने की तारीख/समय	27-02-2024 15:30:00
Bid Offer Validity (From End Date)/बिड पेशकश वैधता (बंद होने की तारीख से)	80 (Days)
Ministry/State Name/मंत्रालय/राज्य का नाम	Ministry Of Heavy Industries And Public Enterprises
Department Name/विभाग का नाम	Department Of Heavy Industry
Organisation Name/संगठन का नाम	Bharat Heavy Electricals Limited (bhel)
Office Name/कार्यालय का नाम	10250020-pem, Noida
Total Quantity/कुल मात्रा	2500
Item Category/मद केटेगरी	3.3 KV HT XLPE Power Cable 3C-240 (Q3) , 11KV HT XLPE Power Cable 1C -630 (Q3) , 11KV HT XLPE Power Cable 1C - 500 (Q3) , 11 KV HT XLPE POWER CABLE 3C-240 (Q3)
MSE Exemption for Years of Experience and Turnover/ अनुभव के वर्षों से एमएसई छूट	No
Startup Exemption for Years of Experience and Turnover/ अनुभव के वर्षों से स्टार्टअप छूट	No
Document required from seller/विक्रेता से मांगे गए दस्तावेज़	Additional Doc 1 (Requested in ATC), Compliance of BoQ specification and supporting document *In case any bidder is seeking exemption from Experience / Turnover Criteria, the supporting documents to prove his eligibility for exemption must be uploaded for evaluation by the buyer
Bid to RA enabled/बिड से रिवर्स नीलामी सक्रिय किया	Yes
RA Qualification Rule	H1-Highest Priced Bid Elimination
Type of Bid/बिड का प्रकार	Two Packet Bid
Primary product category	11 KV HT XLPE POWER CABLE 3C-240
Time allowed for Technical Clarifications during technical evaluation/तकनीकी मूल्यांकन के दौरान तकनीकी स्पष्टीकरण हेतु अनुमत समय	7 Days
Inspection Required (By Empanelled Inspection Authority / Agencies pre-registered with GeM)	No

Bid Details/बिड विवरण

Payment Timelines	Payments shall be made to the Seller within 90 days of issue of consignee receipt-cum-acceptance certificate (CRAC) and on-line submission of bills (This is in supersession of 10 days time as provided in clause 12 of GeM GTC)
Evaluation Method/मूल्यांकन पद्धति	Total value wise evaluation

EMD Detail/ईएमडी विवरण

Advisory Bank/एडवाइजरी बैंक	State Bank of India
EMD Amount/ईएमडी राशि	60000

ePBG Detail/ईपीबीजी विवरण

Advisory Bank/एडवाइजरी बैंक	State Bank of India
ePBG Percentage(%) / ईपीबीजी प्रतिशत (%)	5.00
Duration of ePBG required (Months) / ईपीबीजी की अपेक्षित अवधि (महीने).	25

(a). EMD EXEMPTION: The bidder seeking EMD exemption, must submit the valid supporting document for the relevant category as per GeM GTC with the bid. Under MSE category, only manufacturers for goods and Service Providers for Services are eligible for exemption from EMD. Traders are excluded from the purview of this Policy./जेम की शर्तों के अनुसार ईएमडी छूट के इच्छुक बिडर को संबंधित केटेगरी के लिए बिड के साथ वैध समर्थित दस्तावेज़ प्रस्तुत करने हैं। एमएसई केटेगरी के अंतर्गत केवल वस्तुओं के लिए विनिर्माता तथा सेवाओं के लिए सेवा प्रदाता ईएमडी से छूट के पात्र हैं। व्यापारियों को इस नीति के दायरे से बाहर रखा गया है।

(b). EMD & Performance security should be in favour of Beneficiary, wherever it is applicable./ईएमडी और संपादन जमानत राशि, जहां यह लागू होती है, लाभार्थी के पक्ष में होनी चाहिए।

Beneficiary/लाभार्थी :

IFSC: SBIN0017313, BRANCH-CAG II NEW DELHI
10250020-PEM, Noida, Department of Heavy Industry, Bharat Heavy Electricals Limited (BHEL), Ministry of Heavy Industries and Public Enterprises
(A/c No. 39922687394)

Splitting/विभाजन

Bid splitting not applied/बोली विभाजन लागू नहीं किया गया.

MSE Purchase Preference/एमएसई खरीद वरीयता

MSE Purchase Preference/एमएसई खरीद वरीयता	No
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Details of the Competent Authority for MSE

Name of Competent Authority	S K DUBEY
Designation of Competent Authority	SDGM
Office / Department / Division of Competent Authority	BHEL PEM Noida
CA Approval Number	123
Competent Authority Approval Date	12-02-2024
Brief Description of the Approval Granted by Competent Authority	As per internal guideline, MSE preference not given for non divisible package.

Competent Authority Approval for not opting Micro and Small Enterprises Preference : [View Document](#)

Reserved for Make In India products

Reserved for Make In India products	Yes
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1. Bid reserved for Make In India products: : Procurement under this bid is reserved for purchase from Class 1 local supplier as defined in public procurement (Preference to Make in India), Order 2017 as amended from time to time and its subsequent Orders/Notifications issued by concerned Nodal Ministry for specific Goods/Products. However, eligible micro and small enterprises will be allowed to participate. The minimum local content to qualify as a class 1 local supplier is denoted in the bid document. All bidders must upload a certificate from the OEM regarding the percentage of the local content and the details of locations at which the local value addition is made along with their bid, failing which the bid is liable to be rejected. In case the bid value is more than Rs 10 Crore, the declaration relating to percentage of local content shall be certified by the statutory auditor or cost auditor, if the OEM is a company and by a practicing cost accountant or a chartered accountant for OEMs other than companies as per the Public Procurement (preference to Make-in -India) order 2017 dated 04.06.2020 . In case Buyer has selected Purchase preference to Micro and Small Enterprises clause in the bid, the same will get precedence over this clause.

2. Estimated Bid Value indicated above is being declared solely for the purpose of guidance on EMD amount and for determining the Eligibility Criteria related to Turn Over, Past Performance and Project / Past Experience etc. This has no relevance or bearing on the price to be quoted by the bidders and is also not going to have any impact on bid participation. Also this is not going to be used as a criteria in determining reasonableness of quoted prices which would be determined by the buyer based on its own assessment of reasonableness and based on competitive prices received in Bid / RA process.

3. Reverse Auction would be conducted amongst all the technically qualified bidders except the Highest quoting bidder. The technically qualified Highest Quoting bidder will not be allowed to participate in RA. However, H-1 will also be allowed to participate in RA in following cases:

- i. If number of technically qualified bidders are only 2 or 3.
- ii. If Buyer has chosen to split the bid amongst N sellers, and H1 bid is coming within N.
- iii. In case Primary product of only one OEM is left in contention for participation in RA on elimination of H-1.
- iv. If L-1 is non-MSE and H-1 is eligible MSE and H-1 price is coming within price band of 15% of Non-MSE L-1
- v. If L-1 is non-MII and H-1 is eligible MII and H-1 price is coming within price band of 20% of Non-MII L-1

3.3 KV HT XLPE Power Cable 3C-240 (500 set)

(Minimum 60% Local Content required for qualifying as Class 1 Local Supplier)

Whether Price variation applicable?	Price Variation Clause/मूल्य परिवर्तन खंड(पीवीसी)	Price variation clause document
Yes	As per NIT	84e99849128be29f7fc0995b8b7b4d56.pdf

Technical Specifications/तकनीकी विशिष्टियाँ

Buyer Specification Document/क्रेता विशिष्टि दस्तावेज़	Download
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Consignees/Reporting Officer/परेषिती/रिपोर्टिंग अधिकारी and/ तथा Quantity/मात्रा

S.No./क्र. सं.	Consignee Reporting/Officer/ परेषिती/रिपोर्टिंग अधिकारी	Address/पता	Quantity/मात्रा	Delivery Days/डिलीवरी के दिन
1	Ajay Kumar	425307, Construction Manager, Bharat Heavy Electricals Limited c/o Chief Engineer / Dy. Chief Engineer (Projects) Maharashtra State Power Generation Co. Ltd Bhusawal Thermal Power Station, Unit-6 Bhusawal, Dist. Jalgaon (MS) Pin-425307 (Maharashtra)	500	150

11KV HT XLPE Power Cable 1C -630 (500 set)**(Minimum 60% Local Content required for qualifying as Class 1 Local Supplier)**

Whether Price variation applicable?	Price Variation Clause/मूल्य परिवर्तन खंड(पीवीसी)	Price variation clause document
Yes	As per NIT	

Technical Specifications/तकनीकी विशिष्टियाँ

Buyer Specification Document/क्रेता विशिष्टि दस्तावेज़	Download
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Consignees/Reporting Officer/परेषिती/रिपोर्टिंग अधिकारी and/ तथा Quantity/मात्रा

S.No./क्र. सं.	Consignee Reporting/Officer/ परेषिती/रिपोर्टिंग अधिकारी	Address/पता	Quantity/मात्रा	Delivery Days/डिलीवरी के दिन
1	Ajay Kumar	425307, Construction Manager, Bharat Heavy Electricals Limited c/o Chief Engineer / Dy. Chief Engineer (Projects) Maharashtra State Power Generation Co. Ltd Bhusawal Thermal Power Station, Unit-6 Bhusawal, Dist. Jalgaon (MS) Pin-425307 (Maharashtra)	500	150

11KV HT XLPE Power Cable 1C -500 (1000 set)

(Minimum 60% Local Content required for qualifying as Class 1 Local Supplier)

Whether Price variation applicable?	Price Variation Clause/मूल्य परिवर्तन खंड(पीवीसी)	Price variation clause document
Yes	As per NIT	

Technical Specifications/तकनीकी विशिष्टियाँ

Buyer Specification Document/क्रेता विशिष्टि दस्तावेज़	Download
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Consignees/Reporting Officer/परेषिती/रिपोर्टिंग अधिकारी and/ तथा Quantity/मात्रा

S.No./क्र. सं.	Consignee Reporting/Officer/ परेषिती/रिपोर्टिंग अधिकारी	Address/पता	Quantity/मात्रा	Delivery Days/डिलीवरी के दिन
1	Ajay Kumar	425307, Construction Manager, Bharat Heavy Electricals Limited c/o Chief Engineer / Dy. Chief Engineer (Projects) Maharashtra State Power Generation Co. Ltd Bhusawal Thermal Power Station, Unit-6 Bhusawal, Dist. Jalgaon (MS) Pin-425307 (Maharashtra)	1000	150

11 KV HT XLPE POWER CABLE 3C-240 (500 set)

(Minimum 60% Local Content required for qualifying as Class 1 Local Supplier)

Whether Price variation applicable?	Price Variation Clause/मूल्य परिवर्तन खंड(पीवीसी)	Price variation clause document
Yes	As per NIT	

Technical Specifications/तकनीकी विशिष्टियाँ

Buyer Specification Document/क्रेता विशिष्टि दस्तावेज़	Download
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Consignees/Reporting Officer/परेषिती/रिपोर्टिंग अधिकारी and/ तथा Quantity/मात्रा

S.No./क्र. सं.	Consignee Reporting/Officer/ परेषिती/रिपोर्टिंग अधिकारी	Address/पता	Quantity/मात्रा	Delivery Days/डिलीवरी के दिन
1	Ajay Kumar	425307, Construction Manager, Bharat Heavy Electricals Limited c/o Chief Engineer / Dy. Chief Engineer (Projects) Maharashtra State Power Generation Co. Ltd Bhusawal Thermal Power Station, Unit-6 Bhusawal, Dist. Jalgaon (MS) Pin-425307 (Maharashtra)	500	150

Buyer Added Bid Specific Terms and Conditions/क्रेता द्वारा जोड़ी गई बिड की विशेष शर्तें

1. Inspection

Nominated Inspection Agency: On behalf of the Buyer organization, any one of the following Inspection Agency would be conducting inspection of stores before acceptance:

Pre-dispatch Inspection at Seller Premises (applicable only if pre-dispatch inspection clause has been selected in ATC):

At vendor's works

Post Receipt Inspection at consignee site before acceptance of stores:

NA

2. Buyer Added Bid Specific ATC

Buyer uploaded ATC document [Click here to view the file.](#)

3. Generic

Bidders are advised to check applicable GST on their own before quoting. Buyer will not take any responsibility in this regards. GST reimbursement will be as per actuals or as per applicable rates

(whichever is lower), subject to the maximum of quoted GST %.

4. **Certificates**

Bidder's offer is liable to be rejected if they don't upload any of the certificates / documents sought in the Bid document, ATC and Corrigendum if any.

5. **Generic**

Data Sheet of the product(s) offered in the bid, are to be uploaded along with the bid documents. Buyers can match and verify the Data Sheet with the product specifications offered. In case of any unexplained mismatch of technical parameters, the bid is liable for rejection.

6. **Generic**

Supplier shall ensure that the Invoice is raised in the name of Consignee with GSTIN of Consignee only.

Disclaimer/अस्वीकरण

The additional terms and conditions have been incorporated by the Buyer after approval of the Competent Authority in Buyer Organization, whereby Buyer organization is solely responsible for the impact of these clauses on the bidding process, its outcome, and consequences thereof including any eccentricity / restriction arising in the bidding process due to these ATCs and due to modification of technical specifications and / or terms and conditions governing the bid. Any clause(s) incorporated by the Buyer regarding following shall be treated as null and void and would not be considered as part of bid:-

1. Definition of Class I and Class II suppliers in the bid not in line with the extant Order / Office Memorandum issued by DPIIT in this regard.
2. Seeking EMD submission from bidder(s), including via Additional Terms & Conditions, in contravention to exemption provided to such sellers under GeM GTC.
3. Publishing Custom / BOQ bids for items for which regular GeM categories are available without any Category item bunched with it.
4. Creating BoQ bid for single item.
5. Mentioning specific Brand or Make or Model or Manufacturer or Dealer name.
6. Mandating submission of documents in physical form as a pre-requisite to qualify bidders.
7. Floating / creation of work contracts as Custom Bids in Services.
8. Seeking sample with bid or approval of samples during bid evaluation process.
9. Mandating foreign / international certifications even in case of existence of Indian Standards without specifying equivalent Indian Certification / standards.
10. Seeking experience from specific organization / department / institute only or from foreign / export experience.
11. Creating bid for items from irrelevant categories.
12. Incorporating any clause against the MSME policy and Preference to Make in India Policy.
13. Reference of conditions published on any external site or reference to external documents/clauses.
14. Asking for any Tender fee / Bid Participation fee / Auction fee in case of Bids / Forward Auction, as the case may be.

Further, if any seller has any objection/grievance against these additional clauses or otherwise on any aspect of this bid, they can raise their representation against the same by using the Representation window provided in the bid details field in Seller dashboard after logging in as a seller within 4 days of bid publication on GeM. Buyer is duty bound to reply to all such representations and would not be allowed to open bids if he fails to reply to such representations.

[This Bid is also governed by the General Terms and Conditions/ यह बिड सामान्य शर्तों के अंतर्गत भी शासित है](#)

Index of Annexures

GeM Tender Enquiry for HT XLPE POWER CABLE for 1x 660 MW BHUSAWAL Project

Sl. No.	Description	Annexures
1.	Additional terms and conditions (ATC)	Annexure I
2.	BOQ (Mandatory Spares)	Annexure II
3.	Delivery Schedule and Validity	Annexure III
4.	Land border certificate	Annexure IV
5.	Certificate for local Content	Annexure V
6.	Technical PQR	-
7.	Technical Specification incl. PVC	-
8.	Mahagenco Performa for Vendor approval	Annexure A

ANNEXURE –I (HT XLPE POWER CABLE)

Additional Terms and Conditions (ATC)

Additional Terms and Conditions for subject Tender Enquiry to be complied by Bidders for Consideration in this tender:

1. Dispatch Markings: -

Each box shall be marked with Capital Letters in “Red” indicating the PEM supply (Mandatory Spare) for 1x 660 MW Bhusawal Thermal Power Station Project. 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.

Mandatory Spares: - The 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 ultimate customer MAHAGENCO. One Copy of Packing list must be put inside the Box along with Manufacturing drawing no. reference, Catalogue reference etc.

Note :- MDCC for mandatory Spares shall be issued only after receipt of detailed list of mandatory spares & photographs before final packing clearly showing mandatory spares with due tagging as per packing list (to be sent over mail/CD).

2. Liquidated Damages: -

- a) **LD on mandatory spares portion:** - LD shall be applicable @ ½ percent and applicable GST thereon, of the total mandatory spares portion contract value excluding GST per week or part thereof, limiting to 10% of total contract value of mandatory spares excluding GST.

NOTE:

i. LR/RR date for indigenous supplies (Bill of Lading/AWB for Foreign supplies) shall be treated as the date of dispatch for levying LD. However, if receipted LR date for indigenous supply is beyond 30 days for FTL/ 45 days for PTL from the date of LR (PTL to be clearly mentioned in LR), such excess period shall be considered for LD purpose irrespective of dispatch date. Import General Manifest (IGM)/Bill of entry date (whichever is earlier), for foreign supplies, is beyond 90 days from the date of Bill of Lading/AWB, such excess period shall be considered for LD purpose irrespective of dispatch date.

ii. In case of any amendment/ revision, LD shall be linked to the amended/ revised contract value and delivery date(s).

ANNEXURE –I (HT XLPE POWER CABLE)

Additional Terms and Conditions (ATC)

iii. The sum specified above is not a penalty but a genuine pre-estimate of the loss/ damage which will be suffered by purchaser on account of delay on the part of the Contractor/Seller and the said amount will be deductible without proof of actual loss or damage caused by such delay.

3. Performance Security (Performance bank Guarantee or Security Deposit): -

3.1 Details of PS amount, mode of submission, forfeit etc. shall be as follows-

I. Initially 10% of the contract value (total order value in case of GeM POs excluding PVC). However, 5% of the contract value (as above) will be released after completion of Main Supply based on certification by Project Group.

OR

II. 5% of the contract value (total order value in case of GeM POs excluding PVC). Additional 5% of the contract value will be retained from first bill & subsequent bill(s) of the same contract. The retention amount will be released after completion of Main Supply based on certification by Project Group.

a) Initial validity of performance security shall be 25 months from PO date (Considering delivery period of 05 months (150 days' delivery) + 18 months guarantee period + 2 months claim period is already mentioned in GTC cl no. 7.ii GeM 3.0). Further, extension if any shall be as per GeM Terms.

b) Time for submission of Performance Bank Guarantee shall be 14 days from the date of PO/LOA.

3.2 Modes of deposit:

Performance security may be furnished in the following forms:

- a. Local cheques of Scheduled Banks (subject to realization)/ Pay Order/ Demand Draft/ Electronic Fund Transfer in favour of BHEL.
- b. Bank Guarantee from Scheduled Banks / Public Financial Institutions as defined in the Companies Act. The Bank Guarantee format should have the approval of BHEL.
- c. Fixed Deposit Receipt issued by Scheduled Banks / Public Financial Institutions as defined in the Companies Act (FDR should be in the name of the Contractor, a/c BHEL).
- d. Securities available from Indian Post offices such as National Savings Certificates, Kisan Vikas Patras etc. (held in the name of Contractor furnishing the security and duly endorsed/ hypothecated/ pledged, as applicable, in favour of BHEL).
- e. Insurance Surety Bond.

(Note: BHEL will not be liable or responsible in any manner for the collection of interest or renewal of the documents or in any other matter connected therewith).

Performance Security is to be furnished within 14 days from the date of PO and it should remain valid for a period of 60 (sixty) days beyond the date of completion of all contractual obligations of the supplier, including warranty obligations.

3.3 Forfeiture of Performance Security:

- a. The performance security will be forfeited and credited to BHEL's account in the event of a breach of contract by the supplier.

ANNEXURE –I (HT XLPE POWER CABLE)

Additional Terms and Conditions (ATC)

- b. PS should be refunded to the contractor without interest, after he duly performs and completes the contract in all respects but not later than 60 (sixty) days of completion of all such obligations including the warranty under the contract.
- c. The Performance Security shall not carry any interest.

4. BID SECURITY/ Earnest Money Deposit (EMD)

BID SECURITY/ Earnest Money Deposit (EMD) is applicable. Same shall made part of NIT.

Details of EMD amount, mode of submission, etc. shall be as follows-

EMD amount shall be **Rs. 60,000/-**

EMD is to be submitted by the all bidders along with their bids (except the bidders who are exempted as per as per Clause 4.xiii.m of GeM GTC). At the time of bidding, bidders to upload scanned copy of relevant document for claiming EMD exemption.

4.1 Modes of deposit -

The EMD may be accepted only in the following forms:

Electronic Fund Transfer credited in BHEL account (before tender opening)

- i. BHEL-PEM account details are as follows:
Bank name- State Bank of India
Account No: 39922687394
IFSC: SBIN0017313
BRANCH-CAG II NEW DELHI
- ii. Banker's cheque/ Pay order/ Demand draft, in favour of BHEL-PEM, Noida (along with the offer).
- iii. Fixed Deposit Receipt (FDR)
- iv. Bank Guarantee from any of the Scheduled Banks.
- v. Insurance Surety Bonds.

The EMD shall remain valid for a period of 45 (forty-five) days beyond the final bid validity period.

4.2 Forfeiture of EMD

- i. A bidder's EMD will be forfeited if the bidder withdraws or amends its/his tender or impairs or derogates from the tender in any respect within the period of validity of the tender or if the successful bidder fails to furnish the required performance security within the specified period mentioned in the Tender.
- ii. EMD by the tenderer to be withheld in case any action on the bidder is envisaged under the provisions of extant "Guidelines on Suspension of business dealings with suppliers/ contractors (abridged version of guidelines is available on www.bhel.com)" and forfeited/ released based on the action as determined under these guidelines.
 - 4.2.1** (i) Bid securities of the unsuccessful bidders shall be returned to them after expiry of the final bid validity period and latest by the 30th day after the award of the contract. However, Bid securities of unsuccessful bidders during first stage i.e. technical-commercial evaluation

ANNEXURE –I (HT XLPE POWER CABLE)

Additional Terms and Conditions (ATC)

etc. shall be returned within 30 days of declaration of result of first stage i.e. technical-commercial evaluation.

(ii) Bid security shall be refunded to the successful bidder on conclusion of the order/ receipt of a performance security.

(iii) EMD shall not carry any interest.

5. Breach of contract, Remedies and Termination:

“In case of Breach of Contract, BHEL shall recover 10% of the contract value from the Vendor using following instruments:

- i. encashment of security instruments like EMD, Performance Security with PEM against the said contract.
 - ii. balance amount (if value of security instruments is less than 10% of the contract value) from other financial remedies i.e. available bills of the Vendor, retention amount etc with PEM.
 - iii. balance amount from security instruments like EMD, Performance Security and other financial remedies i.e. available bills of the Vendor, retention amount etc. with other units of BHEL.
 - iv. if recovery is not possible then legal remedies shall be pursued”.
6. For recognition of dispatch, vendor to submit following documents to BHEL by e-mail immediately on dispatch: - GST compliant invoice, LR (indicating Invoice No., no. of boxes, PTL (if applicable) etc.), Packing List (Must be indicating No. of boxes, Packing size, Gross weight and net weight of each package, Contents of the package with cross reference to BoM item code no. or item serial no. and Quantity of each item separately), Insurance Intimation to underwriter through email/fax, Dispatch Clearance.

B. Following ATC available in GEM shall also be made part of NIT: -

- i. Bidder's offer is liable to be rejected if they don't upload any of the certificates / documents sought in the Bid document, ATC and Corrigendum if any.
- ii. Bidders are advised to check applicable GST on their own before quoting. Buyer will not take any responsibility in this regards. GST reimbursement will be as per actuals or as per applicable rates (whichever is lower), subject to the maximum of quoted GST %.
- iii. Data Sheet of the product(s) offered in the bid, are to be uploaded along with the bid documents. Buyers can match and verify the Data Sheet with the product specifications offered. In case of any unexplained mismatch of technical parameters, the bid is liable for rejection.
- iv. The bidder is required to upload, along with the bid, all relevant certificates such as BIS license, type test certificate, approval certificates and other certificates as prescribed in the Product Specification given in the bid document.
- v. While generating invoice in GeM portal, the seller must upload scanned copy of GST invoice and the screenshot of GST portal confirming payment of GST.

ANNEXURE –I (HT XLPE POWER CABLE)

Additional Terms and Conditions (ATC)

Additional Terms and Conditions for subject Tender Enquiry to be complied by bidders for consideration in this tender:

- A. 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 organization contact number and E-mail Id. In case the same is found not available, BHEL has the right to reject such document from evaluation.
- B. "This item /package/system falls under the list of items defined in para 3 of ministry of finance guideline date 20.09.16 (procurement of items related to public safety, health, critical security operations and Equipment's etc.) & hence criteria of prior experience /turnover shall be same for all bidders including start up /MSME".
- C. **Guarantee & Warrantee** shall be as per Cl. No. 10 of GTC on GeM for the bid. However, Guarantee & Warrantee time period shall be 18 months from the date of last supply in the contract.
- D. Evaluation shall be on the basis of total all inclusive, landed price at consignee destination (Refer Cl. No. 6 of GTC on GEM).
- E. **Terms of Delivery:** FOR Dispatch Station Basis. However, Transit insurance shall be in the scope of seller and unloading of items (at delivery point) shall be in buyer scope. Further, w.r.t. Transit Insurance supplier has to inform the details of dispatches (such as Policy No., Consignee Name, Consignment Packing details, Project Name, Purchase Order No., LR No. & date, Invoice No. & date, Dispatch Origin & destination details etc.) to policy underwriter under intimation to BHEL.
- F. PQR criteria uploaded with Buyer uploaded Bid Specific document shall prevail value of Experience criteria and Past performance parameter mentioned in GeM bid.
- G. **Inspection call to be raised by bidder on BHEL CQIR portal** (details shall be shared at the of execution of order) and Inspection agency shall attend at the inspection within seven (07) days of the date on which the material is notified as being ready. In case of delay in witnessing of inspection beyond stipulated time (i.e. 7 days from the date on which the material is notified as being ready), by BHEL arising due to reasons not attributable to vendor, BHEL will extend the delivery period for such delay in carrying out inspection. If BHEL is not able to witness inspection up to 15 days then in addition to delay beyond stipulated period, extension in delivery time of 07 days for arranging fresh inspection will be given.

When the tests have been satisfactorily completed at Seller/ Contractor's works, the Inspection Agency shall issue an inspection report that effect within seven (07) days after completion of the tests, but if the tests were not witnessed by the Inspection Agency or his representative, the material acceptance report would be issued within seven (07) days after receipt of the test certificates by the Purchaser.

Purchaser will issue MDCC to the Seller/ Contractor within 7 days based on inspection report/ test certificates/Certificate of Conformance as applicable. In case of delay in issuance of MDCC beyond 7 days stipulated time (i.e. from the date of successful inspection report), by BHEL arising due to reasons not attributable to vendor, BHEL will extend the delivery period for such delay in issuing MDCC. If BHEL is not able to issue MDCC up to 15 days then in addition to delay beyond stipulated period, 7 days' additional time shall be given to vendor to facilitate the vendor for arranging logistics arrangements.
- H. All Bidders shall be required to submit applicable Freight % & GST % included in their prices during clarification stage of Tender.

ANNEXURE –I (HT XLPE POWER CABLE)

Additional Terms and Conditions (ATC)

- I. Payment Terms:** As per clause no. 12 (i) of GTC on GeM. Payments shall be made to the Seller within 90 days (45 days for seller qualified and registered as Micro or small and 60 days for Medium enterprises as per MSMED Act.) of issue of consignee receipt-cum-acceptance certificate (CRAC) and on-line submission of bills (This is in supersession of 10 days' time as provided in clause 12 of GeM GTC).
- Supplier has to provide Original Tax Invoice + 1 copy of Tax invoice, Packing List, LR/RR or AWB, CRAC, Insurance intimation, Guarantee Certificate, E-way bill (as applicable) for payment.
- Further bidder to submit the final documents (Final drgs & Inspection document) in 12 no.s of hard copies and 04 no.s of CD along with Invoice.
- Provision of offline payment in GeM shall be utilized.
- J. Bid reserved for Make in India products:** - Procurement under this bid is reserved for purchase from Class 1 local suppliers as defined in public procurement (Preference to Make in India), Order 2017 as amended from time to time and its subsequent Orders/Notifications issued by concerned Nodal Ministry for specific Goods/Products. The minimum local content to qualify as a class 1 local supplier is denoted in the bid document as 60%. All bidders must upload a certificate from the OEM regarding the percentage of the local content and the details of locations at which the local value addition is made along with their bid, failing which the bid is liable to be rejected.
- Regarding verification of local content, the local supplier at the time of tender, bidding or solicitation shall be required to provide certification (as per enclosed **Annexure-V**) as per para 9 of PP-MII order revision dated 16.09.2020.
- K. This is conditional tender enquiry. Financial bid opening (Part-II) of a bidder shall be subjected to following: -**
- (i) Approval of bidder by Customer (Mahagenco)- Vendor approval from end customer shall be sought based on the credentials submitted by bidders as per MAHAGENCO vendor approval format (Annexure A)
 - (ii) Techno-Commercial evaluation/recommendation by BHEL.
 - (iii) Qualification of Technical PQR
 - (iv) Offered item should mandatorily conform to PP-MII order provisions.
- L. Consignee Details** (for PRC - Provisional Receipt Certificate & CRAC - Consignee's Receipt cum Acceptance Certificate, as applicable) shall be as per Project Site official details.
- M.** The Bidder has to declares 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.
- N. Bidders to ensure the following: -**
- Ensure compliance to Ministry of Power (MoP) Order No. 11/05/2018-Coord. dt. 28/07/2020, if applicable.
 - Ensure compliance of Ministry of Finance (MoF) Order (Public Procurement No. 4) F. No. 7/10/2021(1) PPD dt. 23.02.23.
 - to submit "Model Certificate for Tenders" as per **Annexure-IV** of Ministry of Finance (MoF) Order (Public Procurement No. 4) F. No. 7/10/2021(1) PPD dt. 23.02.23. Bidder to submit the following

ANNEXURE –I (HT XLPE POWER CABLE)

Additional Terms and Conditions (ATC)

undertaking on their letter head duly signed from the highest competent authority at your end (i.e Owner, partner, CMD, Director etc.)

- O. Delivery & Validity Period:** As per annexure III. Delivery period mentioned in GeM portal is tentative.
- P.** For registration in BHEL PEM- Online registration portal is operational, Non-registered Vendors who wish to apply for registration in BHEL-PEM can apply through Online Registration Portal available at www.pem.bhel.com - vendor section - Online Supplier Registration. All credentials and/or documents duly signed and stamped related to registration can be uploaded on the website and submit the application for registration. However, registration of suppliers is not mandatory in case of open tender.
- Q.** Quantity Variation Clause- Nil Quantity Variation
- R.** CIF is not applicable for subject tender.
- S.** PVC shall be applicable for subject package as per enclosed PVC annexure. Base date is January 2024 (One month prior to date of tendering). Price variation shall be limited to +20% and -ve price variation shall be unlimited. PVC shall be payable only for contractual delivery period (including delivery extensions if any) i.e no PVC shall be payable for delay in delivery attributed to vendor & in delayed delivery cases, PVC for contractual delivery date & actual delivery date shall be compared and whichever is found lower side shall be payable to vendor.
- T.** MSE Preference: - Being subject package is not divisible and MSE preference shall not be given.
- U.** Bidder to note the following: -
- A bidder shall not have conflict of interest with other bidders. Such conflict of interest can lead to anti-competitive practices to the detriment of Procuring Entity's interests. The bidder found to have a conflict of interest shall be disqualified. A bidder may be considered to have a conflict of interest with one or more parties in this bidding process, if:
- they have controlling partner (s) in common;' or
 - they receive or have received any direct or indirect subsidy/ financial stake from any of them; or
 - they have the same legal representative/agent for purposes of this bid; or
 - they have relationship with each other, directly or through common third parties, that puts them in a position to have access to information about or influence on the bid of another Bidder; or
 - Bidder participates in more than one bid in this bidding process. Participation by a Bidder in more than one Bid will result in the disqualification of all bids in which the parties are involved. However, this does not limit the inclusion of the components/ sub-assembly/ Assemblies from one bidding manufacturer in more than one bid, or
 - In cases of agents quoting in offshore procurements, on behalf of their principal manufacturers, one agent cannot represent two manufacturers or quote on their behalf in a particular tender enquiry. One manufacturer can also authorize only one agent/dealer. There can be only one bid from the following:
 1. The principal manufacturer directly or through one Indian agent on his behalf; and
 2. Indian/foreign agent on behalf of only one principal,'or
 - A Bidder or any of its affiliates participated as a consultant in the preparation of the design or technical specifications of the contract that is the subject of the Bid, or
 - In case of a holding company having more than one independently manufacturing units, or more than one unit having common business ownership/management, only one unit should quote. Similar restrictions would apply to closely related sister companies. Bidders must proactively declare such sister/ common business/ management units in same/ similar line of business. "

ANNEXURE –I (HT XLPE POWER CABLE)

Additional Terms and Conditions (ATC)

- V.** All other terms & conditions shall be as per GeM bid, selected Additional Terms & Conditions from GeM library and GTC on GeM 4.0 (version 1.14) available on GeM Portal on enquiry floating date shall be applicable.

1X660 MW BHUSAWAL TPS

**ANNEXURE -II TO BOQ-CUM-PRICE SCHEDULE FOR HT XLPE POWER CABLES
(MANDATORY SPARES)**

Sr. No.	Item code	Item description	Unit	Order Quantity (metres)	Drum Length (Meters)
1.0		11/11 KV AL. CONDUCTOR/ XLPE INSULATED/ ARMoured/ UNEARTHED GRADE POWER CABLE			
1.1	507-27151-A	3C-240	MTR	500	500
1.2	507-27009-A	1C-500	MTR	1000	500
1.3	507-27025-A	1C-630	MTR	500	500
2.0		3.3/3.3 KV AL. CONDUCTOR/ XLPE INSULATED/ ARMoured/ UNEARTHED GRADE POWER CABLE.			
2.1	507-27150-A	3C-240	MTR	500	500

NOTES:

1. Total Quantity indicated above shall be known as Order Quantities. Bidder to supply total quantity in one LOT.
2. The bidder shall indicate the unit price for items inclusive of type test charges. No separate Type Test charges are to be quoted by bidder.
3. Tolerance on individual drum length shall be $\pm 5\%$.
4. 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.

Annexure III to Delivery terms and Validity

1. Delivery Schedule

- a. **Main Supply (Mandatory Spares):** Delivery completion shall be 150 days from the PO date.

List of applicable drawings/ documents as per Technical Specification No. of PE-TS-417-507-E001 (REV. 0) shall be considered for delivery and their submission / re-submission schedule shall be as follows: -

1st submission of drawings / documents – 7 days

BHEL comments – 03 days

Re-submission of drawings / documents – 2 days

BHEL & Customer comments / approval – 18 days

Notes:

- a. Supplier to start manufacturing/supply only after getting the applicable engineering Drgs. /docs approved from BHEL/End Customer.
- b. Drawings /documents submission/re-submission schedule shall be as indicated in technical specification which shall be used for progress monitoring purpose and required course correction, if any.
- c. The delivery date specified is for completion of the deliveries. Deliveries to start progressively so as to meet the completion schedule.
- d. The delivery conditions specified are for contractual purposes. However, to meet project requirement, BHEL may ask for early deliveries without any compensation thereof.

2. **Validity of contract (PO rates, terms and conditions):** Vendor has to make supply of goods/services as per the delivery time mentioned above. However, due to unavoidable circumstances if delay happens in providing inputs/ clearances (inputs, Engineering approvals, deputing inspector for inspection, issuance of MDCC and any hold imposed owing to site issues etc.) for which delivery time extension is admissible as per point no. 3, in such situation it shall be obligatory at vendor part to execute the contract at PO rates, terms and conditions where inputs/ clearances has been accorded within validity of contract. Validity period for various activities shall be as defined below or as mentioned in the NIT.

2.1. Validity of the contract

- Contract shall be valid for 180 days from the PO date. However, delay at vendor's end (if any) shall be added to the validity period and contract validity shall get extended by the delay period at vendor's end.

For example: Original Delivery period for: A (in days)

Delay at vendor's end: B (in days beyond "A" days)

Contract validity: C+B (in days)

Annexure III to Delivery terms and Validity

Notes:

- a. B is the Vendor delay days beyond original contractual delivery period for main supply /extended delivery period owing to time taken by BHEL at point no. 2 above.
- b. Execution of the contract quantities released beyond contract validity period shall be decided on mutual consent basis at PO rates, terms and conditions.

3. Delivery Extension: Extension of contractual delivery time:

Delivery time mentioned in the NIT includes Engineering completion time (time for drawing/document submission/resubmission by the vendor and review/approval of the same by the BHEL/End customer), manufacturing, inspection, Packing and dispatch time. Due diligence is to be observed by the vendor to ensure timely completion of engineering and supply.

During the execution of the contract, time loss occurred owing to the reason attributable to BHEL besides force majeure shall be considered for delivery time extension to the vendor as given below: -

- i. Any Delay in providing comments/ approval on Primary drawing/documents beyond the stipulated time as specified in NIT.
- ii. Time Loss in approval of the drawing/document as a result of increase in the iteration not attributable to the vendor (i.e. resubmission owing to end customer comments) as certified by BHEL. Time extension equivalent to the resubmission time noted in the tech. spec and consequential increase in the approval time in lieu of increase in iteration shall be applicable. However, for incomplete re- submission time loss shall be in vendor account.
- iii. Delay in providing engineering input/material by BHEL.
- iv. Delay in deputing inspector for inspection and delay in release of MDCC in line with GCC/ GEM ATC terms.
- v. Any hold put by BHEL for whatever reasons during execution of contract (within contract validity period), time extension equivalent to hold period shall be admissible. However, in the event hold period continues for more than 30 days then, an additional fifteen days for the purposes of mobilization and demobilization of resources shall also be admissible.

Note: Extension in delivery period if any with or without imposition of LD shall be considered after detailed delay analysis based on provisions given above. However, no delay analysis will be applicable if supply is completed within delivery schedule as specified in Purchase order.

Annexure IV

An undertaking regarding Model Clauses on company letter head only

(To be provided along with bid)

Reference: NIT No.-

Package: - HT XLPE POWER CABLES (MANDATORY SPARES)

Project: 1x 660 MW BHUSAWAL TPS

TO WHOM SO IT MAY CONCERN

This is with reference to Ministry of Finance circular dated 23.02.23 reg. restriction under rule 144 (xi) of GFR.

"I have read the clause regarding restrictions on procurement from a bidder of a country which shares a land border with India. I hereby certify that M/s (bidder name) is not from such a country and is eligible to be considered/participate in tender enquiry for against aforesaid tender enquiry.

Sign & Signature (Not below Director/owner of the company)

Date:

Place:

ANNEXURE V
1x 660 MW BHUSAWAL TPS
HT XLPE POWER CABLES (MANDATORY SPARES)
Letter head of Company

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-.....

Package: - HT XLPE POWER CABLES (MANDATORY SPARES)

Project: 1x 660 MW BHUSAWAL TPS

Dear Sir,

We hereby certify that items offered by us of HT XLPE power Cables (Mandatory Spares) for 1x 660 MW Bhusawal Project(minimum % of local content) meets the requirement of minimum local content in line with applicable clause of Make In India and the Public Procurement (Preference to Make in India), Order 2017 dated- 15.06.2017, 28.05.2018 & 29.05.2019, 04.06.20, 16.09.20 and subsequent order dated 16.11.21.


We further confirm 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)

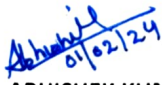
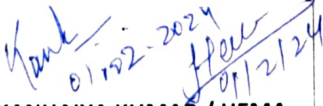


authorized signatory
of company

	BHUSAWAL TPS (1X660 MW)	PE-PQ-415-507-E001
	PRE-QUALIFICATION REQUIREMENTS FOR HT XLPE POWER CABLES	REVISION NO. 00 DATE 01.02.2024
		Page 1 of 1

ITEMS: HT XLPE POWER CABLE	
SCOPE: Supply: YES; Erection & Commissioning: NO;	
1	Vendor should be a manufacturer of HT Power Cables
2	Availability of test reports on HT XLPE FRLS Power Cables to establish in-house capability to carry out all routine, type & acceptance tests as per relevant IS/International Standards.
3	Capacity of manufacturing 5km of HT XLPE Power Cables per month
4	Manufactured and supplied at least one (1) km of FRLS cables.
5	Manufactured & supplied HT XLPE Power Cable sizes of minimum 240sqmm for 3/3.5 core and minimum 630sqmm for single core cable
6	Manufactured & supplied at least 5km of 11kV/6.6kV/3.3kV grade XLPE power cables in one or more orders & at least 2km in one single order.
7	Bidder should have supplied/provided HT XLPE POWER CABLES for at least one thermal power plant of 500 MW or above capacity which has completed one year of commercial operation and the equipment supplied should have completed the contractual guarantee period or should have supplied HT XLPE POWER CABLES of rating/type/size as required under the contract to any power plant.
8	HT XLPE POWER CABLES shall be in successful operation for similar duty condition and similar application for minimum one (1) year as on 06.08.2018.
9	Minimum two (2) nos. purchase orders for HT XLPE Power Cables shall be submitted which should not be more than five (5) years old from date of techno-commercial bid opening.

Notes (General points of PQR):

1. Consideration of offer shall be subject to customer's approval of bidder, if applicable.
2. Bidder to submit all supporting documents in English. If documents submitted by bidder are in language other than English, a self-attested English translated document should also be submitted.
3. Notwithstanding anything stated above, BHEL reserves the right to assess the capabilities & capacity of the bidder to perform the contract, should the circumstance warrant such assessment in the overall interest of BHEL.
4. After satisfactory fulfilment of all the above criteria/requirement, offer shall be considered for further evaluation as per NIT and all the other terms of the tender.
5. Bidder to submit test reports as per PQR Clause No. 2 to establish vendor has in-house facility to conduct all tests including Impulse withstand test.
6. PQR 7 & 8 is in line with customer proveness criteria.

PREPARED BY	CHECKED BY	REVIEWED BY	APPROVED BY
 ABHISHEK KUMAR VERMA, MANAGER	 KANHAIYA KUMAR / HEMA KUSHWAHA SR. MANAGER / DGM	 PRAVEEN DUTTA AGM	 DEBASISA RATH GM-ELECT

VOLUME II

MSPGCL

1 X 660 MW BHUSAWAL TPS

TECHNICAL SPECIFICATION

FOR


HT XLPE POWER CABLES

SPECIFICATION NO: *PE-TS-415-507-E001*

REVISION: 0




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

	DOCUMENT TITLE	SPECIFICATION NO. PE-TS- 415-507-E001	
	TECHNICAL SPECIFICATION FOR HT XLPE POWER CABLES	VOLUME II	
		REVISION 0	DATE: 29.12.2023
		SHEET 1 of 1	

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4.	SECTION – II	
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	 TOTAL NO. OF SHEETS=	 27
	(INCLUDING COVER/ SEPARATOR SHEETS)	

	DOCUMENT TITLE TECHNICAL SPECIFICATION FOR HT XLPE POWER CABLES	SPECIFICATION NO. PE-TS- 415-507-E001	
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COMPLIANCE CERTIFICATE

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

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

BIDDER'S STAMP & SIGNATURE



DOCUMENT TITLE

**TECHNICAL SPECIFICATION FOR
HT XLPE POWER CABLES**

SPECIFICATION NO. PE-TS- 415-507-E001


VOLUME II

SECTION I

REVISION - 0

DATE: 29.12.2023

SECTION -I**SPECIFIC TECHNICAL REQUIREMENTS**

	DOCUMENT TITLE TECHNICAL SPECIFICATION FOR HT XLPE POWER CABLES	SPECIFICATION NO. PE-TS- 415-507-E001	
		VOLUME II	
		SECTION I	
		REVISION - 0	DATE: 29.12.2023
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1.0 SCOPE OF ENQUIRY

- 1.1 Design, Manufacture, Inspection and Testing at Manufacturer's works, proper packing and delivery to site of HT XLPE Power Cables conforming to this specification.
- 1.2 General technical requirements of the HT XLPE Power cables are indicated in Section-II. Project specific technical/ quality requirements / changes are listed in Section-I.
- 1.3 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.
- 1.4 The documents shall be in English Language and MKS system of units.

2.0 BILL OF QUANTITIES:

- 2.1 Quantity requirements shall be as per 'BOQ-cum-price schedule' as part of NIT.

3.0 SPECIFIC TECHNICAL REQUIREMENTS

<u>S.No.</u>	<u>Reference Clause No. of Section- II</u>	<u>Specific Requirement/ Change</u>
1.	3.1, 3.3, 3.4	Quality Plan along with Annexure to QAP as enclosed with technical specification is to be appended with cover sheet bearing document no. The signed and stamped copy of the same shall be submitted to BHEL without making any changes in the contents of the document.
2.		Bidder to offer complete quantity for inspection in 1 LOT.

4.0 DRAWINGS & DOCUMENTS TO BE SUBMITTED

- 4.1 Documents/drawings shall be submitted after placement of order for BHEL and customer approval which has been specified in NIT.

NOTE-

1. Vendor shall submit the dates for drawing/document submission/BHEL comments/ resubmission after approval of documents.

2. In BOM each of the item to be uniquely identified with item code no. or item Sl. No. Supplier to ensure that all the items which will find separate mention in the packing list are covered in detailed BOM. Supplier to give following undertaking in BOM: " The BOM provided here completes the scope (in content and intent) of material supply under PO no. ---- dtd ---- Any additional material which may become necessary for the intended application of supplied item/package will be supplied free of cost in most reasonable time."

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

53622/2024/PS-PEM-EL



DOCUMENT TITLE

**TECHNICAL SPECIFICATION FOR HT
XLPE POWER CABLES**

SPECIFICATION NO. PE-TS-415-507-E001

VOLUME II


SECTION I

REVISION 00


DATE: 29.12.2023

SHEET -

DATASHEET A

	DOCUMENT TITLE		SPECIFICATION NO. PE-TS- 415-507-E001	
	TECHNICAL SPECIFICATION FOR HT XLPE POWER CABLES		VOLUME II	
			SECTION I	
	REVISION 00	DATE: 29.12.2023		
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1.0	Type of Cable	Flame Retardant-Low Smoke (FRLS)
2.0	Standard applicable in general (Latest amendment to be referred if any)	IS:7098 (Part-2), IS:8130, IS:5831, IS:10810, IS:3975, ASTM:2843, ASTM:2863, IEC-754-1, IEC:60332 (Part-1), IEC:60332-3-23, IEEE:60383
3.0	Voltage Grade	11/11kV(UE) & 3.3/3.3kV(UE)
4.0	Number of cores, cross sectional area of conductors and quantities	As per BOQ cum price schedule (part of NIT)
5.0	CONDUCTOR	
(a)	Material	Aluminium
	Grade and Class	Multi-Stranded, H2, Class 2
(b)	Standard Applicable	IS: 8130
(c)	Shape	Stranded, Compacted Circular
(d)	Min. number and diameter of strands	As per Class-2 of IS: 8130
(e)	Conductor screen	
(i)	Material	Extruded Cross-linked Semi-conducting compound
(ii)	Minimum thickness	0.3 mm
6.0	INSULATION	
(a)	Material	Cross-Linked Polyethylene(XLPE)
(b)	Standard Applicable	IS: 7098 (Part-2)
(c)	Continuous withstand temperature	90°C
(d)	Short-circuit withstand temperature	250°C
(e)	Nominal Thickness of Insulation	As per Table – 4 of IS 7098 Part-2
7.0	INSULATION SCREEN	
(a)	For both SINGLE CORE & MULTI CORE cables	
(i)	Material	Extruded Cross-linked Semi-conducting compound
(ii)	Type of Semiconducting compound	Bonded
(iii)	Minimum thickness	0.3 mm
(b)	Material	
(i)	Material	Copper
(ii)	Type	Tape
(iii)	Size	Nominal thickness 0.1mm with tolerance (\pm) 10%
(iv)	Minimum Overlap	10%
(c)	Earth fault current withstand capacity	300A FOR 2 SEC
8.0	EXTRUSION (Insulation and Screens)	
(a)	Process	Triple Extrusion
(b)	Method of Curing	For 11 kV & 3.3 kV - Dry curing (CCV) using pressurised Nitrogen
9.0	CORE IDENTIFICATION	
		With natural colour with coloured strips applied on core or by numeral printing on the cores
10.0	INNER SHEATH	

	DOCUMENT TITLE		SPECIFICATION NO. PE-TS- 415-507-E001	
	TECHNICAL SPECIFICATION FOR HT XLPE POWER CABLES		VOLUME II	
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(a)	Material	Extruded HRPVC, FRLS Type ST-2
(b)	Standard Applicable	IS: 7098 (Part-2) & IS: 5831
(c)	Colour	Black
(d)	Whether FR-LSH	YES
(e)	Inner sheath applicable for single core cable	YES
(f)	Fillers	Acceptable
(g)	Material of fillers (if permitted)	Same as inner sheath (Material of filler to be compatible with that of inner sheath)
(h)	Method of application	
(1)	Multi-core cables:	
(i)	With fillers	[<input checked="" type="checkbox"/>] Pressure extruded [<input checked="" type="checkbox"/>] Vacuum extruded
(ii)	Without fillers	Pressure extruded
(i)	Thickness of inner sheath	As per Table-5 of IS: 7098 (Part-2)
11.0	ARMOUR	Applicable, as per BOQ cum price schedule (part of NIT)
a)	Material	Galvanised Steel
(i)	Multicore cables	Round Wire (Armour dimensions as per Sl. No.(ii) of table – 6 of IS 7098 Part-II.
(ii)	Single core cables	Aluminium Round Wire H4 grade to IS: 8130
b)	Minimum coverage	90%
c)	Gap between armour wires	Shall not exceed one armour wire space (No cross-over/over-riding)
d)	Breaking load of joint	95% of normal armour
e)	Armour joint surface	To be applied with Zinc rich paint
12.0	OUTERSHEATH	
(a)	Material	Extruded HRPVC, FRLSH Type ST-2
(b)	Colour	Black
(c)	Whether FR-LSH	Yes
(d)	Method of application	Extruded
(e)	Thickness of outer sheath	As per Table-7 of IS: 7098 (Part-2)
(f)	Marking	BHEL-PEM, MSPGCL, MANUFACTURER'S NAME, VOLTAGE GRADE, YEAR OF MANUFACTURE, XLPE, NO OF CORE AND SIZE OF CABLE, FR-LSH , IS NUMBER, ISI MARK @ 1m (by embossing) Progressive sequential marking of length of cable in meters @ 1m (by embossing/ printing)
13.0	FR-LSH CHARACTERISTICS	
(a)	Oxygen index	Min 29 (As per ASTM D 2863)
(b)	Temperature index	Min. 250°C at Oxygen Index of 21(As per ASTM D 2863)
(c)	Acid gas generation	Max. 20% (As per IEC-60754-1)
(d)	Smoke density rating	Max. 60% (As per ASTM D 2843)
(e)	Flammability Tests	
(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, CAT-B



DOCUMENT TITLE

**TECHNICAL SPECIFICATION FOR HT
XLPE POWER CABLES**

SPECIFICATION NO. PE-TS- 415-507-E001

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SHEET 3 of 3

(iii)	Swedish chimney test	SEN SS 424 1475 (Class F3)
(iv)	Flammability test	IEEE: 60383
14.0	Anti-rodent and Termite Repulsion test	Yes
15.0	TOLERANCE ON OUTER DIAMETER	(±)2 mm. over the declared value
16.0	CABLE DRUMS	
(a)	Type of Drum	Steel Drum
(b)	Standard drum length	500M (±) 5%
(c)	Painting	Entire surface to be painted
(d)	Outermost Layer	To be covered with waterproof polyethylene
(e)	Others	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.
(f)	Particular information on Drum	Each drum shall carry BHEL-PEM, MSPGCL, MANUFACTURER'S NAME HT POWER CABLE, VOLATAGE GRADE, YEAR OF MANUFACTURE, XLPE, NO OF CORE AND SIZE OF CABLE, FR-LSH SINGLE LENGTH OF CABLE ON DRUM, DIRECTION OF ROTATION BY ARROW, APPROX GROSS MASS, IS/IEC NUMBER, ISI MARK


	DOCUMENT TITLE TECHNICAL SPECIFICATION FOR HT XLPE POWER CABLES	SPECIFICATION NO. PE-TS-415-507-E001	
		VOLUME II	
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DATASHEET C

**GUARANTEED TECHNICAL PARTICULARS
(TO BE SUBMITTED BY SUCCESSFUL BIDDER)**


S.No.	Particulars	Unit	Description
1.0	GENERAL		
1.1	Name of Manufacturer	-	
1.2	Place of Manufacture	-	
2.0	STANDARDS APPLICABLE		
2.1	IS: 7098 Part-2 For general specification of XLPE Cables	YES	
2.2	IS: 8130 For conductor material	YES	
2.3	IS: 5831 For material of innersheath & outersheath	YES	
2.4	IS: 3975 / IS: 8130 For armour of 3 core/ single core cables	YES	
2.5	IS: 10810 For method of tests	YES	
2.6	ASTMD-2863 For oxygen index test	YES	
2.7	SS:424-14-75 & IEC-60332-3 & IEC-60332-1 & IEEE: 60383 For flammability test	YES	
2.8	IEC-60754-1 For acid gas generation test	YES	
2.9	ASTMD-2843 For smoke generation test	YES	
2.10	Current rating of cables conforms to	-	
2.11	Short circuit rating conforms to	-	
2.12	Formula for calculating short circuit current for different durations	-	
3.0	INSTALLATION CONDITIONS AT SITE		
3.1	Ambient air temperature	deg. C	
3.2	Ground temperature	deg. C	
3.3	Depth of laying of cables buried in ground	cm	
3.4	Thermal resistivity of soil	deg. C cm/W	

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			

	DOCUMENT TITLE TECHNICAL SPECIFICATION FOR HT XLPE POWER CABLES	SPECIFICATION NO. PE-TS-415-507-E001	
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4.0	INSTALLATION CONDITIONS FOR CURRENT RATING SPECIFIED AT CLAUSE 7.3		
5.0	CHARACTERISTICS OF FR-LSH SHEATH		
5.1	Oxygen index	-	
5.2	Temperature index	-	
5.3	Acid gas generation	-	
5.4	Smoke density rating	-	
6.0	CABLE DRUMS		
6.1	Type & construction	-	
6.2	Standard drum length	-	
6.3	Tolerance on drum length	-	
7.0	INFORMATION TO BE FILLED IN FOR EACH SIZE CABLE IN THE FORM OF TABLE		
7.1	No. of cores x size	-	
7.2	Voltage grade (Uo/U)	kV	
7.3	Base current ratings (*) based on Clause No. 3.0		
a)	In air	Amp	
b)	In ground	Amp	
c)	ducts	Amp	
7.4	Short circuit rating	kA, sec	
7.5	Properties		
a)	D.C. resistance of conductor at 20 deg. C	ohm/km	
b)	A.C. resistance of conductor at 90 deg. C	ohm/km	
c)	Reactance of cable at normal frequency	ohm/km	
d)	Electrostatic capacitance of cable at normal frequency	mF/km	
7.6	CONDUCTOR		
a)	Material type & grade	-	
b)	No & dia of wires in each core before stranding	no x mm	

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			

	DOCUMENT TITLE TECHNICAL SPECIFICATION FOR HT XLPE POWER CABLES	SPECIFICATION NO. PE-TS-415-507-E001	
		VOLUME II	
		SECTION I	
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c)	Shape	-	
7.7	CONDUCTOR SCREEN		
a)	Material	-	
b)	Minimum thickness	mm	
7.8	XLPE INSULATION		
a)	Nominal thickness of insulation	mm	
b)	Method of curing	-	
7.9	INSULATION SCREEN		
a)	Type of screen	-	
b)	Material and thickness (minimum and nominal)	mm	
i)	Metallic	-	
	No. of tapes and Minimum overlapping	-	
ii)	Non-metallic	-	
iii)	Earth fault current withstand capacity (calculation to be furnished)	kA, sec.	
7.10	PVC ST2 INNERSHEATH		
a)	Material	-	
b)	Thickness (min.)	mm.	
c)	Method of application	-	
1)	Multi-core cables		
i)	With fillers	-	
ii)	With out fillers	Pressure Extruded	
2)	Single core cables		
d)	Type & Shape of fillers (if used)	-	
e)	Colour	-	
7.11	ARMOUR		
a)	Material	-	
b)	Size/ dimensions	-	
c)	Minimum no. of wires/ formed wires	-	
d)	Tolerance on formed wire dimension	-	
e)	Maximum resistivity of GS formed wire	-	
f)	Maximum resistivity of Al round wire	-	
7.12	PVC/POLYETHYLENE ST2 FR-LSH OUTERSHEATH		
a)	Nominal thickness of outer sheath	mm.	

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			

	DOCUMENT TITLE TECHNICAL SPECIFICATION FOR HT XLPE POWER CABLES	SPECIFICATION NO. PE-TS-415-507-E001	
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7.13	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.	
7.14	Tolerance on overall diameter	(±) mm	
7.15	Minimum bending radius	x O.D.	
7.16	Safe pulling force	kg.	
7.17	Weight of cable	kg./km	
a)	Weight of conductor	MT./km	
b)	Weight of XLPE insulation	MT./km	
c)	Weight of PVC (Inner Sheath & Fillers)	kg./km	
d)	Maximum resistivity of GS formed wire	kg./km	
e)	Weight of PVC/Polyethylene (Outer Sheath & Fillers)	kg./km	
7.18	Dimension of drum	mm.	
7.19	Shipping weight	kg	
7.20	Cable marking on outer sheath	-	

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

:

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			



DOCUMENT TITLE

**TECHNICAL SPECIFICATION FOR
HT XLPE POWER CABLES**

SPECIFICATION NO. PE-TS-415-507-E001


VOLUME II

SECTION II

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SECTION – II**GENERAL TECHNICAL SPECIFICATION**

	DOCUMENT TITLE TECHNICAL SPECIFICATION FOR HT XLPE POWER CABLES	SPECIFICATION NO. PE-TS-415-507-E001	
		VOLUME II	
		SECTION II	
		REVISION 00	DATE: 29.12.2023
		SHEET 1 OF 1	

1.0 TECHNICAL REQUIREMENTS

- 1.1 Technical requirements for HT XLPE POWER CABLES shall be as indicated in this section, in addition to those specified in Section I & Datasheet-A.

2.0 CODES & STANDARDS

- 2.1 The design, material, construction, manufacture, inspection, testing and performance of HT XLPE POWER CABLES shall conform to the latest revision of relevant standards and codes of practices mentioned in Data Sheet - A.
- 2.2 In case of conflict between the applicable reference standard and this specification, this specification shall govern.

3.0 QUALITY ASSURANCE REQUIREMENTS

- 3.1 Bidder shall confirm compliance with the Standard Quality Plan as attached with the specification without any deviations. At contract stage, the successful bidder shall submit the same QP for BHEL/ ultimate customer's approval. In case bidder has reference QP agreed with ultimate customer, same can be submitted for specific project after award of contract for BHEL/ultimate customer's approval. There shall be no commercial implication to BHEL on account of minor changes in QP during contract stage.
- 3.2 All materials shall be procured, manufactured, inspected and tested by vendor/ sub-vendor as per approved Quality Plan.
- 3.3 Type testing requirements, routine / acceptance testing and special testing requirements shall be as per Annexure -A to QP. Charges for all these tests for all the equipment & 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 as specified in Datasheet-A.
- 4.2 In case of wooden drums, all wooden parts shall be manufactured from seasoned wood treated with copper naphthenates / zinc naphthenates (refer IS: 401). 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. Over the cables polyethylene sheet shall be wrapped and then sealed properly.
- 4.3 In case of Steel drums, New or practically new cable drums made of steel and painted with epoxy resin paint are to be used. Cable ends are carefully protected before packing. Over the cables polyethylene sheet shall be wrapped and then sealed properly. For Typical details of Steel drums, Annexure-B to Section-II, may be referred by the bidder. Bidder may modify, to choose appropriate dimensions of steel drums to suite various sizes/weight/ lengths of HT XLPE POWER CABLES. BIS certification mark shall be stamped on each cable drum.

53622/2024/PS-PEM-EL



DOCUMENT TITLE

**TECHNICAL SPECIFICATION FOR HT
XLPE POWER CABLES**

SPECIFICATION NO. PE-TS-415-507-E001

VOLUME II


SECTION II


REVISION 00

DATE: 29.12.2023

SHEET -


QUALITY PLAN


		STANDARD QUALITY PLAN			CUSTOMER : MAHAGENCO		PROJECT: 1X660 MW BHUSAWAL TPS		DOCUMENT NAME - QUALITY PLAN - HT XLPE CABLE			
					BIDDER/ VENDOR		QUALITY PLAN NUMBER: PE-QP-999-507-E001A, R0		DOC NO -			
SHEET 1 OF 11		SYSTEM			ITEM : HT XLPE Power Cables		SECTION		VOLUME III			
SL. NO.	COMPONENT/ OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
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 final cable drum number or batch 2. Cable manufacturer to maintain all quality records identified as per all QP stages enumerated below whether it is identified for BHEL verification or witness or not.												
1.0	RAW MATERIALS & BOUGHT OUT ITEMS											
1.1	Aluminium Rods (Conductor/ Armour Wire)	GENERAL : 1. Physical properties		MA	Physical Tests	Sample/ Batch	IS:7098-II,IS: 5082, IS:5484, IS:8130 & Appd Datasheet	IS:7098-II,IS: 5082, IS:5484, IS:8130 & Appd Datasheet	Inpection Report/ Test Cert.	2/3	-	1/2
		2. Elec.Properties		MA	Electrical Tests	Sample/ Batch	-do-	-do-	-do-	2/3	-	1/2
		SPECIFIC CHECKS : a) Make		MA	Verify	100%	Manufacturer approved source	Manufacturer approved source	COC/ Test Cert.	2/3	-	1
		b) Grade		MA	-do-	-do-	IS 8130, IS 5082/ Approved datasheet	IS 8130, IS 5082/ Approved datasheet	-do-	2/3	-	1
		c) Resistivity		MA	Electrical Tests	Manufacturer std.	IS 8130, IS 5082	IS 8130, IS 5082	-do-	2/3	-	1
1.2	XLPE Compound for insulation	GENERAL : 1. Physical properties		MA	Physical Tests	Sample/ Batch	IS 7098-II & Mfs Std./ Approved datasheet	IS 7098-II & Mfs Std./ Approved datasheet	Inpection Repor/ Test Cert.	2/3	-	1/2
		2. Elec.Properties		MA	Electrical Tests	Sample/ Batch	-do-	-do-	-do-	2/3	-	1/2
		SPECIFIC CHECKS : a) Make		MA	Verify	100%	Manufacturer approved source	Manufacturer approved source	COC/ Test Cert.	2/3	-	1
		b) Type/ Grade		MA	-do-	-do-	Approved datasheet	Approved datasheet	-do-	2/3	-	1
		c) Shelf life/ Storage condition		MA	-do-	-do-	Compound Manufacturer std.	Compound Manufacturer std.	-do-	2/3	-	1
BHEL			PARTICULARS			BIDDER/VENDOR						
			NAME									
			SIGNATURE									
			DATE						BIDDER'S/VENDORS COMPANY SEAL			



 BHARAT HEAVY ELECTRICALS LIMITED
 PROJECT ENGINEERING MANAGEMENT

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 INITIALS OF DEALING ENGINEER
 DATE
 DEPARTMENT


 Nishu Manu
 28.1.2021
 Electrical


		STANDARD QUALITY PLAN			CUSTOMER : MAHAGENCO		PROJECT: 1X660 MW BHUSAWAL TPS		DOCUMENT NAME - QUALITY PLAN - HT XLPE CABLE			
SHEET 2 OF 11		BIDDER/ VENDOR SYSTEM			QUALITY PLAN NUMBER: PE-QP-999-507-E001A, R0		DOC NO .					
SL. NO.	COMPONENT/ OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
1	2	3	4	5	6	7	8	9	P	W	V	11
1.3	Semi Conducting Compound	<u>GENERAL :</u> 1. Physical properties <u>SPECIFIC CHECKS :</u> 1. Make 2. Type/ Grade 3. Shelf life/ Storage condition	MA	Physical Tests	Sample/ Batch	IS 7098-II & Mfs Std./ Approved datasheet	IS 7098-II & Mfs Std./ Approved datasheet	Inpection Report/ Test Cert.	2/3	-	1/2	
1.4	Copper Tape	<u>GENERAL :</u> 1. Physical properties 2. Elec.Properties 3. Dimension <u>SPECIFIC CHECKS :</u> 1. Resistivity	MA	Physical Tests	Sample/ Batch	IS 7098-II, IS 1897, IS 613 & Mfr. Std./ Approved datasheet	IS 7098-II, IS 1897, IS 613 & Mfr. Std./ Approved datasheet	Inpection Report/ Test Cert.	2/3	-	1/2	
			MA	Electrical Tests	Sample/ Batch	-do-	-do-	-do-	2/3	-	1/2	
			MA	Measurement	-do-	-do-	-do-	-do-	2/3	-	2	
1.5	Fillers (as applicable)	1. Make 2. Type/ Grade	MA	Verify	100%	Manufacturer approved source Approved datasheet	Manufacturer approved source Approved datasheet	COC/ Test Cert. -do-	2/3 2/3	-	1 1	(Fillers material chosen shall be compatible with the temerature rating of the cable and shall have no deleterious effect on any other componenet of the cable)
1.6	PVC Compound (for sheath)	<u>GENERAL :</u> 1. Physical properties 2. Elec.Properties 3. FRLS Properties (as applicable)	MA	Physical Tests	Sample/ Batch	IS 7098-II, IS 5831& Mfr. Std./ Approved datasheet	IS 7098-II, IS 5831& Mfr. Std./ Approved datasheet	Inpection Report/ Test Cert.	2/3	-	1/2	
			MA	Electrical Tests	Sample/ Batch	-do-	-do-	-do-	2/3	-	1/2	
			CR	Chemical/ Environ.	Sample/ Batch	-do-	-do-	-do-	2/3	-	1/2	



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 INITIALS OF DEALING ENGINEER: Nishu Manu
 DATE: 28.1.2021
 DEPARTMENT: Electrical



PARTICULARS	BIDDER/VENDOR
NAME	
SIGNATURE	
DATE	
BIDDER'S/VENDORS COMPANY SEAL	



		STANDARD QUALITY PLAN			CUSTOMER : MAHAGENCO		PROJECT: 1X660 MW BHUSAWAL TPS		DOCUMENT NAME - QUALITY PLAN - HT XLPE CABLE				
SHEET 3 OF 11		BIDDER/ VENDOR			SYSTEM		TITLE		DOC NO -				
SL. NO.		COMPONENT/ OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	SECTION VOLUME III			
1		2	3	4	5	6	7	8	9	10			
										P	W	V	REMARKS
1.7		Galvanised steel wire/strip for Armour (as applicable)	SPECIFIC CHECKS : a) Make b) Type/ Grade c) Shelf life/ Storage condition GENERAL : 1. Make 2. Dimension 3. Phy.and Elec. Properties 4.Galvanization Quality	MA	Verify	100%	Manufacturer approved source	Manufacturer approved source	COC/ Test Cert.	2/3	-	1	
1.8		Steel Drum	1. Dimension 2. Surface finish	MA	Meas. Visual	Mfr's Plant Std. -do-	Approved drawing of steel drum / BHEL specification Surface shall be smooth	Approved drawing of steel drum / BHEL specification Surface shall be smooth	Inpection Report/ Test Cert. -do-	2/3 2/3	-	1 1	
1.9		Wooden Drum (Not Applicable)	1. physical & constructional check 2. Anti-termite treatment	MA	Visual Chem	Mfr's Plant Std. -do-	IS 10418 Mfr's Plant Std.	IS 10418 Mfr's Plant Std.	Inpection Report/ Test Cert. COC	2/3 2/3	-	1 1	Wooden drum is not applicable
BHEL				PARTICULARS		BIDDER/VENDOR							
				NAME									
				SIGNATURE									
				DATE				BIDDER'S/VENDORS COMPANY SEAL					

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 INITIALS OF DEALING ENGINEER: Nishu Mahru
 DATE: 28.1.2021
 DEPARTMENT: Electrical

		STANDARD QUALITY PLAN			CUSTOMER : MAHAGENCO		PROJECT 1X660 MW BHUSAWAL TPS		DOCUMENT NAME - QUALITY PLAN - HT XLPE CABLE			
SHEET 4 OF 11		BIDDER/ VENDOR			SYSTEM		QUALITY PLAN NUMBER: PE-QP-999-507-E001A, R0		DOC NO -			
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	SECTION AGENCY VOLUME III			
1	2	3	4	5	6	7	8	9	P	W	V	REMARKS
2.0	IN PROCESS											
2.1	Wire Drawing	1. Size	MA	Dimensional	Plant Mfg. Std.	IS 8130 & Appd. Datasheet	IS 8130 & Appd. Datasheet	Inpection Report	2	-	1	
		2. Surface finish	MA	Visual	-do-	Surface shall be smooth	Surface shall be smooth	-do-	2	-	1	
		3. % of Elongation	MA	Mechanical	-do-	IS 8130 & Appd. Datasheet	IS 8130 & Appd. Datasheet	-do-	2	-	1	
2.2	Stranding of wires	1. No. of wires	MA	Counting	Plant Mfg. Std.	IS 8130 & Appd. Datasheet	IS 8130 & Appd. Datasheet	Inpection Report	2	-	-	
		2. Resistance	CR	Electrical	-do-	-do-	-do-	-do-	2	-	-	
		3. Sequence, lay length & Direction	MA	Visual, Meas.	One Sample of each size/	Mfrs Std. / Appd. Datasheet	Mfrs Std. / Appd. Datasheet	-do-	2	-	-	
		4. Surface Finish	MA	Visual	100%	Surface shall be smooth	Surface shall be smooth	-do-	2	-	-	
		5. Dimension	MA	Measurement	One Sample of each size/	IS 8130 & Appd. Datasheet	IS 8130 & Appd. Datasheet	-do-	2	-	-	
2.3	Conductor Screening	1. Surface Finish	MA	Visual	100%	Surface shall be smooth	Surface shall be smooth	Inpection Report	2	-	-	
		2. Radial Thickness	CR	Mechanical	One Sample of each size/	IS 7098-II & Appd. Datasheet	IS 7098-II & Appd. Datasheet	-do-	2	-	-	
2.4	Core Insulation (XLPE) (No repair permitted)	1. Surface finish	MA	Visual	100%	Free from bulging, burnt particles, lumps, cuts & scratches	Free from bulging, burnt particles, lumps, cuts & scratches	Inpection Report	2	-	1	
		2. Eccentricity & Ovality #	CR	Measurement	One Sample of each size/ lot	IS 7098-II & Appd. Datasheet	IS 7098-II & Appd. Datasheet	-do-	2	-	1	# To be checked at starting & finished end of extruded length.
		3. Insulation Thickness	CR	Measurement	-do-	-do-	-do-	-do-	2	-	-	
		4. Dia over insulation	MA	Measurement	-do-	-do-	-do-	-do-	2	-	-	
		5. Tensile Strength & % Elongatio	MA	Mechanical	100%	-do-	-do-	-do-	2	-	-	
BHEL			PARTICULARS			BIDDER/VENDOR						
			NAME									
			SIGNATURE									
			DATE						BIDDER'S/VENDORS COMPANY SEAL			


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DATE	28.1.2021
DEPARTMENT	Electrical

		STANDARD QUALITY PLAN			CUSTOMER : MAHAGENCO		PROJECT TITLE 1X660 MW BHUSAWAL TPS		DOCUMENT NAME - QUALITY PLAN - HT XLPE CABLE				
					BIDDER/VENDOR SYSTEM		QUALITY PLAN NUMBER: PE-QP-999-507-E001A, R0		DOC NO -				
SHEET 5 OF 11		SYSTEM		ITEM : HT XLPE Power Cables		SECTION		VOLUME III					
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS	
									P	W	V		
1	2	3	4	5	6	7	8	9	10	11	11		
2.5	Insulation Screening	NON METTALIC											
		1. Surface finish	MA	Visual	100%	Surface shall be smooth	Surface shall be smooth	Inpection Report	2	-	-		
		2. Thickness	CR	Measurement	One Sample of each size/ lot	IS 7098-II & Appd. Datasheet	IS 7098-II & Appd. Datasheet	-do-	2	-	-		
		METALLIC											
2.6	Core Laying	1. Dimension of tape	CR	Measurement	One Sample of each size/	Mfrs Std. / Appd. datasheet	Mfrs Std. / Appd. datasheet	Inpection Report	2	-	-		
		2. Overlap of Tape Band	MA	-do-	-do-	-do-	-do-	-do-	2	-	-		
		3. Tightness of Tape	MA	Visual	-do-	-do-	Mfs Std.	Mfs Std.	-do-	2	-	-	
		1. Dia over laid up core	MA	Measurement	One Sample of each size/	IS 7098-II & Appd. Datasheet	IS 7098-II & Appd. Datasheet	Inpection Report	2	-	-		
2.7	InnerSheath Extrusion (as applicable)	2. Sequence of lay & direction	MA	Visual & Meas.	-do-	IS 7098-II & Mfr. Std.	IS 7098-II & Mfr. Std.	-do-	2	-	-		
		3. Lay Length	MA	Measurement	-do-	-do-	-do-	-do-	2	-	-		
		1. Surface finish	MA	Visual	100%	Surface shall be smooth	Surface shall be smooth	Inpection Report	2	-	-	(Pimple, fish eye, porosity & burnt particles not permitted.)	
2.8	Armour(as applicable)	2. Thickness	CR	Measurement	One Sample of each size/	IS 7098-II & Appd. Datasheet	IS 7098-II & Appd. Datasheet	-do-	2	-	-		
		3. Dia over inner sheath	MA	-do-	-do-	-do-	-do-	-do-	2	-	-		
		1. No. of wires/Strips	MA	Counting	At the start of the process	IS 7098-II & Appd. Datasheet	IS 7098-II & Appd. Datasheet	Inpection Report	2	-	-		
		2. Lay length & Direction	MA	Visual & Meas.	-do-	IS 7098-II & Mfr. Std.	IS 7098-II & Mfr. Std.	-do-	2	-	-		
		3. Dia over armouring	MA	Measurement	-do-	IS 7098-II & Appd. Datasheet	IS 7098-II & Appd. Datasheet	-do-	2	-	-		
		4. Coverage	MA	Measurement	-do-	-do-	-do-	-do-	2	-	-		
BHEL			PARTICULARS			BIDDER/VENDOR							
			NAME										
 BHARAT HEAVY ELECTRICALS LIMITED PROJECT ENGINEERING MANAGEMENT			SIGNATURE										
			DATE						BIDDER'S/VENDORS COMPANY SEAL				


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SIGNATURE
 INITIALS OF DEALING ENGINEER
 DATE
 DEPARTMENT

Nishu Menon
 Nishu Menon
 28.1.2021
 Electrical

		STANDARD QUALITY PLAN		CUSTOMER : MAHAGENCO		PROJECT 1X660 MW BHUSAWAL TPS		DOCUMENT NAME - QUALITY PLAN - HT XLPE CABLE				
				BIDDER/ VENDOR		QUALITY PLAN NUMBER: PE-QP-999-507-E001A, R0		DOC NO -				
SHEET 6 OF 11		SYSTEM		ITEM : HT XLPE Power Cables		SECTION			VOLUME III			
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
2.9	Outer Sheath Extrusion (No repair permitted)	1. Surface finish	MA	Visual	100%	Surface shall be smooth	Surface shall be smooth	Inpection Report	2	-	-	(Pimple, fish eye, porosity & burnt particles not permitted.)
		2. Sheath Thickness	CR	Measurement	One Sample of each size/	IS 7098-II & Appd. Datasheet	IS 7098-II & Appd. Datasheet	-do-	2	-	-	
		3. Dia over outer sheath	MA	-do-	-do-	-do-	-do-	-do-	2	-	-	
		4. Embossing/ Sequential Marking	MA	Visual	100%	Approved data sheet	Approved data sheet	-do-	2	-	-	
3.0	Finished Cable (INTERNAL)	1. Routine Test (Refer Note-F)	CR	Electrical Tests & Measurement	100%	IS 7098-II & Appd. Datasheet	IS 7098-II & Appd. Datasheet	Test Report	2	-	1	
4.0	Final Inspection (EXTERNAL)	1. Finish	MA	Visual	One drum in each Lot	IS 7098-II & Appd. Datasheet	Free from Porosity, Bulging, Burnt particles,lumps, cuts &	Test Report	2	1	-	
		2. Length	MA	Measurement	-do-	-do-	Approved Data Sheet	-do-	2	1	-	
		3. Dimension	MA	-do-	As per IS	-do-	-do-	-do-	2	1	-	
		4. Armouring - Coverage No.of Wires/Strips	MA	Visual & Meas.	-do-	-do-	-do-	-do-	2	1	-	
BHEL		PARTICULARS		BIDDER/ VENDOR								
		NAME										
		SIGNATURE										
		DATE										
										BIDDER'S/VENDORS COMPANY SEAL		

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SIGNATURE	
INITIALS OF DEALING ENGINEER	Nishu Manu
DATE	28.1.2021
DEPARTMENT	Electrical

		STANDARD QUALITY PLAN			CUSTOMER : MAHAGENCO		PROJECT 1X660 MW BHUSAWAL TPS		DOCUMENT NAME - QUALITY PLAN - HT XLPE CABLE			
					BIDDER/ VENDOR		QUALITY PLAN NUMBER: PE-QP-999-507-E001A, R0		DOC NO -			
SHEET 7 OF 11		SYSTEM			ITEM : HT XLPE Power Cables		SECTION		VOLUME III			
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
1	2	3	4	5	6	7	8	9	P	W	V	11
5.0	Packing	5. Marking & Colour Coding 6. Acceptance Tests (Refer Note-F) 7. Type Tests (Refer Note-F) Sealing Identification	MA CR CR MA	Visual Phy, Elect. Tests FRLS Tests Physical & Electrical Tests Visual	As per IS -do- Sample # 100%	-do- -do- -do- As per IS	Approved Data Sheet -do- -do- As per IS	-do- -do- -do- -do-	2 2 2 2	1 1 1 1	- - - -	# Refer Annexure to QAP enclsloed

NOTES:-


- (A) JOINTS IN WIRE SHALL BE AS PERMITTED BY IS / BHEL SPECIFICATION, VENDOR TO CERTIFY THE SAME.
- (B) NO REPAIR OF CORE INSULATION PERMITTED
- (C) RECORD OF RAW MATERIAL, PROCESS & ALL STAGES SHALL BE CERTIFIED BY VENDORS QC. AND ARE LIABLE TO AUDIT CHECK BY PURCHASER.
- (D) FILLERS/DUMMY CORES ETC. SHALL BE AS PER APPROVED DATA SHEET
- (E) VENDOR SHALL FURNISH COMPLIANCE CERTIFICATE TO THE INSPECTION AGENCY CONFIRMING THE PACKING AS PER BHEL SPECIFICATION.
- (F) **FOR LIST OF ROUTINE, TYPE & ACCEPTANCE TESTS, REFER ANNEXURE TO QAP ENCLOSED.**

LEGEND : P : PERFORMER W: WITNESSER V: VERIFIER 1- BHEL / MAHAGENCO / TPIA 2-VENDOR 3-SUB-VENDOR CHP: CUSTOMER HOLD POINT WHICH WILL BE DECIDED AT CONTRACT STAGE

BHEL		PARTICULARS		BIDDER/ VENDOR	
		NAME			
		SIGNATURE			
		DATE			
BHARAT HEAVY ELECTRICALS LIMITED PROJECT ENGINEERING MANAGEMENT				BIDDER'S/VENDORS COMPANY SEAL	

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INITIALS OF DEALING ENGINEER
DATE
DEPARTMENT


 Nishu Manu
 28.1.2021
 Electrical

Annexure to Quality Plan

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 1 drum for every 10 drums or less of each type and size of cable/ lot.
 - b) Electrical tests to be conducted on one drum of every size & voltage grade of cables.
 - c) FRLS test & Flammability Test to be conducted on every size & voltage grade of cables. Sampling quantity as per appendix -D of IS 7098-2, D2.2.



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:
 - a) Acceptance tests shall be as per 1 drum for every 10 drums or less of each type and size of cable/ lot.
 - b) FRLS test & Flammability Test to be conducted on every size & voltage grade of cables. Sampling quantity as per appendix -D of IS 7098-2, D2.2.

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.
2. Sampling: Routine tests shall be conducted on 100% cable drums.

S. No.	TEST	APPLICABLE FOR	TEST CONDUCTION REQUIRED AS	REFERENCE STANDARD	REMARKS
1.0	Tests for Conductor				
I.	Annealing test	For copper conductor only	T, A	IS 10810 Pt 1	<i><u>Internal in process Test Report to be furnished for acceptance test</u></i>
II.	Tensile test	For aluminium conductor only <i>(Not applicable for compacted circular or shaped conductor)</i>	T, A	IS 10810 Pt 2	
III.	Wrapping test	For aluminium conductor only <i>(Not applicable for compacted circular or shaped conductor)</i>	T, A	IS 10810 Pt 3	
IV.	Resistance test	For Al/Cu	T, A, R	IS 10810 Pt 5	
2.0	Tests for Armour Wires/Strips				
I.	Measurement of dimensions	Applicable for Aluminium wire & GS wire/Strip	T,A	IS 10810 Pt 36	
II.	Tensile test	Applicable for Aluminium wire & GS wire/Strip	T, A	IS 10810 Pt 37	
III.	Elongation at break test	Applicable for GS wire/Strip only	T, A	IS 10810 Pt 37	



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SIGNATURE INITIALS OF DEALING ENGINEER DATE DEPARTMENT	 Nishu Manu 28.1.2021 Electrical

53622/2024/PS-PEM-EL

CUSTOMER - MANAGEMENT

Annexure to Quality Plan



S. No.	TEST	APPLICABLE FOR	TEST CONDUCTION REQUIRED AS	REFERENCE STANDARD	REMARKS
IV.	Torsion test	For GS round wire only	T, A	IS 10810 Pt 38	
V.	Winding test	For GS strip only	T, A	IS 10810 Pt 39	
VI.	Resistivity test	Applicable for Aluminium wire & GS wire	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 Aluminium wires only	T, A	IS 10810 Pt 3	
3.0	Physical Tests for XLPE Insulation & PVC sheath				
I.	Test for thickness & Eccentricity	Applicable for XLPE insulation, HRPVC inner sheath & For HRPVC inner/outer sheath only	T, A	IS 10810 Pt 6	
II.	Tensile strength and elongation test at break	Applicable for XLPE insulation & For HRPVC inner/outer sheath only			
(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 XLPE insulation & For HRPVC inner/outer sheath only	T	IS 10810 Pt 11	
IV.	Loss of mass in air oven test	For HRPVC inner/outer sheath only	T	IS 10810 Pt 10	
V.	Hot deformation test	For HRPVC inner/outer sheath only	T	IS 10810 Pt 15	
VI.	Heat shock test	For HRPVC inner/outer sheath only	T	IS 10810 Pt 14	
VII.	Shrinkage test	For XLPE insulation & For HRPVC inner/outer sheath only	T	IS 10810 Pt 12	
VIII.	Thermal stability test	For HRPVC inner/outer sheath only	T	IS 10810 Pt 60	
IX.	Hot set test	For XLPE insulation only	T, A	IS 10810 Pt 30	
X.	Water absorption (gravimetric) test	For XLPE insulation only	T	IS 10810 Pt 33	
XI.	Degree of cross-linking	For XLPE insulation only	T	IS 7098-II	
4.0	Tests On Extruded Semi-conducting Screen				
I.	Test for Strippability	Applicable for Semi-conducting Strippable screen	T	IS 7098-II	Not applicable since it is bonded type
II.	Volume Resistivity	Applicable for Semi-conducting Strippable screen	T	IS 7098-II	
III.	Test for cross linking		A	IS 7098-II	
5.0	Improved Fire performance (FR-LSH) Tests				

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DATE	Electrical
DEPARTMENT	

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Annexure to Quality Plan

S. No.	TEST	APPLICABLE FOR	TEST CONDUCTION REQUIRED AS	REFERENCE STANDARD	REMARKS
I.	Oxygen index test	For inner/outer sheath only	T, A	IS 10810 Pt 58 / ASTMD 2863	Sample shall be as per IS 7098, Part 2
II.	Smoke density test	For inner/outer sheath only	T, A	ASTMD 2843	
III.	Acid gas generation test	For inner/outer sheath only	T, A	IS 10810 Pt 59 / IEC-754-1	
IV.	Temperature Index Test	For inner/outer sheath only	T,A	IS 10810 Pt 64 / ASTMD 2863	
6.0	Flammability Tests				
I.	Flammability test for bunched cables	For complete cable	T,A	IEC-60332 (Part-3)	
II.	Flammability test for single cable	For complete cable	T,A	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	
7.0	Electrical Tests				
I.	High Voltage Test	For complete cable	T, A, R	IS 10810 Pt 45	
II.	Insulation Resistance Test (Volume resistivity method)	For complete cable	T, A	IS 10810 Pt 43	
III.	Partial discharge test (shall be carried out on full drum length)		T,A,R	IS 10810 Pt 46	
IV.	Bending Test followed by Partial Discharge test		T	IS 10810 Pt 50	
V.	Dielectric Power Factor Test (i) As a function of voltage (ii) As a function of temperature		T	IS 10810 Pt 48	
VI.	Heat Cycle Test		T	IS 10810 Pt 49	
VII.	Impulse Withstand Test		T	IS 10810 Pt 47	
VIII.	Thermal ageing test	For complete cable	T	IS 7098-II	
IX.	Flammability Test	For HRPVC sheathed cable	T	IS 10810 Pt 53	
8.0	Anti-rodent and Termite Repulsion test	For HRPVC outer sheath only	A	Refer Note	

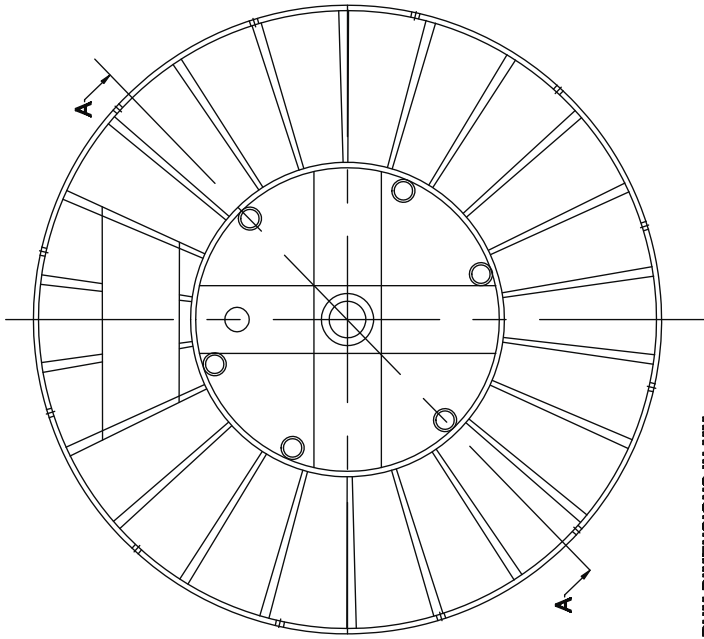
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DATE	28.1.2021
DEPARTMENT	Electrical

Note: A few chipping of the PVC compound is slowly ignited on a porcelain dish or cubicle in a muffle furnace at about 600 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.

STEEL DRUM DRAWING (TYPICAL)

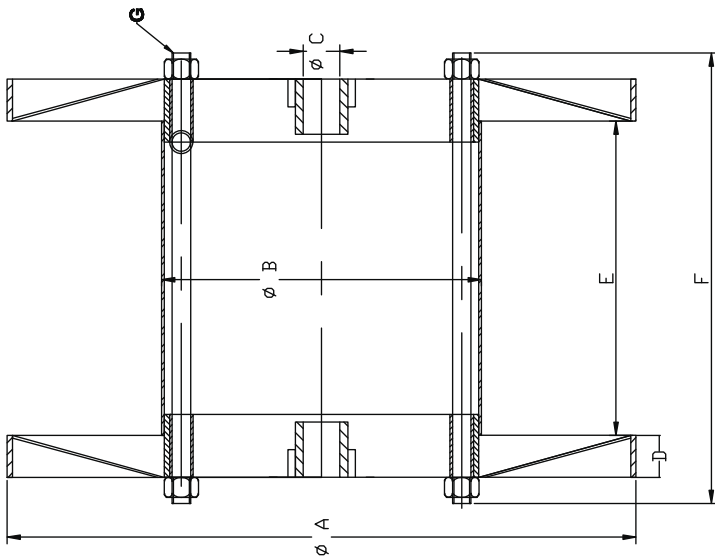
ANNEXURE-C TO SECTION-II

- Dwg. not to scale.
- ALL DIMENSIONS ARE IN MM.



APPROXIMATE DRUM DIMENSIONS IN MM
 ALL DIMENSIONS AND VALUES ARE
 TYPICAL AND ARE DEPENDENT ON
 CABLE WEIGHT.

A	FLANGE	2200
B	BARREL	1200
C	CENTRAL HOLE	100
D	FLANGE	50
E	TRAVERSE	1400
F	GROSS WIDTH	1600
G	STUD SIZE	16 MM.





**TECHNICAL SPECIFICATION FOR
HT XLPE POWER CABLE
1X660 MW BHUSAVAL TPS**

SPECIFICATION NO. PE-TS-415-507-E001

REVISION 0

DATE: 29.12.2023

SHEET 1 OF 1

DRAWINGS & DOCUMENTS Delivery Schedule

Documents shall be submitted after placement of order for BHEL & customer's approval as per the schedule specified below:

BHEL Drawing No.	Drawing Title	Vendor Sub (Days)*	Bhel comment (Days)	Vendor Sub (Days)#	Bhel and Customer comment/approval (Days)
Primary Documents					
PE-V1-415-507-E101	TECHNICAL DATA SHEET - HT XLPE POWER CABLES	7	3	2	18
PE-V1-415-507-E103	CROSS SECTION DRGS. - HT XLPE POWER CABLES	7	3	2	18
PE-V1-415-507-E912	QUALITY PLAN - HT XLPE POWER CABLES	7	3	2	18
Secondary Documents					
PE-V1-415-507-E104	TYPE TEST REPORTS FOR TEST CONDUCTED - HT XLPE POWER CABLES	WITHIN ONE WEEK AFTER CONDUCTION OF TYPE TESTS.			
NOTES:					
a) * 1st submission within indicated days from date of purchase order					
b) # Submission (within indicated days) after incorporating all BHEL comments					
c) Primary documents shall be considered for Delay analysis and secondary documents shall be for engineering completion purpose					

Notes:

1. Vendor shall submit the dates for drawing/document submission/BHEL comments/ resubmission after approval of documents.



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Cir. No. 22/DIV/CAB/05

07 June 2023

To Cable Division and Utilities/SEBS, listed of purchasing organisations

Sub: Correction in amendment to Price Variation Clause for MV and EHV Cables wef Apr 2023

IEEMA recently published amended Price Variation Clause for MV and EHV Cables wef Apr 2023 vide Cir. No. 07/DIV/CAB/05 and 06/DIV/CAB/05 dated 08 May 2023. After publishing IEEMA found some corrections to be done in the below factor tables:

For EHV Cables -

Table: 3d (SMIF): Variation factor for Copper in Lead + Cu wire construction (CuFpb)

For MV Cables -

Table: H4 (c) 3.3 KV (E) Unscreened arm

And note added for Table: H5 (a) & Table: H5 (b) as "Fillers added in above factors"

Factor of 3.3 KV (UE) Screened Armoured cables shall be as per factor of IEEMA Circular for 3.3kV (E) Screened Arm cables

The corrected factor tables are attached and request to all stakeholders to replace these tables with earlier published factor tables.

All other factor tables and guidelines remains unchanged as per Cir No. 07/DIV/CAB/05 and 06/DIV/CAB/05 dated 08 May 2023.

Director

Encl.: corrected factor tables for amended PV clause for MV Cables wef Apr 23.



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TABLE : H4 (c)
VARIATION FACTOR FOR STEEL WIRE ARMOUR (FeW)

THREE CORE ARMoured XLPE INSULATED 3.3 to 33 KV POWER CABLES WITH Al / Cu CONDUCTOR

Nominal Cross Sectional Area in Sq. mm	3.3 KV (E) Unscreened arm	3.3 KV (E) screened arm	6.6 KV (E)	11 KV (E) / 6.6 KV (UE)	11 KV (UE)	22 KV (E)	33 KV (E)	33 KV (UE)
25	1.258	1.358	1.457	1.612	2.509	1.503	-	-
35	1.361	1.465	1.569	1.853	2.644	2.797	2.517	-
50	1.682	1.685	1.687	2.321	2.800	2.921	4.569	4.603
70	2.033	1.959	1.979	2.503	3.219	3.347	4.809	4.935
95	2.202	2.355	2.507	2.718	4.019	4.200	5.437	6.553
120	2.371	2.523	2.675	2.882	4.241	4.416	6.713	6.820
150	2.870	2.812	2.847	3.265	4.447	4.621	6.976	7.088
185	3.121	3.215	3.309	4.148	4.726	5.289	7.356	7.489
240	3.758	3.993	4.227	4.442	5.442	6.651	7.718	7.890
300	4.099	4.562	5.024	5.182	6.894	7.084	8.187	8.359
400	5.750	6.161	6.572	6.658	7.433	7.657	8.760	8.960
500	6.716	6.747	6.777	6.861	7.588	7.797	8.830	9.629
630	7.492	7.116	7.465	7.477	8.209	8.386	9.413	10.365

TABLE : H5 (a)
VARIATION FACTOR FOR Polymer (CCFAl/CCFCu)

SINGLE CORE ARMoured XLPE INSULATED 3.3 to 33 KV POWER CABLES WITH Al / Cu CONDUCTOR

Nominal Cross Sectional Area (in Sq. mm)	3.3 KV(E) Unscreened ARM	3.3 KV (E) screened 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	33 KV (UE) ARM
35	0.123	0.197	0.259	0.278	0.330	0.376	0.468	0.493
50	0.152	0.209	0.272	0.294	0.379	0.394	0.483	0.530
70	0.170	0.227	0.295	0.317	0.404	0.419	0.508	0.583
95	0.184	0.244	0.317	0.338	0.435	0.449	0.554	0.609
120	0.197	0.261	0.337	0.392	0.457	0.472	0.576	0.634
150	0.194	0.303	0.389	0.413	0.477	0.492	0.597	0.656
185	0.224	0.322	0.414	0.445	0.502	0.539	0.674	0.767
240	0.276	0.354	0.456	0.479	0.558	0.573	0.711	0.806
300	0.294	0.377	0.489	0.506	0.587	0.602	0.811	0.915
400	0.333	0.450	0.569	0.578	0.687	0.703	0.866	0.974
500	0.367	0.493	0.675	0.679	0.809	0.826	1.056	1.139
630	0.438	0.611	0.735	0.739	0.873	0.928	1.168	1.290
800	0.529	0.734	0.863	0.866	1.027	1.05	1.189	1.380
1000	0.648	0.880	1.031	1.035	1.138	1.158	1.402	1.619

Note: The above factors are for PVC and Zero Halogen low smoke (LSZH) and for PE factor, the above factor will be multiplied by 0.63
 Fillers added in above factors





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TABLE : H5 (a)
VARIATION FACTOR FOR Polymer (CCFAL/CCFCu)

SINGLE CORE UNARMoured XLPE INSULATED 3.3 to 33 KV POWER CABLES WITH Al / Cu CONDUCTOR

Nominal Cross Sectional Area (in Sq. mm)	3.3 KV(E) Unscreened ARM	3.3 KV(E) screened 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	33 KV (UE) ARM
35	0.158	0.191	0.224	0.252	0.323	0.342	0.361	0.380
50	0.177	0.209	0.240	0.269	0.342	0.361	0.520	0.539
70	0.198	0.232	0.265	0.296	0.370	0.391	0.551	0.572
95	0.233	0.261	0.288	0.318	0.396	0.450	0.582	0.636
120	0.253	0.282	0.310	0.342	0.454	0.477	0.613	0.636
150	0.269	0.299	0.328	0.361	0.476	0.500	0.638	0.662
185	0.292	0.323	0.354	0.420	0.508	0.532	0.719	0.743
240	0.322	0.371	0.419	0.455	0.547	0.572	0.766	0.791
300	0.355	0.408	0.461	0.490	0.585	0.610	0.863	0.888
400	0.423	0.474	0.524	0.539	0.683	0.711	0.932	0.960
500	0.477	0.553	0.629	0.635	0.743	0.825	1.059	1.141
630	0.548	0.620	0.691	0.697	0.866	0.898	1.144	1.176
800	0.672	0.749	0.826	0.833	1.016	1.051	1.320	1.355
1000	0.789	0.877	0.964	0.964	1.099	1.200	1.488	1.589

Note: The above factors are for PVC and Zero Halogen low smoke (LSZH) and for PE factor the above factor will be multiplied by 0.63
 Fillers added in above factors

TABLE : H5 (b)
VARIATION FACTOR FOR POLYMER (CCFAI / CCFCu)

THREE CORE ARMoured XLPE INSULATED 3.3 to 33 KV POWER CABLES WITH Al / Cu CONDUCTOR

Nominal Cross Sectional Area (in Sq. mm)	3.3 KV (E) Unscreened ARM	3.3 KV (E) screened 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	33 KV (UE) ARM
35	0.374	0.634	0.990	1.142	1.604	1.782	-	
50	0.445	0.702	1.119	1.260	1.834	2.046	2.864	3.070
70	0.547	0.863	1.290	1.396	2.011	2.284	3.219	3.380
95	0.594	0.990	1.440	1.647	2.269	2.428	3.367	3.721
120	0.732	1.214	1.692	1.877	2.498	2.715	3.646	4.020
150	0.812	1.355	1.906	2.061	2.767	2.931	3.927	4.216
185	0.960	1.589	2.086	2.406	3.028	3.180	4.166	4.529
240	1.130	1.832	2.484	2.744	3.398	3.580	4.589	4.917
300	1.219	2.201	2.912	3.161	3.840	4.016	5.029	5.325
400	1.313	2.561	3.530	3.664	4.353	4.666	5.736	5.911
500	1.652	3.138	3.925	3.971	4.621	4.878	5.913	6.625
630	1.949	3.774	4.487	4.982	5.225	5.477	6.696	7.445

Note: The above factors are for PVC and Zero Halogen low smoke (LSZH) and for PE factor the above factor will be multiplied by 0.63
 Fillers added in above factors





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IEEMA (PVC)/MV SCREEN CABLE/2019 (R-1)

Effective from: 01 April 2023

Cir. No. 07/DIV/CAB/05

08 May 2023

To Cable Division and Utilities/SEBS, listed of purchasing organisations

Sub: Amendment to Price Variation Clause for MV Cables

IEEMA MV Cable PV formula is applicable from Sep 2019. With the coming demand for cables; Cable manufacturers' requested IEEMA to publish following missing factors from formula document of MV Cable effective from Sep 2019; since some of the users were procuring such cables and demanding these factors and also for the correction in the SMIF factor for Copper Wire Metallic Screen for MV and EHV cables.

IEEMA Cable Technical committee discussed the subject in depth and IEEMA collected the variation factors and finalised in consensus. The average factors are tabled in annexure which are effective from 01 Apr 2023 and accordingly modified the formulae, attached with circular.

New evolved variation factors and corrections in formulae are as below:

1. Variation factors for Polymer (CCFAL/CCFCu), Table: H5 (a) are added for Single core unarmored XLPE insulated 3.3 to 33 KV Power cables with Al / Cu conductor
2. Variation factors for 33 KV (UE) and 3.3 KV (screened) are added
3. The formula for copper screen factor given in IEEMA MV Cable PV clause for all formulae wef Sep 19 is for copper wires only and copper tape binder if provided, its area would be additional.

The SMIF, weight factor for Copper Wire Metallic Screen has been modified as under:

SMIF = $(A \times D \times LF) / 1000$, where D = Density (= 8.89 for Cu), LF = Lay Factor (=1.07, for Copper Wire Metallic Screen and counter helix tape)

4. Considering the fluctuations in the prices; and as suggested by members, IEEMA will be publishing a separate price for XLPE for EHV Cables (Above 66 KV) in IEEMA Cable price variation circular from 01 Apr 2023 onwards. This price will be applicable for XLPE in all EHV Cable (Above 66 KV) formulae from 01 Apr 2023 onwards. And correction/change in existing "XLPE - HV Cable" being mentioned in IEEMA Price circulars with "XLPE - MV Cable" applicable for MV cables.
5. For the better clarity and application of prices, it is also agreed upon to change/replace the existing PVC grades "CW 22" & "HR-11" being mentioned in IEEMA Price circulars with generic PVC names as under;

CW 22 to be changed to "PVC" &
 HR 11 to be changed to "HR PVC"





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As discussed and agreed in consensus, the understanding for above generic PVC grades is that "PVC" will be considered for PVC insulation and PVC sheath of General Purpose PVC insulated LV cables as per IS 1554 (I) suitable max conductor temperature of 70 °C, whereas "HRPVC" will be considered for Heat Resisting PVC insulation and Heat Resisting PVC sheath of HRPVC insulated LV Cables as per IS 1554 (I) and also for Heat Resisting PVC sheath of XLPE insulated LV cables as per IS 7098 (I) & Heat Resisting PVC sheath of XLPE insulated HT Cables as per IS 7098 (Part-2).

6. There is regular requirement of 3.3 kV DC cables for Metro Projects, with Galvanized Steel (GS) wire/strip armouring, in view of this, Variation Factors for GS wire/ Strip armouring for Single core 3.3 kV cables are collected and the table of average variation factor is evolved.
7. As suggested by stake holders and in consensus with IEEMA Cable Tech committee, prices of Steel for armouring for following thickness are published in IEEMA Cable PVC from 01 Jan 2023 and are effective/applicable from 01 Jan 2023.
 Round wire 2.0 mm dia, Round wire 2.5 mm dia, Round wire 3.15 mm dia, Round wire 4.0 mm dia

We are enclosing amended price variation clause for MV Cables along with applicable table of variation factors and additional table of variation factors which are effective from 01 Mar 2023. We recommend all stakeholders to incorporate these changes in all the contracts/tenders henceforth for settlement of price variation from 01 Apr 2023 onwards.

Director

Encl.: Amended PV clause for MV Cables along with table of variation Factors



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IEEMA (PVC)/MV SCREEN CABLE/2019 (R-1)

Effective from: 01 April 2023

Material Price Variation Clause for 3.3-33 KV XLPE Insulated Armoured Single & Three core Screen 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 Ex-Works Price quoted/confirmed (in Rs/Km)

ALUMINIUM

AIF Variation factor for Aluminium

AI Price of Aluminum. This price is as applicable **one** month prior to the date of delivery.

Alo Price of Aluminium. This price is as applicable **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 **one** month prior to the date of delivery.

Cuo Price of CC copper rods. This price is as applicable **one** month prior to the date of tendering.

POLYMER COMPOUND (PVC/PE/Zero Halogen low smoke)

PVC Price of PVC Compound / PE / Zero Halogen low smoke. This price is as applicable on **one** month prior to the date of delivery.

PVCo Price of PVC Compound / PE / Zero Halogen low smoke. This price is as applicable on **one** month prior to the date of tendering.

(the relevant price of Polymer Compound is to be selected depending upon the type of compound used for the cable)

CCFAI Variation factor for PVC compound / PE / Zero Halogen low smoke for aluminum conductor cable.

CCFCu Variation factor for PVC compound / PE / Zero Halogen low smoke for copper conductor cable.

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.



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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

COPPER TAPE

SMIFS Variation factor for Copper tape

SMIF1 Price of CC copper rods. This price is as applicable **one** month prior to the date of delivery.

SMIF0 Price of CC copper rods. This price is as applicable **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)/--/-- for 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, date of manufacturer's dispatch note is to be considered as the date of delivery) or contracted delivery date (including any agreed extension thereto) whichever is earlier.

Notes: All prices of raw materials are exclusive of GST amount. 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/s
3. Price of XLPE Compound (in Rs/MT) is the ex-works price, as quoted by the manufacturer/s
4. Price of Polymer Compound (in Rs/MT) is the ex-work price, as quoted by the manufacturer/s
5. Price of Zero halogen low smoke (LSZH) (in Rs/MT) is the ex-work price, as quoted by the manufacturer/s
6. Price of CC copper rods (in Rs/MT) is ex-works price as quoted by the primary producer
7. Price of galvanized steel strip / steel wire (in Rs/MT) is ex-works price as quoted by the manufacturer for Round steel Wire and Flat steel strip (the relevant price of steel strip or steel wire is to be selected depending upon the type of armouring of the cable)



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IEEMA (PVC)/MV SCREEN CABLE/2019 (R-1)

Effective from: 01 April 2023

Price variation formulae

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

$P = P_o + AIF (AI - AIo) + XLFAL(CC - Cco) + SMIFS (SMIF1 - SMIF0) + CCFAl (PVCc - PVCco)$
 For Single Core unarmoured cables Aluminium factor (AIF) shall be referred from Table ALP

Table References:

ALP	Aluminium conductor Factor in single core (for unarmoured cable) ; AIF
H1	Aluminium Armour Factor for Armour with Al Cond.
H2(a)	XLPE Compound Factor ; XLFAI
H3(a)	Copper Tape Factor ; SMIFS
H5(a)	Polymer factor for Single core cable ; CCFAl

Note: For cases where specific Earth Fault Current through Screen is required, Screen area as approved by the customer in Datasheet/Earth Fault Current calculation of Screen shall be used to derive SMIF as below:

If A= Area of Metallic Screen in Approved Datasheet / Calculation Sheet

D= Density= 8.89 for Cu. & 2.703 for Al; LF = Lay Factor (=1.07, for Copper Wire Metallic Screen and counter helix tape)

$$SMIF = (A \times D \times LF) / 1000$$

H. For Copper conductor XLPE insulated 3.3 to 33 kV Single Core Armoured power cables

$P = P_o + CuF (Cu - Cu0) + XLFCu(CC - Cco) + SMIFS (SMIF1 - SMIF0) + AIF(AI - AIo) + CCFAl (PVCc - PVCco)$

For Single Core unarmoured cables Aluminium factor (AIF) shall be 0

Table References:

CuP	Copper conductor Factor in single core ; CuF
H2(a)	XLPE Compound Factor ; XLFCu
H3(a)	Copper Tape Factor ; SMIFS
H4(a)	Aluminium Armour factor ; AIF
H5(a)	Polymer factor for Single core cable ; CCFCu

Note: For cases where specific Earth Fault Current through Screen is required, Screen area as approved by the customer in Datasheet/Earth Fault Current calculation of Screen shall be used to derive SMIF as below

If A= Area of Metallic Screen in Approved Datasheet / Calculation Sheet

D= Density= 8.89 for Cu. & 2.703 for Al; LF = Lay Factor (=1.07, for Copper Wire Metallic Screen and counter helix tape)

$$SMIF = (A \times D \times LF) / 1000$$



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IEEMA (PVC)/MV SCREEN CABLE/2019 (R-1)

Effective from: 01 April 2023

I. For Aluminium conductor XLPE insulated 3.3 to 33 kV Three Core Armoured power cables

$$P = P_o + AIF (AI - AIo) + XLFAL(CC-Cco) + SMIF (SMIF1-SMIF0) + FeF(FeF1-FeF0) + CCFAl (PVCc - PVCco)$$

For unarmoured Three Core cables, Steel Armour factor (FeF for Strip & FeW for Wire) shall be 0

Table References:

ALP	Aluminium conductor Factor in three core; AIF
H2(b)	XLPE Compound Factor ; XLFAl
H3(b)	Copper Tape Factor ; SMIF
H4(b)	Steel Strip Armour Factor ; FeF
H4(c)	Steel Wire Armour ; FeW
H5(b)	Polymer factor for Three Core cable ; CCFAl

Note: For cases where specific Earth Fault Current through Screen is required, Screen area as approved by the customer in Datasheet/Earth Fault Current calculation of Screen shall be used to derive SMIF as below

If A= Area of Metallic Screen in Approved Datasheet / Calculation Sheet

D= Density= 8.89 for Cu. & 2.703 for Al; LF = Lay Factor (=1.07, for Copper Wire Metallic Screen and counter helix tape)

$$SMIF = (A \times D \times LF)/1000$$

J. For Copper conductor XLPE insulated 3.3 to 33 kV Three Core Armoured power cables

$$P = P_o + CuF (Cu - Cuo) + XLFCu(CC-Cco) + SMIF(SMIF1-SMIF0) + FeF(FeF1-FeF0) + CCFCu (PVCc - PVCco)$$

For Three Core unarmoured cables, Steel Armour factor (FeF for Strip & FeW for Wire) shall be 0

Table References:

CuP	Copper conductor Factor in three core; CuF
H2(b)	XLPE Compound Factor; XLFCu
H3(b)	Copper Tape Factor; SMIF
H4(b)	Steel Strip Armour Factor; FeF
H4(c)	Steel Wire Armour Factor; FeW
H5(b)	Polymer factor for Three Core cable; CCFCu

Note: For cases where specific Earth Fault Current through Screen is required, Screen area as approved by the customer in Datasheet/Earth Fault Current calculation of Screen shall be used to derive SMIF as below

If A= Area of Metallic Screen in Approved Datasheet / Calculation Sheet

D= Density= 8.89 for Cu. & 2.703 for Al; LF = Lay Factor (=1.07, for Copper Wire Metallic Screen and counter helix tape)

$$SMIF = (A \times D \times LF)/1000$$





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IEEMA (PVC)/MV SCREEN CABLE/2019 (R-1)

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K. For Aluminium conductor XLPE insulated 3.3 kV Single Core Armoured power cables

$$P = P_o + AIF (AI - AIo) + XLFAL(CC-Cco) + CCFAl (PVCc - PVCco) + FeF(FeF1-FeF0)$$

For Single Core unarmoured cables Aluminium factor (AIF) shall be referred from Table ALP

Table References:

ALP	Aluminium conductor Factor in single core (for unarmoured cable) ; AIF
H1	Aluminium Armour Factor for Armour with Al Cond.
H2(a)	XLPE Compound Factor ; XLFAI
H4(d)	Steel Strip Armour Factor ; FeF / Steel Wire Armour Factor ; FeW for 3.3KV cables
H5(a)	Polymer factor for Single core cable ; CCFAl

Note: For cases where specific Earth Fault Current through Screen is required, Screen area as approved by the customer in Datasheet/Earth Fault Current calculation of Screen shall be used to derive SMIF as below

If A= Area of Metallic Screen in Approved Datasheet / Calculation Sheet

D= Density= 8.89 for Cu. & 2.703 for Al; LF = Lay Factor (=1.07, for Copper Wire Metallic Screen and counter helix tape) **SMIF = (A x D x LF)/1000**

L. For Copper conductor XLPE insulated 3.3 kV Single Core Armoured power cables

$$P = P_o + CuF (Cu - Cu0) + XLFCu(CC-Cco) + AIF(AI-AIo) + CCFAl (PVCc - PVCco) + FeF(FeF1-FeF0)$$

For Single Core unarmoured cables Aluminium factor (AIF) shall be 0

Table References:

CuP	Copper conductor Factor in single core ; CuF
H2(a)	XLPE Compound Factor ; XLFCu
H4(a)	Aluminium Armour factor ; AIF
H4(d)	Steel Strip Armour Factor ; FeF / Steel Wire Armour Factor ; FeW for 3.3KV cables
H5(a)	Polymer factor for Single core cable ; CCFCu

Note: For cases where specific Earth Fault Current through Screen is required, Screen area as approved by the customer in Datasheet/Earth Fault Current calculation of Screen shall be used to derive SMIF as below

If A= Area of Metallic Screen in Approved Datasheet / Calculation Sheet

D= Density= 8.89 for Cu. & 2.703 for Al; LF = Lay Factor (=1.07, for Copper Wire Metallic Screen and counter helix tape) **SMIF = (A x D x LF)/1000**

The PV factor for metallic screen will be computed based on approved screen area in case of cables having a specific short circuit capacity

Authorized Signatory



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IEEMA (PVC)/MV SCREEN CABLE/2019 (R-1)

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TABLE ALP

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

Nominal Cross Sectional Area (in Sq. mm.)	1 core	3 core
25	0.073	0.219
35	0.101	0.302
50	0.137	0.410
70	0.197	0.593
95	0.274	0.821
120	0.346	1.036
150	0.425	1.279
185	0.533	1.605
240	0.703	2.099
300	0.879	2.635
400	1.126	3.374
500	1.418	4.256
630	1.828	5.494
800	2.340	7.018
1000	2.951	8.834





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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	3 core
25	0.240	0.720
35	0.332	0.993
50	0.451	1.348
70	0.648	1.950
95	0.901	2.700
120	1.138	3.407
150	1.398	4.207
185	1.753	5.279
240	2.312	6.904
300	2.891	8.667
400	3.703	11.097
500	4.664	13.998
630	6.012	18.070
800	7.696	23.082
1000	9.706	29.055





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

Nominal Cross Sectional Area (in Sq. mm.)	Aluminium Factor for Aluminium Armoured Cable with Aluminium Conductor							
	3.3 KV(E) unshielded Arm	3.3 KV(E) shielded Arm	6.6 KV (E)	11 KV (E)/ 6.6 KV (UE)	11 KV (UE)	22 KV (E)	33 KV (E)	33 KV (UE)
35	0.251	0.268	0.284	0.301	0.344	0.358	0.473	0.528
50	0.312	0.324	0.336	0.352	0.397	0.408	0.672	0.695
70	0.385	0.397	0.409	0.423	0.469	0.501	0.723	0.775
95	0.476	0.488	0.500	0.518	0.637	0.656	0.856	0.883
120	0.561	0.574	0.586	0.601	0.726	0.744	0.949	0.985
150	0.653	0.666	0.678	0.696	0.823	0.842	1.050	1.094
185	0.773	0.785	0.797	0.893	0.949	0.965	1.183	1.247
240	0.997	1.030	1.063	1.083	1.139	1.154	1.387	1.463
300	1.209	1.240	1.271	1.283	1.333	1.307	1.753	1.877
400	1.438	1.497	1.556	1.565	1.620	1.636	2.046	2.217
500	1.873	1.887	1.901	1.910	2.110	2.128	2.484	2.613
630	2.337	2.349	2.361	2.369	2.580	2.595	2.978	3.147
800	3.007	3.039	3.071	3.080	3.145	3.163	3.588	3.789
1000	3.737	3.739	3.741	3.749	3.804	3.822	4.565	4.891





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TABLE : H2 (a)
VARIATION FACTOR FOR XLPE(XLFAI/XLFCu)
SINGLE CORE ARMOURED /UNARMOURED XLPE INSULATED 3.3 to 33 KV POWER CABLES WITH AI / Cu CONDUCTOR

Nominal Cross-Sectional Area (in Sq. mm.)	XLPE Factor for Armoured/ Unarmoured Cable with AL /CU Conductor							
	3.3 KV(E) unscreened Arm	3.3 KV(E) screened Arm	6.6 KV (E)	6.6 KV (UE) / 11 KV (E)	11 KV (UE)	22 KV (E)	33 KV (E)	33 KV (UE)
25	0.110	0.117	0.131	0.170	0.279	-	-	-
35	0.122	0.129	0.137	0.175	0.284	0.317	0.522	0.575
50	0.135	0.144	0.151	0.191	0.307	0.341	0.563	0.620
70	0.155	0.165	0.172	0.215	0.342	0.379	0.615	0.678
95	0.174	0.185	0.193	0.241	0.377	0.417	0.670	0.732
120	0.192	0.205	0.212	0.262	0.407	0.449	0.713	0.785
150	0.209	0.223	0.229	0.283	0.437	0.481	0.757	0.832
185	0.228	0.244	0.250	0.308	0.471	0.518	0.809	0.888
240	0.255	0.271	0.279	0.343	0.519	0.569	0.883	0.961
300	0.280	0.296	0.322	0.372	0.560	0.613	0.943	1.030
400	0.326	0.345	0.392	0.420	0.625	0.683	1.041	1.133
500	0.388	0.407	0.461	0.469	0.694	0.757	1.142	1.236
630	0.467	0.490	0.520	0.529	0.777	0.845	1.265	1.356
800	0.567	0.595	0.593	0.602	0.874	0.949	1.407	1.494
1000	0.656	0.688	0.665	0.660	0.955	1.036	1.525	1.624

Note : XLPE factors include Semicons for Conductor & Insulation screen





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TABLE – H2 (b)
VARIATION FACTOR FOR XLPE (XLFAI/XLFCu)

THREE CORE ARMoured /UNARMoured XLPE INSULATED 3.3 to 33 KV POWER CABLES WITH Al / Cu CONDUCTOR

Nominal Cross-Sectional Area (in Sq. mm)	3.3 KV unscreened Arm	3.3 KV screened 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	33 KV (UE) ARM
25	0.315	0.315	0.394	0.511	0.838	-	-	-
35	0.339	0.350	0.427	0.545	0.880	0.982	1.638	-
50	0.378	0.387	0.474	0.600	0.957	1.065	1.751	1.858
70	0.435	0.445	0.541	0.679	1.067	1.183	1.916	2.034
95	0.489	0.499	0.604	0.755	1.171	1.295	2.071	2.194
120	0.537	0.554	0.661	0.822	1.265	1.396	2.210	2.355
150	0.585	0.601	0.719	0.890	1.359	1.497	2.350	2.494
185	0.642	0.660	0.784	0.968	1.468	1.614	2.513	2.665
240	0.717	0.734	0.873	1.074	1.615	1.773	2.732	2.882
300	0.781	0.804	1.006	1.167	1.744	1.928	2.919	3.089
400	0.886	0.910	1.227	1.314	1.948	2.130	3.229	3.399
500	0.956	1.085	1.421	1.446	2.148	2.381	3.588	3.689
630	1.129	1.285	1.582	1.609	2.382	2.630	3.940	4.068

Note : XLPE factors include Semicons for Conductor & Insulation screen





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IEEMA (PVC)/MV SCREEN CABLE/2019 (R-1)**Effective from: 01 April 2023****TABLE – H3 (a)****VARIATION FACTOR FOR COPPER TAPE (SMIFS)**

SINGLE CORE ARMoured /UNARMoured XLPE INSULATED 3.3 to 33 KV POWER CABLES WITH Al / Cu CONDUCTOR

Nominal Cross-Sectional Area in sq.mm.	3.3 KV Screened	6.6 KV (E)	6.6 KV (UE) / 11 KV (E)	11 KV (UE)	22 KV (E)	33 KV (E)	33 KV (UE)
	ARM	ARM	ARM	ARM	ARM	ARM	ARM
35	0.016	0.018	0.020	0.025	0.026	0.016	0.035
50	0.016	0.019	0.022	0.026	0.028	0.035	0.038
70	0.020	0.022	0.024	0.029	0.030	0.037	0.040
95	0.022	0.024	0.026	0.031	0.032	0.039	0.043
120	0.022	0.025	0.028	0.032	0.034	0.041	0.045
150	0.025	0.027	0.029	0.034	0.035	0.042	0.046
185	0.027	0.029	0.031	0.036	0.038	0.045	0.049
240	0.030	0.032	0.034	0.039	0.040	0.047	0.052
300	0.034	0.035	0.036	0.043	0.043	0.050	0.054
400	0.039	0.040	0.041	0.046	0.047	0.054	0.062
500	0.045	0.045	0.045	0.050	0.051	0.058	0.066
630	0.048	0.049	0.050	0.054	0.056	0.063	0.071
800	0.055	0.055	0.055	0.060	0.061	0.068	0.077
1000	0.056	0.060	0.058	0.065	0.066	0.073	0.082





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IEEMA (PVC)/MV SCREEN CABLE/2019 (R-1)

Effective from: 01 April 2023

TABLE – H3 (b)
VARIATION FACTOR FOR COPPER TAPE (SMIF)

THREE CORE ARMOURED /UNARMOURED XLPE INSULATED 3.3 to 33 KV POWER CABLES WITH Al / Cu CONDUCTOR

Nominal Cross-Sectional Area in sq.mm.	3.3 KV Screened	6.6 KV (E)	6.6 KV (UE) / 11 KV (E)	11 KV (UE)	22 KV (E)	33 KV (E)	33 KV (UE)
	ARM	ARM	ARM	ARM	ARM	ARM	
35	0.049	0.055	0.061	0.072	0.079	-	-
50	0.053	0.059	0.065	0.076	0.083	0.104	0.123
70	0.059	0.065	0.071	0.082	0.090	0.111	0.130
95	0.065	0.071	0.077	0.088	0.096	0.117	0.137
120	0.071	0.077	0.083	0.094	0.101	0.123	0.144
150	0.076	0.082	0.088	0.099	0.106	0.128	0.149
185	0.082	0.088	0.094	0.105	0.113	0.134	0.157
240	0.091	0.097	0.103	0.114	0.121	0.143	0.166
300	0.102	0.106	0.110	0.122	0.129	0.150	0.174
400	0.120	0.122	0.124	0.135	0.142	0.164	0.198
500	0.134	0.135	0.136	0.147	0.155	0.176	0.211
630	0.149	0.149	0.149	0.160	0.168	0.190	0.228





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IEEMA (PVC)/MV SCREEN CABLE/2019 (R-1)

Effective from: 01 April 2023

TABLE : H4 (a)
VARIATION FACTOR FOR ALUMINIUM (AIF)
SINGLE CORE ARMOURED XLPE INSULATED 3.3 to 33 KV POWER CABLES WITH
Cu CONDUCTOR

Nominal Cross Sectional Area (in Sq. mm.)	Aluminium Factor for Aluminium Armoured Cable with Copper Conductor							
	3.3 KV(E) unscreened Arm	3.3 KV(E) screened Arm	6.6 KV (E)	11 KV (E)/ 6.6 KV (UE)	11 KV (UE)	22 KV (E)	33 KV (E)	33 KV (UE)
35	0.153	0.170	0.187	0.204	0.247	0.258	0.372	0.426
50	0.179	0.191	0.203	0.220	0.262	0.275	0.425	0.456
70	0.196	0.208	0.219	0.233	0.278	0.311	0.444	0.501
95	0.213	0.225	0.237	0.254	0.373	0.392	0.470	0.523
120	0.228	0.241	0.253	0.268	0.393	0.410	0.488	0.545
150	0.243	0.256	0.269	0.287	0.414	0.432	0.504	0.567
185	0.261	0.273	0.285	0.381	0.437	0.455	0.526	0.600
240	0.324	0.357	0.389	0.410	0.465	0.480	0.556	0.633
300	0.365	0.397	0.428	0.440	0.490	0.510	0.737	0.834
400	0.432	0.452	0.471	0.480	0.536	0.552	0.783	0.895
500	0.489	0.503	0.517	0.526	0.726	0.744	0.844	0.955
630	0.544	0.556	0.568	0.572	0.787	0.801	0.902	1.034
800	0.706	0.747	0.787	0.797	0.862	0.880	0.982	1.111
1000	0.824	0.845	0.865	0.867	0.923	0.940	1.324	1.504





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IEEMA (PVC)/MV SCREEN CABLE/2019 (R-1)

Effective from: 01 April 2023

TABLE : H4 (b)

VARIATION FACTOR FOR STEEL STRIP ARMOUR (FeF)

THREE CORE ARMoured XLPE INSULATED 3.3 to 33 KV POWER CABLES WITH Al / Cu CONDUCTOR

Nominal Cross Sectional Area Sq. mm.	3.3 KV (E) unscreened arm	3.3 KV (E) screened arm	6.6 KV (E)	11 KV (E) / 6.6 KV (UE)	11 KV (UE)	22 KV (E)	33 KV (E)	33 KV (UE)
25	0.551	0.553	0.604	0.656	0.814	-	-	-
35	0.645	0.645	0.645	0.731	0.879	0.937	-	-
50	0.675	0.684	0.703	0.761	0.937	0.966	1.181	1.301
70	0.761	0.764	0.761	0.849	0.996	1.055	1.289	1.393
95	0.820	0.828	0.849	0.907	1.083	1.113	1.348	1.454
120	0.879	0.924	0.907	0.966	1.142	1.172	1.406	1.531
150	0.966	0.988	0.966	1.055	1.201	1.259	1.494	1.592
185	1.025	1.051	1.055	1.113	1.259	1.318	1.553	1.668
240	1.142	1.147	1.142	1.231	1.377	1.406	1.641	1.760
300	1.231	1.258	1.259	1.318	1.465	1.524	1.758	1.852
400	1.348	1.402	1.406	1.435	1.582	1.641	1.876	1.990
500	1.454	1.500	1.573	1.642	1.714	1.758	2.095	2.100
630	1.632	1.680	1.745	1.943	1.889	1.918	2.150	2.280

TABLE : H4 (c)

VARIATION FACTOR FOR STEEL WIRE ARMOUR (FeW)

THREE CORE ARMoured XLPE INSULATED 3.3 to 33 KV POWER CABLES WITH Al / Cu CONDUCTOR

Nominal Cross Sectional Area in Sq. mm	3.3 KV (E) Unscreened arm	3.3 KV (E) screened arm	6.6 KV (E)	11 KV (E) / 6.6 KV (UE)	11 KV (UE)	22 KV (E)	33 KV (E)	33 KV (UE)
25	1.258	1.358	1.457	1.612	2.509	1.503	-	-
35	1.361	1.465	1.569	1.853	2.644	2.797	2.517	-
50	1.682	1.685	1.687	2.321	2.800	2.921	4.569	4.603
70	1.938	1.959	1.979	2.503	3.219	3.347	4.809	4.935
95	2.202	2.355	2.507	2.718	4.019	4.200	5.437	6.553
120	2.371	2.523	2.675	2.882	4.241	4.416	6.713	6.820
150	2.776	2.812	2.847	3.265	4.447	4.621	6.976	7.088
185	3.121	3.215	3.309	4.148	4.726	5.289	7.356	7.489
240	3.758	3.993	4.227	4.442	5.442	6.651	7.718	7.890
300	4.099	4.562	5.024	5.182	6.894	7.084	8.187	8.359
400	5.750	6.161	6.572	6.658	7.433	7.657	8.760	8.960
500	6.716	6.747	6.777	6.861	7.588	7.797	8.830	9.629
630	6.767	7.116	7.465	7.477	8.209	8.386	9.413	10.365





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Effective from: 01 April 2023

TABLE : H4 (d)

VARIATION FACTOR FOR STEEL WIRE ARMOUR (FeW/FeF)

SINGLE CORE ARMoured XLPE INSULATED 3.3 KV POWER CABLES WITH Al / Cu CONDUCTOR

Nominal Cross section area in sq. mm	Single Core 3.3 kV	
	FeF	FeW
25	0.276	0.385
35	0.303	0.409
50	0.314	0.442
70	0.331	0.528
95	0.341	0.584
120	0.369	0.629
150	0.395	0.676
185	0.423	0.731
240	0.464	0.92
300	0.504	0.982
400	0.573	1.215
500	0.613	1.359
630	0.696	1.518

TABLE : H5 (a)

VARIATION FACTOR FOR Polymer (CCFAL/CCFCu)

SINGLE CORE ARMoured XLPE INSULATED 3.3 to 33 KV POWER CABLES WITH Al / Cu CONDUCTOR

Nominal Cross Sectional Area (in Sq. mm)	3.3 KV(E) Unscreened ARM	3.3 KV(E) screened 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	33 KV (UE) ARM
35	0.123	0.197	0.259	0.278	0.330	0.376	0.468	0.493
50	0.152	0.209	0.272	0.294	0.379	0.394	0.483	0.530
70	0.170	0.227	0.295	0.317	0.404	0.419	0.508	0.583
95	0.184	0.244	0.317	0.338	0.435	0.449	0.554	0.609
120	0.197	0.261	0.337	0.392	0.457	0.472	0.576	0.634
150	0.194	0.303	0.389	0.413	0.477	0.492	0.597	0.656
185	0.224	0.322	0.414	0.445	0.502	0.539	0.674	0.767
240	0.276	0.354	0.456	0.479	0.558	0.573	0.711	0.806
300	0.294	0.377	0.489	0.506	0.587	0.602	0.811	0.915
400	0.333	0.450	0.569	0.578	0.687	0.703	0.866	0.974
500	0.367	0.493	0.675	0.679	0.809	0.826	1.056	1.139
630	0.438	0.611	0.735	0.739	0.873	0.928	1.168	1.290
800	0.529	0.734	0.863	0.866	1.027	1.05	1.189	1.380
1000	0.648	0.880	1.031	1.035	1.138	1.158	1.402	1.619

Note: The above factors are for PVC and Zero Halogen low smoke (LSZH) and for PE factor, the above factor will be multiplied by 0.63





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Effective from: 01 April 2023

TABLE : H5 (a)

VARIATION FACTOR FOR Polymer (CCFAL/CCFCu)

SINGLE CORE UNARMoured XLPE INSULATED 3.3 to 33 KV POWER CABLES WITH Al / Cu CONDUCTOR

Nominal Cross Sectional Area (in Sq. mm)	3.3 KV(E) Unscreened ARM	3.3 KV(E) screened 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	33 KV (UE) ARM
35	0.158	0.191	0.224	0.252	0.323	0.342	0.361	0.380
50	0.177	0.209	0.240	0.269	0.342	0.361	0.520	0.539
70	0.198	0.232	0.265	0.296	0.370	0.391	0.551	0.572
95	0.233	0.261	0.288	0.318	0.396	0.450	0.582	0.636
120	0.253	0.282	0.310	0.342	0.454	0.477	0.613	0.636
150	0.269	0.299	0.328	0.361	0.476	0.500	0.638	0.662
185	0.292	0.323	0.354	0.420	0.508	0.532	0.719	0.743
240	0.322	0.371	0.419	0.455	0.547	0.572	0.766	0.791
300	0.355	0.408	0.461	0.490	0.585	0.610	0.863	0.888
400	0.423	0.474	0.524	0.539	0.683	0.711	0.932	0.960
500	0.477	0.553	0.629	0.635	0.743	0.825	1.059	1.141
630	0.548	0.620	0.691	0.697	0.866	0.898	1.144	1.176
800	0.672	0.749	0.826	0.833	1.016	1.051	1.320	1.355
1000	0.789	0.877	0.964	0.964	1.099	1.200	1.488	1.589

Note: The above factors are for PVC and Zero Halogen low smoke (LSZH) and for PE factor the above factor will be multiplied by 0.63

TABLE : H5 (b)

VARIATION FACTOR FOR POLYMER (CCFAI / CCFCu)

THREE CORE ARMoured XLPE INSULATED 3.3 to 33 KV POWER CABLES WITH Al / Cu CONDUCTOR

Nominal Cross Sectional Area (in Sq. mm)	3.3 KV (E) Unscreened ARM	3.3 KV (E) screened 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	33 KV (UE) ARM
35	0.374	0.634	0.990	1.142	1.604	1.782	-	
50	0.445	0.702	1.119	1.260	1.834	2.046	2.864	3.070
70	0.547	0.863	1.290	1.396	2.011	2.284	3.219	3.380
95	0.594	0.990	1.440	1.647	2.269	2.428	3.367	3.721
120	0.732	1.214	1.692	1.877	2.498	2.715	3.646	4.020
150	0.812	1.355	1.906	2.061	2.767	2.931	3.927	4.216
185	0.960	1.589	2.086	2.406	3.028	3.180	4.166	4.529
240	1.130	1.832	2.484	2.744	3.398	3.580	4.589	4.917
300	1.219	2.201	2.912	3.161	3.840	4.016	5.029	5.325
400	1.313	2.561	3.530	3.664	4.353	4.666	5.736	5.911
500	1.652	3.138	3.925	3.971	4.621	4.878	5.913	6.625
630	1.949	3.774	4.487	4.982	5.225	5.477	6.696	7.445

Note: The above factors are for PVC and Zero Halogen low smoke (LSZH) and for PE factor the above factor will be multiplied by 0.63



Revised ANNEXURE A

Maharashtra State Power Generation Company Limited			
Bhusawal Project (1x660MW)			
Proforma of Vendor Approval			
Sr. No.	Information/ Particulars required	Details furnished along with documents thereof	Remarks if any
1	Name of System /Package/Item:		
2	Name of agency on whom order for the main work is placed		
3	Approval for (Name of construction material)	HT XLPE POWER CABLE	
4	Name of the vendors specified in contract document for this material		
5	Name of the proposed Sub Contractor(Vendor)		
6	Reasons for asking new vendor		
7	Details of supporting documents in lieu of above reasons		
8	Specific requirement of material in terms of dia, size, quantity etc.		
9	When the material is required & for which structure		
10	Whether vendor is Partnership/ Pvt./Public Ltd. Company		
11	Particular of registration with Government		
	i) GST registration No.		
	ii) Company registration No. & Incorporation Certificate		
	iii) PF & ESIC Certificate.		
	iv) Pan No.		
12	Address of vendor's factory		
13	Contact No. of vendor's representative for additional information		
14	Production Business Area		
16	Average annual turnover for last three years as per CA's Certificate		
17	Name of Companies where the vendor is registered		
18	Details of orders completed last 3 years (Quantity & amount)		
19	Details of orders in hand (Quantity & amount)		
20	Maximum value & quantity of work executed during last 3 years		
21	Name of the reputed, well known clients to whom the vendor has supplied the material		
22	End users Performance Certificate (Name & documents) along with the relevant PO.		
23	Any additional information		
24	Recommendation		

undertake compliance of this and any false declaration and non-compliance of this would be a ground for immediate termination of the contract and further legal action in accordance with the laws./जेम की सामान्य शर्तों के खंड 26 के संदर्भ में भारत के साथ भूमि सीमा साझा करने वाले देश के बिडर से खरीद पर प्रतिबंध के संबंध में भारत के साथ भूमि सीमा साझा करने वाले देश का कोई भी बिडर इस निविदा में बिड देने के लिए तभी पात्र होगा जब वह बिड देने वाला सक्षम प्राधिकारी के पास पंजीकृत हो।बिड में भाग लेते समय बिडर को इसका अनुपालन करना होगा और कोई भी गलत घोषणा किए जाने व इसका अनुपालन न करने पर अनुबंध को तत्काल समाप्त करने और कानून के अनुसार आगे की कानूनी कार्रवाई का आधार होगा।

---Thank You/धन्यवाद---

Index of Annexures

GeM Tender Enquiry for HT XLPE POWER CABLE for 1x 660 MW BHUSAWAL Project

Sl. No.	Description	Annexures
1.	Additional terms and conditions (ATC)	Annexure I
2.	BOQ (Mandatory Spares)	Annexure II
3.	Delivery Schedule and Validity	Annexure III
4.	Land border certificate	Annexure IV
5.	Certificate for local Content	Annexure V
6.	Technical PQR	-
7.	Technical Specification incl. PVC	-
8.	Mahagenco Performa for Vendor approval	Annexure A

ANNEXURE –I (HT XLPE POWER CABLE)

Additional Terms and Conditions (ATC)

Additional Terms and Conditions for subject Tender Enquiry to be complied by Bidders for Consideration in this tender:

1. Dispatch Markings: -

Each box shall be marked with Capital Letters in “Red” indicating the PEM supply (Mandatory Spare) for 1x 660 MW Bhusawal Thermal Power Station Project. 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.

Mandatory Spares: - The 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 ultimate customer MAHAGENCO. One Copy of Packing list must be put inside the Box along with Manufacturing drawing no. reference, Catalogue reference etc.

Note :- MDCC for mandatory Spares shall be issued only after receipt of detailed list of mandatory spares & photographs before final packing clearly showing mandatory spares with due tagging as per packing list (to be sent over mail/CD).

2. Liquidated Damages: -

- a) **LD on mandatory spares portion:** - LD shall be applicable @ ½ percent and applicable GST thereon, of the total mandatory spares portion contract value excluding GST per week or part thereof, limiting to 10% of total contract value of mandatory spares excluding GST.

NOTE:

i. LR/RR date for indigenous supplies (Bill of Lading/AWB for Foreign supplies) shall be treated as the date of dispatch for levying LD. However, if receipted LR date for indigenous supply is beyond 30 days for FTL/ 45 days for PTL from the date of LR (PTL to be clearly mentioned in LR), such excess period shall be considered for LD purpose irrespective of dispatch date. Import General Manifest (IGM)/Bill of entry date (whichever is earlier), for foreign supplies, is beyond 90 days from the date of Bill of Lading/AWB, such excess period shall be considered for LD purpose irrespective of dispatch date.

ii. In case of any amendment/ revision, LD shall be linked to the amended/ revised contract value and delivery date(s).

ANNEXURE –I (HT XLPE POWER CABLE)

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iii. The sum specified above is not a penalty but a genuine pre-estimate of the loss/ damage which will be suffered by purchaser on account of delay on the part of the Contractor/Seller and the said amount will be deductible without proof of actual loss or damage caused by such delay.

3. Performance Security (Performance bank Guarantee or Security Deposit): -

3.1 Details of PS amount, mode of submission, forfeit etc. shall be as follows-

I. Initially 10% of the contract value (total order value in case of GeM POs excluding PVC). However, 5% of the contract value (as above) will be released after completion of Main Supply based on certification by Project Group.

OR

II. 5% of the contract value (total order value in case of GeM POs excluding PVC). Additional 5% of the contract value will be retained from first bill & subsequent bill(s) of the same contract. The retention amount will be released after completion of Main Supply based on certification by Project Group.

a) Initial validity of performance security shall be 25 months from PO date (Considering delivery period of 05 months (150 days' delivery) + 18 months guarantee period + 2 months claim period is already mentioned in GTC cl no. 7.ii GeM 3.0). Further, extension if any shall be as per GeM Terms.

b) Time for submission of Performance Bank Guarantee shall be 14 days from the date of PO/LOA.

Note:- Bidder to mandatorily choose second option(ii) in view of recent changes in GFR.

3.2 Modes of deposit:

Performance security may be furnished in the following forms:

- a. Local cheques of Scheduled Banks (subject to realization)/ Pay Order/ Demand Draft/ Electronic Fund Transfer in favour of BHEL.
- b. Bank Guarantee from Scheduled Banks / Public Financial Institutions as defined in the Companies Act. The Bank Guarantee format should have the approval of BHEL.
- c. Fixed Deposit Receipt issued by Scheduled Banks / Public Financial Institutions as defined in the Companies Act (FDR should be in the name of the Contractor, a/c BHEL).
- d. Securities available from Indian Post offices such as National Savings Certificates, Kisan Vikas Patras etc. (held in the name of Contractor furnishing the security and duly endorsed/ hypothecated/ pledged, as applicable, in favour of BHEL).
- e. Insurance Surety Bond.

(Note: BHEL will not be liable or responsible in any manner for the collection of interest or renewal of the documents or in any other matter connected therewith).

Performance Security is to be furnished within 14 days from the date of PO and it should remain valid for a period of 60 (sixty) days beyond the date of completion of all contractual obligations of the supplier, including warranty obligations.

3.3 Forfeiture of Performance Security:

- a. The performance security will be forfeited and credited to BHEL's account in the event of a breach of contract by the supplier.

ANNEXURE –I (HT XLPE POWER CABLE)

Additional Terms and Conditions (ATC)

- b. PS should be refunded to the contractor without interest, after he duly performs and completes the contract in all respects but not later than 60 (sixty) days of completion of all such obligations including the warranty under the contract.
- c. The Performance Security shall not carry any interest.

4. BID SECURITY/ Earnest Money Deposit (EMD)

BID SECURITY/ Earnest Money Deposit (EMD) is applicable. Same shall made part of NIT.

Details of EMD amount, mode of submission, etc. shall be as follows-

EMD amount shall be **Rs. 60,000/-**

EMD is to be submitted by the all bidders along with their bids (except the bidders who are exempted as per as per Clause 4.xiii.m of GeM GTC). At the time of bidding, bidders to upload scanned copy of relevant document for claiming EMD exemption.

4.1 Modes of deposit -

The EMD may be accepted only in the following forms:

Electronic Fund Transfer credited in BHEL account (before tender opening)

- i. BHEL-PEM account details are as follows:
Bank name- State Bank of India
Account No: 39922687394
IFSC: SBIN0017313
BRANCH-CAG II NEW DELHI
- ii. Banker's cheque/ Pay order/ Demand draft, in favour of BHEL-PEM, Noida (along with the offer).
- iii. Fixed Deposit Receipt (FDR)
- iv. Bank Guarantee from any of the Scheduled Banks.
- v. Insurance Surety Bonds.

The EMD shall remain valid for a period of 45 (forty-five) days beyond the final bid validity period.

4.2 Forfeiture of EMD

- i. A bidder's EMD will be forfeited if the bidder withdraws or amends its/his tender or impairs or derogates from the tender in any respect within the period of validity of the tender or if the successful bidder fails to furnish the required performance security within the specified period mentioned in the Tender.
- ii. EMD by the tenderer to be withheld in case any action on the bidder is envisaged under the provisions of extant "Guidelines on Suspension of business dealings with suppliers/ contractors (abridged version of guidelines is available on www.bhel.com)" and forfeited/ released based on the action as determined under these guidelines.
 - 4.2.1** (i) Bid securities of the unsuccessful bidders shall be returned to them after expiry of the final bid validity period and latest by the 30th day after the award of the contract. However, Bid securities of unsuccessful bidders during first stage i.e. technical-commercial evaluation

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etc. shall be returned within 30 days of declaration of result of first stage i.e. technical-commercial evaluation.

(ii) Bid security shall be refunded to the successful bidder on conclusion of the order/ receipt of a performance security.

(iii) EMD shall not carry any interest.

5. Breach of contract, Remedies and Termination:

“In case of Breach of Contract, BHEL shall recover 10% of the contract value from the Vendor using following instruments:

- i. encashment of security instruments like EMD, Performance Security with PEM against the said contract.
 - ii. balance amount (if value of security instruments is less than 10% of the contract value) from other financial remedies i.e. available bills of the Vendor, retention amount etc with PEM.
 - iii. balance amount from security instruments like EMD, Performance Security and other financial remedies i.e. available bills of the Vendor, retention amount etc. with other units of BHEL.
 - iv. if recovery is not possible then legal remedies shall be pursued”.
6. For recognition of dispatch, vendor to submit following documents to BHEL by e-mail immediately on dispatch: - GST compliant invoice, LR (indicating Invoice No., no. of boxes, PTL (if applicable) etc.), Packing List (Must be indicating No. of boxes, Packing size, Gross weight and net weight of each package, Contents of the package with cross reference to BoM item code no. or item serial no. and Quantity of each item separately), Insurance Intimation to underwriter through email/fax, Dispatch Clearance.

B. Following ATC available in GEM shall also be made part of NIT: -

- i. Bidder's offer is liable to be rejected if they don't upload any of the certificates / documents sought in the Bid document, ATC and Corrigendum if any.
- ii. Bidders are advised to check applicable GST on their own before quoting. Buyer will not take any responsibility in this regards. GST reimbursement will be as per actuals or as per applicable rates (whichever is lower), subject to the maximum of quoted GST %.
- iii. Data Sheet of the product(s) offered in the bid, are to be uploaded along with the bid documents. Buyers can match and verify the Data Sheet with the product specifications offered. In case of any unexplained mismatch of technical parameters, the bid is liable for rejection.
- iv. The bidder is required to upload, along with the bid, all relevant certificates such as BIS license, type test certificate, approval certificates and other certificates as prescribed in the Product Specification given in the bid document.
- v. While generating invoice in GeM portal, the seller must upload scanned copy of GST invoice and the screenshot of GST portal confirming payment of GST.

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Additional Terms and Conditions for subject Tender Enquiry to be complied by bidders for consideration in this tender:

- A. 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 organization contact number and E-mail Id. In case the same is found not available, BHEL has the right to reject such document from evaluation.
- B. "This item /package/system falls under the list of items defined in para 3 of ministry of finance guideline date 20.09.16 (procurement of items related to public safety, health, critical security operations and Equipment's etc.) & hence criteria of prior experience /turnover shall be same for all bidders including start up /MSME".
- C. **Guarantee & Warrantee** shall be as per Cl. No. 10 of GTC on GeM for the bid. However, Guarantee & Warrantee time period shall be 18 months from the date of last supply in the contract.
- D. Evaluation shall be on the basis of total all inclusive, landed price at consignee destination (Refer Cl. No. 6 of GTC on GEM).
- E. **Terms of Delivery:** FOR Dispatch Station Basis. However, Transit insurance shall be in the scope of seller and unloading of items (at delivery point) shall be in buyer scope. Further, w.r.t. Transit Insurance supplier has to inform the details of dispatches (such as Policy No., Consignee Name, Consignment Packing details, Project Name, Purchase Order No., LR No. & date, Invoice No. & date, Dispatch Origin & destination details etc.) to policy underwriter under intimation to BHEL.
- F. PQR criteria uploaded with Buyer uploaded Bid Specific document shall prevail value of Experience criteria and Past performance parameter mentioned in GeM bid.
- G. **Inspection call to be raised by bidder on BHEL CQIR portal** (details shall be shared at the of execution of order) and Inspection agency shall attend at the inspection within seven (07) days of the date on which the material is notified as being ready. In case of delay in witnessing of inspection beyond stipulated time (i.e. 7 days from the date on which the material is notified as being ready), by BHEL arising due to reasons not attributable to vendor, BHEL will extend the delivery period for such delay in carrying out inspection. If BHEL is not able to witness inspection up to 15 days then in addition to delay beyond stipulated period, extension in delivery time of 07 days for arranging fresh inspection will be given.
When the tests have been satisfactorily completed at Seller/ Contractor's works, the Inspection Agency shall issue an inspection report that effect within seven (07) days after completion of the tests, but if the tests were not witnessed by the Inspection Agency or his representative, the material acceptance report would be issued within seven (07) days after receipt of the test certificates by the Purchaser.
Purchaser will issue MDCC to the Seller/ Contractor within 7 days based on inspection report/ test certificates/Certificate of Conformance as applicable. In case of delay in issuance of MDCC beyond 7 days stipulated time (i.e. from the date of successful inspection report), by BHEL arising due to reasons not attributable to vendor, BHEL will extend the delivery period for such delay in issuing MDCC. If BHEL is not able to issue MDCC up to 15 days then in addition to delay beyond stipulated period, 7 days' additional time shall be given to vendor to facilitate the vendor for arranging logistics arrangements.
- H. All Bidders shall be required to submit applicable Freight % & GST % included in their prices during clarification stage of Tender.

ANNEXURE –I (HT XLPE POWER CABLE)

Additional Terms and Conditions (ATC)

- I. Payment Terms:** As per clause no. 12 (i) of GTC on GeM. Payments shall be made to the Seller within 90 days (45 days for seller qualified and registered as Micro or small and 60 days for Medium enterprises as per MSMED Act.) of issue of consignee receipt-cum-acceptance certificate (CRAC) and on-line submission of bills (This is in supersession of 10 days' time as provided in clause 12 of GeM GTC).
- Supplier has to provide Original Tax Invoice + 1 copy of Tax invoice, Packing List, LR/RR or AWB, CRAC, Insurance intimation, Guarantee Certificate, E-way bill (as applicable) for payment.
- Further bidder to submit the final documents (Final drgs & Inspection document) in 12 no.s of hard copies and 04 no.s of CD along with Invoice.
- Provision of offline payment in GeM shall be utilized.
- J. Bid reserved for Make in India products:** - Procurement under this bid is reserved for purchase from Class 1 local suppliers as defined in public procurement (Preference to Make in India), Order 2017 as amended from time to time and its subsequent Orders/Notifications issued by concerned Nodal Ministry for specific Goods/Products. The minimum local content to qualify as a class 1 local supplier is denoted in the bid document as 60%. All bidders must upload a certificate from the OEM regarding the percentage of the local content and the details of locations at which the local value addition is made along with their bid, failing which the bid is liable to be rejected.
- Regarding verification of local content, the local supplier at the time of tender, bidding or solicitation shall be required to provide certification (as per enclosed **Annexure-V**) as per para 9 of PP-MII order revision dated 16.09.2020.
- K. This is conditional tender enquiry. Financial bid opening (Part-II) of a bidder shall be subjected to following: -**
- (i) Approval of bidder by Customer (Mahagenco)- Vendor approval from end customer shall be sought based on the credentials submitted by bidders as per MAHAGENCO vendor approval format (Annexure A)
 - (ii) Techno-Commercial evaluation/recommendation by BHEL.
 - (iii) Qualification of Technical PQR
 - (iv) Offered item should mandatorily conform to PP-MII order provisions.
- L. Consignee Details** (for PRC - Provisional Receipt Certificate & CRAC - Consignee's Receipt cum Acceptance Certificate, as applicable) shall be as per Project Site official details.
- M.** The Bidder has to declares 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.
- N. Bidders to ensure the following: -**
- Ensure compliance to Ministry of Power (MoP) Order No. 11/05/2018-Coord. dt. 28/07/2020, if applicable.
 - Ensure compliance of Ministry of Finance (MoF) Order (Public Procurement No. 4) F. No. 7/10/2021(1) PPD dt. 23.02.23.
 - to submit "Model Certificate for Tenders" as per **Annexure-IV** of Ministry of Finance (MoF) Order (Public Procurement No. 4) F. No. 7/10/2021(1) PPD dt. 23.02.23. Bidder to submit the following

ANNEXURE –I (HT XLPE POWER CABLE)

Additional Terms and Conditions (ATC)

undertaking on their letter head duly signed from the highest competent authority at your end (i.e Owner, partner, CMD, Director etc.)

- O. Delivery & Validity Period:** As per annexure III. Delivery period mentioned in GeM portal is tentative.
- P.** For registration in BHEL PEM- Online registration portal is operational, Non-registered Vendors who wish to apply for registration in BHEL-PEM can apply through Online Registration Portal available at www.pem.bhel.com - vendor section - Online Supplier Registration. All credentials and/or documents duly signed and stamped related to registration can be uploaded on the website and submit the application for registration. However, registration of suppliers is not mandatory in case of open tender.
- Q.** Quantity Variation Clause- Nil Quantity Variation
- R.** CIF is not applicable for subject tender.
- S.** PVC shall be applicable for subject package as per enclosed PVC annexure. Base date is January 2024 (One month prior to date of tendering). Price variation shall be limited to +20% and -ve price variation shall be unlimited. PVC shall be payable only for contractual delivery period (including delivery extensions if any) i.e no PVC shall be payable for delay in delivery attributed to vendor & in delayed delivery cases, PVC for contractual delivery date & actual delivery date shall be compared and whichever is found lower side shall be payable to vendor.
- T.** MSE Preference: - Being subject package is not divisible and MSE preference shall not be given.
- U.** Bidder to note the following: -
- A bidder shall not have conflict of interest with other bidders. Such conflict of interest can lead to anti-competitive practices to the detriment of Procuring Entity's interests. The bidder found to have a conflict of interest shall be disqualified. A bidder may be considered to have a conflict of interest with one or more parties in this bidding process, if:
- they have controlling partner (s) in common;' or
 - they receive or have received any direct or indirect subsidy/ financial stake from any of them; or
 - they have the same legal representative/agent for purposes of this bid; or
 - they have relationship with each other, directly or through common third parties, that puts them in a position to have access to information about or influence on the bid of another Bidder; or
 - Bidder participates in more than one bid in this bidding process. Participation by a Bidder in more than one Bid will result in the disqualification of all bids in which the parties are involved. However, this does not limit the inclusion of the components/ sub-assembly/ Assemblies from one bidding manufacturer in more than one bid, or
 - In cases of agents quoting in offshore procurements, on behalf of their principal manufacturers, one agent cannot represent two manufacturers or quote on their behalf in a particular tender enquiry. One manufacturer can also authorize only one agent/dealer. There can be only one bid from the following:
 1. The principal manufacturer directly or through one Indian agent on his behalf; and
 2. Indian/foreign agent on behalf of only one principal,'or
 - A Bidder or any of its affiliates participated as a consultant in the preparation of the design or technical specifications of the contract that is the subject of the Bid, or
 - In case of a holding company having more than one independently manufacturing units, or more than one unit having common business ownership/management, only one unit should quote. Similar restrictions would apply to closely related sister companies. Bidders must proactively declare such sister/ common business/ management units in same/ similar line of business. "

ANNEXURE –I (HT XLPE POWER CABLE)

Additional Terms and Conditions (ATC)

- V.** All other terms & conditions shall be as per GeM bid, selected Additional Terms & Conditions from GeM library and GTC on GeM 4.0 (version 1.14) available on GeM Portal on enquiry floating date shall be applicable.

Note:- Unit of Measurement (UOM) should be read as Meter only instead of Set.

1X660 MW BHUSAWAL TPS

**ANNEXURE -II TO BOQ-CUM-PRICE SCHEDULE FOR HT XLPE POWER CABLES
(MANDATORY SPARES)**

Sr. No.	Item code	Item description	Unit	Order Quantity (metres)	Drum Length (Meters)
1.0		11/11 KV AL. CONDUCTOR/ XLPE INSULATED/ ARMoured/ UNEARTHED GRADE POWER CABLE			
1.1	507-27151-A	3C-240	MTR	500	500
1.2	507-27009-A	1C-500	MTR	1000	500
1.3	507-27025-A	1C-630	MTR	500	500
2.0		3.3/3.3 KV AL. CONDUCTOR/ XLPE INSULATED/ ARMoured/ UNEARTHED GRADE POWER CABLE.			
2.1	507-27150-A	3C-240	MTR	500	500

NOTES:

1. Total Quantity indicated above shall be known as Order Quantities. Bidder to supply total quantity in one LOT.
2. The bidder shall indicate the unit price for items inclusive of type test charges. No separate Type Test charges are to be quoted by bidder.
3. Tolerance on individual drum length shall be $\pm 5\%$.
4. 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.

Annexure III to Delivery terms and Validity

1. Delivery Schedule

- a. **Main Supply (Mandatory Spares):** Delivery completion shall be 150 days from the PO date.

List of applicable drawings/ documents as per Technical Specification No. of PE-TS-417-507-E001 (REV. 0) shall be considered for delivery and their submission / re-submission schedule shall be as follows: -

1st submission of drawings / documents – 7 days

BHEL comments – 03 days

Re-submission of drawings / documents – 2 days

BHEL & Customer comments / approval – 18 days

Notes:

- a. Supplier to start manufacturing/supply only after getting the applicable engineering Drgs. /docs approved from BHEL/End Customer.
- b. Drawings /documents submission/re-submission schedule shall be as indicated in technical specification which shall be used for progress monitoring purpose and required course correction, if any.
- c. The delivery date specified is for completion of the deliveries. Deliveries to start progressively so as to meet the completion schedule.
- d. The delivery conditions specified are for contractual purposes. However, to meet project requirement, BHEL may ask for early deliveries without any compensation thereof.

2. **Validity of contract (PO rates, terms and conditions):** Vendor has to make supply of goods/services as per the delivery time mentioned above. However, due to unavoidable circumstances if delay happens in providing inputs/ clearances (inputs, Engineering approvals, deputing inspector for inspection, issuance of MDCC and any hold imposed owing to site issues etc.) for which delivery time extension is admissible as per point no. 3, in such situation it shall be obligatory at vendor part to execute the contract at PO rates, terms and conditions where inputs/ clearances has been accorded within validity of contract. Validity period for various activities shall be as defined below or as mentioned in the NIT.

2.1. Validity of the contract

- Contract shall be valid for 180 days from the PO date. However, delay at vendor's end (if any) shall be added to the validity period and contract validity shall get extended by the delay period at vendor's end.

For example: Original Delivery period for: A (in days)

Delay at vendor's end: B (in days beyond "A" days)

Contract validity: C+B (in days)

Annexure III to Delivery terms and Validity

Notes:

- a. B is the Vendor delay days beyond original contractual delivery period for main supply /extended delivery period owing to time taken by BHEL at point no. 2 above.
- b. Execution of the contract quantities released beyond contract validity period shall be decided on mutual consent basis at PO rates, terms and conditions.

3. Delivery Extension: Extension of contractual delivery time:

Delivery time mentioned in the NIT includes Engineering completion time (time for drawing/document submission/resubmission by the vendor and review/approval of the same by the BHEL/End customer), manufacturing, inspection, Packing and dispatch time. Due diligence is to be observed by the vendor to ensure timely completion of engineering and supply.

During the execution of the contract, time loss occurred owing to the reason attributable to BHEL besides force majeure shall be considered for delivery time extension to the vendor as given below: -

- i. Any Delay in providing comments/ approval on Primary drawing/documents beyond the stipulated time as specified in NIT.
- ii. Time Loss in approval of the drawing/document as a result of increase in the iteration not attributable to the vendor (i.e. resubmission owing to end customer comments) as certified by BHEL. Time extension equivalent to the resubmission time noted in the tech. spec and consequential increase in the approval time in lieu of increase in iteration shall be applicable. However, for incomplete re- submission time loss shall be in vendor account.
- iii. Delay in providing engineering input/material by BHEL.
- iv. Delay in deputing inspector for inspection and delay in release of MDCC in line with GCC/ GEM ATC terms.
- v. Any hold put by BHEL for whatever reasons during execution of contract (within contract validity period), time extension equivalent to hold period shall be admissible. However, in the event hold period continues for more than 30 days then, an additional fifteen days for the purposes of mobilization and demobilization of resources shall also be admissible.

Note: Extension in delivery period if any with or without imposition of LD shall be considered after detailed delay analysis based on provisions given above. However, no delay analysis will be applicable if supply is completed within delivery schedule as specified in Purchase order.

Annexure IV

An undertaking regarding Model Clauses on company letter head only

(To be provided along with bid)

Reference: NIT No.-

Package: - HT XLPE POWER CABLES (MANDATORY SPARES)

Project: 1x 660 MW BHUSAWAL TPS

TO WHOM SO IT MAY CONCERN

This is with reference to Ministry of Finance circular dated 23.02.23 reg. restriction under rule 144 (xi) of GFR.

"I have read the clause regarding restrictions on procurement from a bidder of a country which shares a land border with India. I hereby certify that M/s (bidder name) is not from such a country and is eligible to be considered/participate in tender enquiry for against aforesaid tender enquiry.

Sign & Signature (Not below Director/owner of the company)

Date:

Place:

ANNEXURE V
1x 660 MW BHUSAWAL TPS
HT XLPE POWER CABLES (MANDATORY SPARES)
Letter head of Company

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-.....

Package: - HT XLPE POWER CABLES (MANDATORY SPARES)

Project: 1x 660 MW BHUSAWAL TPS

Dear Sir,

We hereby certify that items offered by us of HT XLPE power Cables (Mandatory Spares) for 1x 660 MW Bhusawal Project(minimum % of local content) meets the requirement of minimum local content in line with applicable clause of Make In India and the Public Procurement (Preference to Make in India), Order 2017 dated- 15.06.2017, 28.05.2018 & 29.05.2019, 04.06.20, 16.09.20 and subsequent order dated 16.11.21.


We further confirm 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)

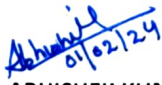
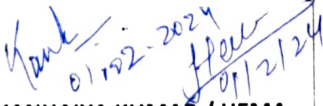


authorized signatory
of company

	BHUSAWAL TPS (1X660 MW)	PE-PQ-415-507-E001
	PRE-QUALIFICATION REQUIREMENTS FOR HT XLPE POWER CABLES	REVISION NO. 00 DATE 01.02.2024
		Page 1 of 1

ITEMS: HT XLPE POWER CABLE	
SCOPE: Supply: YES; Erection & Commissioning: NO;	
1	Vendor should be a manufacturer of HT Power Cables
2	Availability of test reports on HT XLPE FRLS Power Cables to establish in-house capability to carry out all routine, type & acceptance tests as per relevant IS/International Standards.
3	Capacity of manufacturing 5km of HT XLPE Power Cables per month
4	Manufactured and supplied at least one (1) km of FRLS cables.
5	Manufactured & supplied HT XLPE Power Cable sizes of minimum 240sqmm for 3/3.5 core and minimum 630sqmm for single core cable
6	Manufactured & supplied at least 5km of 11kV/6.6kV/3.3kV grade XLPE power cables in one or more orders & at least 2km in one single order.
7	Bidder should have supplied/provided HT XLPE POWER CABLES for at least one thermal power plant of 500 MW or above capacity which has completed one year of commercial operation and the equipment supplied should have completed the contractual guarantee period or should have supplied HT XLPE POWER CABLES of rating/type/size as required under the contract to any power plant.
8	HT XLPE POWER CABLES shall be in successful operation for similar duty condition and similar application for minimum one (1) year as on 06.08.2018.
9	Minimum two (2) nos. purchase orders for HT XLPE Power Cables shall be submitted which should not be more than five (5) years old from date of techno-commercial bid opening.

Notes (General points of PQR):

1. Consideration of offer shall be subject to customer's approval of bidder, if applicable.
2. Bidder to submit all supporting documents in English. If documents submitted by bidder are in language other than English, a self-attested English translated document should also be submitted.
3. Notwithstanding anything stated above, BHEL reserves the right to assess the capabilities & capacity of the bidder to perform the contract, should the circumstance warrant such assessment in the overall interest of BHEL.
4. After satisfactory fulfilment of all the above criteria/requirement, offer shall be considered for further evaluation as per NIT and all the other terms of the tender.
5. Bidder to submit test reports as per PQR Clause No. 2 to establish vendor has in-house facility to conduct all tests including Impulse withstand test.
6. PQR 7 & 8 is in line with customer proveness criteria.

PREPARED BY	CHECKED BY	REVIEWED BY	APPROVED BY
 ABHISHEK KUMAR VERMA, MANAGER	 KANHAIYA KUMAR / HEMA KUSHWAHA SR. MANAGER / DGM	 PRAVEEN DUTTA AGM	 DEBASISA RATH GM-ELECT

VOLUME II

MSPGCL

1 X 660 MW BHUSAWAL TPS

TECHNICAL SPECIFICATION

FOR


HT XLPE POWER CABLES

SPECIFICATION NO: *PE-TS-415-507-E001*

REVISION: 0




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

	DOCUMENT TITLE	SPECIFICATION NO. PE-TS- 415-507-E001	
	TECHNICAL SPECIFICATION FOR HT XLPE POWER CABLES	VOLUME II	
		REVISION 0	DATE: 29.12.2023
		SHEET 1 of 1	

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	a) GENERAL TECHNICAL SPECIFICATION	02
	b) QUALITY PLAN (ALONGWITH ANNEXURE A to QP)	11
	c) ANNEXURE-C (STEEL DRUM DRAWING, TYPICAL)	01
	 TOTAL NO. OF SHEETS=	 27
	(INCLUDING COVER/ SEPARATOR SHEETS)	

	<p style="text-align: center;">DOCUMENT TITLE</p> <p style="text-align: center;">TECHNICAL SPECIFICATION FOR HT XLPE POWER CABLES</p>	SPECIFICATION NO. PE-TS- 415-507-E001	
		VOLUME II	
		REVISION 0	DATE: 29.12.2023
		SHEET 1 of 1	

COMPLIANCE CERTIFICATE

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

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

BIDDER'S STAMP & SIGNATURE



DOCUMENT TITLE

**TECHNICAL SPECIFICATION FOR
HT XLPE POWER CABLES**

SPECIFICATION NO. PE-TS- 415-507-E001


VOLUME II

SECTION I

REVISION - 0

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SECTION -I**SPECIFIC TECHNICAL REQUIREMENTS**

	DOCUMENT TITLE TECHNICAL SPECIFICATION FOR HT XLPE POWER CABLES	SPECIFICATION NO. PE-TS- 415-507-E001	
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1.0 SCOPE OF ENQUIRY

- 1.1 Design, Manufacture, Inspection and Testing at Manufacturer's works, proper packing and delivery to site of HT XLPE Power Cables conforming to this specification.
- 1.2 General technical requirements of the HT XLPE Power cables are indicated in Section-II. Project specific technical/ quality requirements / changes are listed in Section-I.
- 1.3 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.
- 1.4 The documents shall be in English Language and MKS system of units.

2.0 BILL OF QUANTITIES:

- 2.1 Quantity requirements shall be as per 'BOQ-cum-price schedule' as part of NIT.

3.0 SPECIFIC TECHNICAL REQUIREMENTS

<u>S.No.</u>	<u>Reference Clause No. of Section- II</u>	<u>Specific Requirement/ Change</u>
1.	3.1, 3.3, 3.4	Quality Plan along with Annexure to QAP as enclosed with technical specification is to be appended with cover sheet bearing document no. The signed and stamped copy of the same shall be submitted to BHEL without making any changes in the contents of the document.
2.		Bidder to offer complete quantity for inspection in 1 LOT.

4.0 DRAWINGS & DOCUMENTS TO BE SUBMITTED

- 4.1 Documents/drawings shall be submitted after placement of order for BHEL and customer approval which has been specified in NIT.

NOTE-

1. Vendor shall submit the dates for drawing/document submission/BHEL comments/ resubmission after approval of documents.

2. In BOM each of the item to be uniquely identified with item code no. or item Sl. No. Supplier to ensure that all the items which will find separate mention in the packing list are covered in detailed BOM. Supplier to give following undertaking in BOM: " The BOM provided here completes the scope (in content and intent) of material supply under PO no. ---- dtd ---- Any additional material which may become necessary for the intended application of supplied item/package will be supplied free of cost in most reasonable time."

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

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DOCUMENT TITLE

**TECHNICAL SPECIFICATION FOR HT
XLPE POWER CABLES**

SPECIFICATION NO. PE-TS-415-507-E001

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SHEET -

DATASHEET A

	DOCUMENT TITLE		SPECIFICATION NO. PE-TS- 415-507-E001	
	TECHNICAL SPECIFICATION FOR HT XLPE POWER CABLES		VOLUME II	
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1.0	Type of Cable	Flame Retardant-Low Smoke (FRLS)
2.0	Standard applicable in general (Latest amendment to be referred if any)	IS:7098 (Part-2), IS:8130, IS:5831, IS:10810, IS:3975, ASTM:2843, ASTM:2863, IEC-754-1, IEC:60332 (Part-1), IEC:60332-3-23, IEEE:60383
3.0	Voltage Grade	11/11kV(UE) & 3.3/3.3kV(UE)
4.0	Number of cores, cross sectional area of conductors and quantities	As per BOQ cum price schedule (part of NIT)
5.0	CONDUCTOR	
(a)	Material	Aluminium
	Grade and Class	Multi-Stranded, H2, Class 2
(b)	Standard Applicable	IS: 8130
(c)	Shape	Stranded, Compacted Circular
(d)	Min. number and diameter of strands	As per Class-2 of IS: 8130
(e)	Conductor screen	
(i)	Material	Extruded Cross-linked Semi-conducting compound
(ii)	Minimum thickness	0.3 mm
6.0	INSULATION	
(a)	Material	Cross-Linked Polyethylene(XLPE)
(b)	Standard Applicable	IS: 7098 (Part-2)
(c)	Continuous withstand temperature	90°C
(d)	Short-circuit withstand temperature	250°C
(e)	Nominal Thickness of Insulation	As per Table – 4 of IS 7098 Part-2
7.0	INSULATION SCREEN	
(a)	For both SINGLE CORE & MULTI CORE cables	
(i)	Material	Extruded Cross-linked Semi-conducting compound
(ii)	Type of Semiconducting compound	Bonded
(iii)	Minimum thickness	0.3 mm
(b)	Material	
(i)	Material	Copper
(ii)	Type	Tape
(iii)	Size	Nominal thickness 0.1mm with tolerance (\pm) 10%
(iv)	Minimum Overlap	10%
(c)	Earth fault current withstand capacity	300A FOR 2 SEC
8.0	EXTRUSION (Insulation and Screens)	
(a)	Process	Triple Extrusion
(b)	Method of Curing	For 11 kV & 3.3 kV - Dry curing (CCV) using pressurised Nitrogen
9.0	CORE IDENTIFICATION	
		With natural colour with coloured strips applied on core or by numeral printing on the cores
10.0	INNER SHEATH	

	DOCUMENT TITLE	SPECIFICATION NO. PE-TS- 415-507-E001	
	TECHNICAL SPECIFICATION FOR HT XLPE POWER CABLES	VOLUME II	
		SECTION I	
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(a)	Material	Extruded HRPVC, FRLS Type ST-2
(b)	Standard Applicable	IS: 7098 (Part-2) & IS: 5831
(c)	Colour	Black
(d)	Whether FR-LSH	YES
(e)	Inner sheath applicable for single core cable	YES
(f)	Fillers	Acceptable
(g)	Material of fillers (if permitted)	Same as inner sheath (Material of filler to be compatible with that of inner sheath)
(h)	Method of application	
(1)	Multi-core cables:	
(i)	With fillers	[<input checked="" type="checkbox"/>] Pressure extruded [<input checked="" type="checkbox"/>] Vacuum extruded
(ii)	Without fillers	Pressure extruded
(i)	Thickness of inner sheath	As per Table-5 of IS: 7098 (Part-2)
11.0	ARMOUR	Applicable, as per BOQ cum price schedule (part of NIT)
a)	Material	Galvanised Steel
(i)	Multicore cables	Round Wire (Armour dimensions as per Sl. No.(ii) of table – 6 of IS 7098 Part-II.
(ii)	Single core cables	Aluminium Round Wire H4 grade to IS: 8130
b)	Minimum coverage	90%
c)	Gap between armour wires	Shall not exceed one armour wire space (No cross-over/over-riding)
d)	Breaking load of joint	95% of normal armour
e)	Armour joint surface	To be applied with Zinc rich paint
12.0	OUTERSHEATH	
(a)	Material	Extruded HRPVC, FRLSH Type ST-2
(b)	Colour	Black
(c)	Whether FR-LSH	Yes
(d)	Method of application	Extruded
(e)	Thickness of outer sheath	As per Table-7 of IS: 7098 (Part-2)
(f)	Marking	BHEL-PEM, MSPGCL, MANUFACTURER'S NAME, VOLTAGE GRADE, YEAR OF MANUFACTURE, XLPE, NO OF CORE AND SIZE OF CABLE, FR-LSH , IS NUMBER, ISI MARK @ 1m (by embossing) Progressive sequential marking of length of cable in meters @ 1m (by embossing/ printing)
13.0	FR-LSH CHARACTERISTICS	
(a)	Oxygen index	Min 29 (As per ASTM D 2863)
(b)	Temperature index	Min. 250°C at Oxygen Index of 21(As per ASTM D 2863)
(c)	Acid gas generation	Max. 20% (As per IEC-60754-1)
(d)	Smoke density rating	Max. 60% (As per ASTM D 2843)
(e)	Flammability Tests	
(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, CAT-B



DOCUMENT TITLE

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(iii)	Swedish chimney test	SEN SS 424 1475 (Class F3)
(iv)	Flammability test	IEEE: 60383
14.0	Anti-rodent and Termite Repulsion test	Yes
15.0	TOLERANCE ON OUTER DIAMETER	(±)2 mm. over the declared value
16.0	CABLE DRUMS	
(a)	Type of Drum	Steel Drum
(b)	Standard drum length	500M (±) 5%
(c)	Painting	Entire surface to be painted
(d)	Outermost Layer	To be covered with waterproof polyethylene
(e)	Others	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.
(f)	Particular information on Drum	Each drum shall carry BHEL-PEM, MSPGCL, MANUFACTURER'S NAME HT POWER CABLE, VOLATAGE GRADE, YEAR OF MANUFACTURE, XLPE, NO OF CORE AND SIZE OF CABLE, FR-LSH SINGLE LENGTH OF CABLE ON DRUM, DIRECTION OF ROTATION BY ARROW, APPROX GROSS MASS, IS/IEC NUMBER, ISI MARK


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DATASHEET C

**GUARANTEED TECHNICAL PARTICULARS
(TO BE SUBMITTED BY SUCCESSFUL BIDDER)**


S.No.	Particulars	Unit	Description
1.0	GENERAL		
1.1	Name of Manufacturer	-	
1.2	Place of Manufacture	-	
2.0	STANDARDS APPLICABLE		
2.1	IS: 7098 Part-2 For general specification of XLPE Cables	YES	
2.2	IS: 8130 For conductor material	YES	
2.3	IS: 5831 For material of innersheath & outersheath	YES	
2.4	IS: 3975 / IS: 8130 For armour of 3 core/ single core cables	YES	
2.5	IS: 10810 For method of tests	YES	
2.6	ASTMD-2863 For oxygen index test	YES	
2.7	SS:424-14-75 & IEC-60332-3 & IEC-60332-1 & IEEE: 60383 For flammability test	YES	
2.8	IEC-60754-1 For acid gas generation test	YES	
2.9	ASTMD-2843 For smoke generation test	YES	
2.10	Current rating of cables conforms to	-	
2.11	Short circuit rating conforms to	-	
2.12	Formula for calculating short circuit current for different durations	-	
3.0	INSTALLATION CONDITIONS AT SITE		
3.1	Ambient air temperature	deg. C	
3.2	Ground temperature	deg. C	
3.3	Depth of laying of cables buried in ground	cm	
3.4	Thermal resistivity of soil	deg. C cm/W	

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			

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4.0	INSTALLATION CONDITIONS FOR CURRENT RATING SPECIFIED AT CLAUSE 7.3		
5.0	CHARACTERISTICS OF FR-LSH SHEATH		
5.1	Oxygen index	-	
5.2	Temperature index	-	
5.3	Acid gas generation	-	
5.4	Smoke density rating	-	
6.0	CABLE DRUMS		
6.1	Type & construction	-	
6.2	Standard drum length	-	
6.3	Tolerance on drum length	-	
7.0	INFORMATION TO BE FILLED IN FOR EACH SIZE CABLE IN THE FORM OF TABLE		
7.1	No. of cores x size	-	
7.2	Voltage grade (Uo/U)	kV	
7.3	Base current ratings (*) based on Clause No. 3.0		
a)	In air	Amp	
b)	In ground	Amp	
c)	ducts	Amp	
7.4	Short circuit rating	kA, sec	
7.5	Properties		
a)	D.C. resistance of conductor at 20 deg. C	ohm/km	
b)	A.C. resistance of conductor at 90 deg. C	ohm/km	
c)	Reactance of cable at normal frequency	ohm/km	
d)	Electrostatic capacitance of cable at normal frequency	mF/km	
7.6	CONDUCTOR		
a)	Material type & grade	-	
b)	No & dia of wires in each core before stranding	no x mm	

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			

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c)	Shape	-	
7.7	CONDUCTOR SCREEN		
a)	Material	-	
b)	Minimum thickness	mm	
7.8	XLPE INSULATION		
a)	Nominal thickness of insulation	mm	
b)	Method of curing	-	
7.9	INSULATION SCREEN		
a)	Type of screen	-	
b)	Material and thickness (minimum and nominal)	mm	
i)	Metallic	-	
	No. of tapes and Minimum overlapping	-	
ii)	Non-metallic	-	
iii)	Earth fault current withstand capacity (calculation to be furnished)	kA, sec.	
7.10	PVC ST2 INNERSHEATH		
a)	Material	-	
b)	Thickness (min.)	mm.	
c)	Method of application	-	
1)	Multi-core cables		
i)	With fillers	-	
ii)	With out fillers	Pressure Extruded	
2)	Single core cables		
d)	Type & Shape of fillers (if used)	-	
e)	Colour	-	
7.11	ARMOUR		
a)	Material	-	
b)	Size/ dimensions	-	
c)	Minimum no. of wires/ formed wires	-	
d)	Tolerance on formed wire dimension	-	
e)	Maximum resistivity of GS formed wire	-	
f)	Maximum resistivity of Al round wire	-	
7.12	PVC/POLYETHYLENE ST2 FR-LSH OUTERSHEATH		
a)	Nominal thickness of outer sheath	mm.	

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			

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7.13	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.	
7.14	Tolerance on overall diameter	(±) mm	
7.15	Minimum bending radius	x O.D.	
7.16	Safe pulling force	kg.	
7.17	Weight of cable	kg./km	
a)	Weight of conductor	MT./km	
b)	Weight of XLPE insulation	MT./km	
c)	Weight of PVC (Inner Sheath & Fillers)	kg./km	
d)	Maximum resistivity of GS formed wire	kg./km	
e)	Weight of PVC/Polyethylene (Outer Sheath & Fillers)	kg./km	
7.18	Dimension of drum	mm.	
7.19	Shipping weight	kg	
7.20	Cable marking on outer sheath	-	

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

:

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			



DOCUMENT TITLE

**TECHNICAL SPECIFICATION FOR
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VOLUME II

SECTION II

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SECTION – II**GENERAL TECHNICAL SPECIFICATION**

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		VOLUME II	
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		REVISION 00	DATE: 29.12.2023
		SHEET 1 OF 1	

1.0 TECHNICAL REQUIREMENTS

- 1.1 Technical requirements for HT XLPE POWER CABLES shall be as indicated in this section, in addition to those specified in Section I & Datasheet-A.

2.0 CODES & STANDARDS

- 2.1 The design, material, construction, manufacture, inspection, testing and performance of HT XLPE POWER CABLES shall conform to the latest revision of relevant standards and codes of practices mentioned in Data Sheet - A.
- 2.2 In case of conflict between the applicable reference standard and this specification, this specification shall govern.

3.0 QUALITY ASSURANCE REQUIREMENTS

- 3.1 Bidder shall confirm compliance with the Standard Quality Plan as attached with the specification without any deviations. At contract stage, the successful bidder shall submit the same QP for BHEL/ ultimate customer's approval. In case bidder has reference QP agreed with ultimate customer, same can be submitted for specific project after award of contract for BHEL/ultimate customer's approval. There shall be no commercial implication to BHEL on account of minor changes in QP during contract stage.
- 3.2 All materials shall be procured, manufactured, inspected and tested by vendor/ sub-vendor as per approved Quality Plan.
- 3.3 Type testing requirements, routine / acceptance testing and special testing requirements shall be as per Annexure -A to QP. Charges for all these tests for all the equipment & 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 as specified in Datasheet-A.
- 4.2 In case of wooden drums, all wooden parts shall be manufactured from seasoned wood treated with copper naphthenates / zinc naphthenates (refer IS: 401). 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. Over the cables polyethylene sheet shall be wrapped and then sealed properly.
- 4.3 In case of Steel drums, New or practically new cable drums made of steel and painted with epoxy resin paint are to be used. Cable ends are carefully protected before packing. Over the cables polyethylene sheet shall be wrapped and then sealed properly. For Typical details of Steel drums, Annexure-B to Section-II, may be referred by the bidder. Bidder may modify, to choose appropriate dimensions of steel drums to suite various sizes/weight/ lengths of HT XLPE POWER CABLES. BIS certification mark shall be stamped on each cable drum.

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DOCUMENT TITLE

**TECHNICAL SPECIFICATION FOR HT
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SHEET -


QUALITY PLAN


		STANDARD QUALITY PLAN			CUSTOMER : MAHAGENCO		PROJECT: 1X660 MW BHUSAWAL TPS		DOCUMENT NAME - QUALITY PLAN - HT XLPE CABLE			
					BIDDER/ VENDOR		QUALITY PLAN NUMBER: PE-QP-999-507-E001A, R0		DOC NO -			
SHEET 1 OF 11		SYSTEM			ITEM : HT XLPE Power Cables		SECTION		VOLUME III			
SL. NO.	COMPONENT/ OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
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 final cable drum number or batch 2. Cable manufacturer to maintain all quality records identified as per all QP stages enumerated below whether it is identified for BHEL verification or witness or not.												
1.0	RAW MATERIALS & BOUGHT OUT ITEMS											
1.1	Aluminium Rods (Conductor/ Armour Wire)	GENERAL : 1. Physical properties		MA	Physical Tests	Sample/ Batch	IS:7098-II,IS: 5082, IS:5484, IS:8130 & Appd Datasheet	IS:7098-II,IS: 5082, IS:5484, IS:8130 & Appd Datasheet	Inpection Report/ Test Cert.	2/3	-	1/2
		2. Elec.Properties		MA	Electrical Tests	Sample/ Batch	-do-	-do-	-do-	2/3	-	1/2
		SPECIFIC CHECKS : a) Make		MA	Verify	100%	Manufacturer approved source	Manufacturer approved source	COC/ Test Cert.	2/3	-	1
		b) Grade		MA	-do-	-do-	IS 8130, IS 5082/ Approved datasheet	IS 8130, IS 5082/ Approved datasheet	-do-	2/3	-	1
		c) Resistivity		MA	Electrical Tests	Manufacturer std.	IS 8130, IS 5082	IS 8130, IS 5082	-do-	2/3	-	1
1.2	XLPE Compound for insulation	GENERAL : 1. Physical properties		MA	Physical Tests	Sample/ Batch	IS 7098-II & Mfs Std./ Approved datasheet	IS 7098-II & Mfs Std./ Approved datasheet	Inpection Repor/ Test Cert.	2/3	-	1/2
		2. Elec.Properties		MA	Electrical Tests	Sample/ Batch	-do-	-do-	-do-	2/3	-	1/2
		SPECIFIC CHECKS : a) Make		MA	Verify	100%	Manufacturer approved source	Manufacturer approved source	COC/ Test Cert.	2/3	-	1
		b) Type/ Grade		MA	-do-	-do-	Approved datasheet	Approved datasheet	-do-	2/3	-	1
		c) Shelf life/ Storage condition		MA	-do-	-do-	Compound Manufacturer std.	Compound Manufacturer std.	-do-	2/3	-	1
BHEL			PARTICULARS			BIDDER/VENDOR						
			NAME									
			SIGNATURE									
			DATE						BIDDER'S/VENDORS COMPANY SEAL			



 BHARAT HEAVY ELECTRICALS LIMITED
 PROJECT ENGINEERING MANAGEMENT

This is to certify that this document has been reviewed in PEM for confirming to the technical requirements for the project.


SIGNATURE
 INITIALS OF DEALING ENGINEER
 DATE
 DEPARTMENT


 Nishu Manu
 28.1.2021
 Electrical


		STANDARD QUALITY PLAN			CUSTOMER : MAHAGENCO		PROJECT: 1X660 MW BHUSAWAL TPS		DOCUMENT NAME - QUALITY PLAN - HT XLPE CABLE			
SHEET 2 OF 11		BIDDER/ VENDOR			QUALITY PLAN NUMBER: PE-QP-999-507-E001A, R0		DOC NO .					
SYSTEM		ITEM : HT XLPE Power Cables		SECTION		VOLUME III						
SL. NO.	COMPONENT/ OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
1.3	Semi Conducting Compound	GENERAL : 1. Physical properties	MA	Physical Tests	Sample/ Batch	IS 7098-II & Mfs Std./ Approved datasheet	IS 7098-II & Mfs Std./ Approved datasheet	Inpection Report/ Test Cert.	2/3	-	1/2	(Fillers material chosen shall be compatible with the temerature rating of the cable and shall have no deleterious effect on any other componenet of the cable)
		SPECIFIC CHECKS : 1. Make	MA	Verify	100%	Manufacturer approved source	Manufacturer approved source	COC/ Test Cert.	2/3	-	1	
		2. Type/ Grade	MA	-do-	-do-	Approved datasheet	Approved datasheet	-do-	2/3	-	1	
3. Shelf life/ Storage condition	MA	-do-	-do-	Compound Manufacturer std.	Compound Manufacturer std.	-do-	2/3	-	1			
1.4	Copper Tape	GENERAL : 1. Physical properties	MA	Physical Tests	Sample/ Batch	IS 7098-II, IS 1897, IS 613 & Mfr. Std./ Approved datasheet	IS 7098-II, IS 1897, IS 613 & Mfr. Std./ Approved datasheet	Inpection Report/ Test Cert.	2/3	-	1/2	
		2. Elec.Properties	MA	Electrical Tests	Sample/ Batch	-do-	-do-	-do-	2/3	-	1/2	
		3. Dimension	MA	Measurement	-do-	-do-	-do-	-do-	2/3	-	2	
1.5	Fillers (as applicable)	SPECIFIC CHECKS : 1. Resistivity	MA	Electrical Tests	Manufacturer std.	IS 613	IS 613	-do-	3/2	-	1	
		1. Make	MA	Verify	100%	Manufacturer approved source	Manufacturer approved source	COC/ Test Cert.	2/3	-	1	
1.6	PVC Compound (for sheath)	2. Type/ Grade	MA	-do-	-do-	Approved datasheet	Approved datasheet	-do-	2/3	-	1	
		GENERAL : 1. Physical properties	MA	Physical Tests	Sample/ Batch	IS 7098-II, IS 5831& Mfr. Std./ Approved datasheet	IS 7098-II, IS 5831& Mfr. Std./ Approved datasheet	Inpection Report/ Test Cert.	2/3	-	1/2	
		2. Elec.Properties	MA	Electrical Tests	Sample/ Batch	-do-	-do-	-do-	2/3	-	1/2	
		3. FRLS Properties (as applicable)	CR	Chemical/ Environ.	Sample/ Batch	-do-	-do-	-do-	2/3	-	1/2	


 BHARAT HEAVY ELECTRICALS LIMITED PROJECT ENGINEERING MANAGEMENT	
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SIGNATURE	<i>Nishu Manu</i>
INITIALS OF DEALING ENGINEER	Nishu Manu
DATE	28.1.2021
DEPARTMENT	Electrical



PARTICULARS	BIDDER/VENDOR
NAME	
SIGNATURE	
DATE	
BIDDER'S/VENDORS COMPANY SEAL	


		STANDARD QUALITY PLAN			CUSTOMER : MAHAGENCO		PROJECT: 1X660 MW BHUSAWAL TPS		DOCUMENT NAME - QUALITY PLAN - HT XLPE CABLE				
SHEET 3 OF 11		BIDDER/ VENDOR			SYSTEM		TITLE		DOC NO -				
SL. NO.		COMPONENT/ OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	SECTION VOLUME III			
1		2	3	4	5	6	7	8	9	10			11
										P	W	V	
1.7		Galvanised steel wire/strip for Armour (as applicable)	SPECIFIC CHECKS : a) Make b) Type/ Grade c) Shelf life/ Storage condition GENERAL : 1. Make 2. Dimension 3. Phy.and Elec. Properties 4.Galvanization Quality	MA	Verify	100%	Manufacturer approved source	Manufacturer approved source	COC/ Test Cert.	2/3	-	1	
1.8		Steel Drum	1. Dimension 2. Surface finish	MA	Meas. Visual	Mfr's Plant Std. -do-	Approved drawing of steel drum / BHEL specification Surface shall be smooth	Approved drawing of steel drum / BHEL specification Surface shall be smooth	Inpection Report/ Test Cert. -do-	2/3 2/3	-	1 1	
1.9		Wooden Drum (Not Applicable)	1. physical & constructional check 2. Anti-termite treatment	MA	Visual Chem	Mfr's Plant Std. -do-	IS 10418 Mfr's Plant Std.	IS 10418 Mfr's Plant Std.	Inpection Report/ Test Cert. COC	2/3 2/3	-	1 1	Wooden drum is not applicable
BHEL				PARTICULARS			BIDDER/VENDOR						
				NAME									
				SIGNATURE									
				DATE						BIDDER'S/VENDORS COMPANY SEAL			


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 INITIALS OF DEALING ENGINEER: Nishu Mahru
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 DEPARTMENT: Electrical


		STANDARD QUALITY PLAN			CUSTOMER : MAHAGENCO		PROJECT 1X660 MW BHUSAWAL TPS		DOCUMENT NAME - QUALITY PLAN - HT XLPE CABLE			
SHEET 4 OF 11		BIDDER/VENDOR			SYSTEM		QUALITY PLAN NUMBER: PE-QP-999-507-E001A, R0		DOC NO -			
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	SECTION AGENCY VOLUME III			
1	2	3	4	5	6	7	8	9	P	W	V	REMARKS
2.0	IN PROCESS											
2.1	Wire Drawing	1. Size	MA	Dimensional	Plant Mfg. Std.	IS 8130 & Appd. Datasheet	IS 8130 & Appd. Datasheet	Inpection Report	2	-	1	
		2. Surface finish	MA	Visual	-do-	Surface shall be smooth	Surface shall be smooth	-do-	2	-	1	
		3. % of Elongation	MA	Mechanical	-do-	IS 8130 & Appd. Datasheet	IS 8130 & Appd. Datasheet	-do-	2	-	1	
2.2	Stranding of wires	1. No. of wires	MA	Counting	Plant Mfg. Std.	IS 8130 & Appd. Datasheet	IS 8130 & Appd. Datasheet	Inpection Report	2	-	-	
		2. Resistance	CR	Electrical	-do-	-do-	-do-	-do-	2	-	-	
		3. Sequence, lay length & Direction	MA	Visual, Meas.	One Sample of each size/	Mfrs Std. / Appd. Datasheet	Mfrs Std. / Appd. Datasheet	-do-	2	-	-	
		4. Surface Finish	MA	Visual	100%	Surface shall be smooth	Surface shall be smooth	-do-	2	-	-	
		5. Dimension	MA	Measurement	One Sample of each size/	IS 8130 & Appd. Datasheet	IS 8130 & Appd. Datasheet	-do-	2	-	-	
2.3	Conductor Screening	1. Surface Finish	MA	Visual	100%	Surface shall be smooth	Surface shall be smooth	Inpection Report	2	-	-	
		2. Radial Thickness	CR	Mechanical	One Sample of each size/	IS 7098-II & Appd. Datasheet	IS 7098-II & Appd. Datasheet	-do-	2	-	-	
2.4	Core Insulation (XLPE) (No repair permitted)	1. Surface finish	MA	Visual	100%	Free from bulging, burnt particles, lumps, cuts & scratches	Free from bulging, burnt particles, lumps, cuts & scratches	Inpection Report	2	-	1	
		2. Eccentricity & Ovality #	CR	Measurement	One Sample of each size/ lot	IS 7098-II & Appd. Datasheet	IS 7098-II & Appd. Datasheet	-do-	2	-	1	# To be checked at starting & finished end of extruded length.
		3. Insulation Thickness	CR	Measurement	-do-	-do-	-do-	-do-	2	-	-	
		4. Dia over insulation	MA	Measurement	-do-	-do-	-do-	-do-	2	-	-	
		5. Tensile Strength & % Elongatio	MA	Mechanical	100%	-do-	-do-	-do-	2	-	-	
BHEL			PARTICULARS			BIDDER/VENDOR						
			NAME									
			SIGNATURE									
			DATE						BIDDER'S/VENDORS COMPANY SEAL			


 BHARAT HEAVY ELECTRICALS LIMITED PROJECT ENGINEERING MANAGEMENT	
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DATE	28.1.2021
DEPARTMENT	Electrical

		STANDARD QUALITY PLAN			CUSTOMER : MAHAGENCO		PROJECT TITLE 1X660 MW BHUSAWAL TPS		DOCUMENT NAME - QUALITY PLAN - HT XLPE CABLE			
					BIDDER/VENDOR SYSTEM		QUALITY PLAN NUMBER: PE-QP-999-507-E001A, R0		DOC NO -			
		SHEET 5 OF 11		SYSTEM		ITEM : HT XLPE Power Cables		SECTION		VOLUME III		
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10	11	11	
2.5	Insulation Screening	NON METTALIC										
		1. Surface finish	MA	Visual	100%	Surface shall be smooth	Surface shall be smooth	Inpection Report	2	-	-	(Pimple, fish eye, porosity & burnt particles not permitted.)
		2. Thickness	CR	Measurement	One Sample of each size/ lot	IS 7098-II & Appd. Datasheet	IS 7098-II & Appd. Datasheet	-do-	2	-	-	
		METALLIC										
1. Dimension of tape	CR	Measurement	One Sample of each size/	Mfrs Std. / Appd. datasheet	Mfrs Std. / Appd. datasheet	Inpection Report	2	-	-			
2. Overlap of Tape Band	MA	-do-	-do-	-do-	-do-	-do-	-do-	2	-	-		
3. Tightness of Tape	MA	Visual	-do-	-do-	Mfs Std.	Mfs Std.	-do-	2	-	-		
2.6	Core Laying	1. Dia over laid up core	MA	Measurement	One Sample of each size/	IS 7098-II & Appd. Datasheet	IS 7098-II & Appd. Datasheet	Inpection Report	2	-	-	
		2. Sequence of lay & direction	MA	Visual & Meas.	-do-	IS 7098-II & Mfr. Std.	IS 7098-II & Mfr. Std.	-do-	2	-	-	
		3. Lay Length	MA	Measurement	-do-	-do-	-do-	-do-	2	-	-	
2.7	InnerSheath Extrusion (as applicable)	1. Surface finish	MA	Visual	100%	Surface shall be smooth	Surface shall be smooth	Inpection Report	2	-	-	
		2. Thickness	CR	Measurement	One Sample of each size/	IS 7098-II & Appd. Datasheet	IS 7098-II & Appd. Datasheet	-do-	2	-	-	
		3. Dia over inner sheath	MA	-do-	-do-	-do-	-do-	-do-	2	-	-	
2.8	Armour(as applicable)	1. No. of wires/Strips	MA	Counting	At the start of the process	IS 7098-II & Appd. Datasheet	IS 7098-II & Appd. Datasheet	Inpection Report	2	-	-	
		2. Lay length & Direction	MA	Visual & Meas.	-do-	IS 7098-II & Mfr. Std.	IS 7098-II & Mfr. Std.	-do-	2	-	-	
		3. Dia over armouring	MA	Measurement	-do-	IS 7098-II & Appd. Datasheet	IS 7098-II & Appd. Datasheet	-do-	2	-	-	
		4. Coverage	MA	Measurement	-do-	-do-	-do-	-do-	2	-	-	
BHEL			PARTICULARS			BIDDER/VENDOR						
			NAME									
			SIGNATURE									
			DATE						BIDDER'S/VENDORS COMPANY SEAL			


 BHARAT HEAVY ELECTRICALS LIMITED
 PROJECT ENGINEERING MANAGEMENT


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SIGNATURE: 
 INITIALS OF DEALING ENGINEER: Nishu Menon
 DATE: 28.1.2021
 DEPARTMENT: Electrical

		STANDARD QUALITY PLAN		CUSTOMER : MAHAGENCO		PROJECT 1X660 MW BHUSAWAL TPS		DOCUMENT NAME - QUALITY PLAN - HT XLPE CABLE				
				BIDDER/ VENDOR		QUALITY PLAN NUMBER: PE-QP-999-507-E001A, R0		DOC NO -				
SHEET 6 OF 11		SYSTEM		ITEM : HT XLPE Power Cables		SECTION			VOLUME III			
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
2.9	Outer Sheath Extrusion (No repair permitted)	1. Surface finish	MA	Visual	100%	Surface shall be smooth	Surface shall be smooth	Inpection Report	2	-	-	(Pimple, fish eye, porosity & burnt particles not permitted.)
		2. Sheath Thickness	CR	Measurement	One Sample of each size/	IS 7098-II & Appd. Datasheet	IS 7098-II & Appd. Datasheet	-do-	2	-	-	
		3. Dia over outer sheath	MA	-do-	-do-	-do-	-do-	-do-	2	-	-	
		4. Embossing/ Sequential Marking	MA	Visual	100%	Approved data sheet	Approved data sheet	-do-	2	-	-	
3.0	Finished Cable (INTERNAL)	1. Routine Test (Refer Note-F)	CR	Electrical Tests & Measurement	100%	IS 7098-II & Appd. Datasheet	IS 7098-II & Appd. Datasheet	Test Report	2	-	1	
4.0	Final Inspection (EXTERNAL)	1. Finish	MA	Visual	One drum in each Lot	IS 7098-II & Appd. Datasheet	Free from Porosity, Bulging, Burnt particles,lumps, cuts &	Test Report	2	1	-	
		2. Length	MA	Measurement	-do-	-do-	Approved Data Sheet	-do-	2	1	-	
		3. Dimension	MA	-do-	As per IS	-do-	-do-	-do-	2	1	-	
		4. Armouring - Coverage No.of Wires/Strips	MA	Visual & Meas.	-do-	-do-	-do-	-do-	2	1	-	
BHEL		PARTICULARS		BIDDER/ VENDOR								
		NAME										
		SIGNATURE										
		DATE										
										BIDDER'S/VENDORS COMPANY SEAL		

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SIGNATURE
INITIALS OF DEALING ENGINEER
DATE
DEPARTMENT


 Nishu Manu
 28.1.2021
 Electrical



		STANDARD QUALITY PLAN		CUSTOMER : MAHAGENCO		PROJECT 1X660 MW BHUSAWAL TPS		DOCUMENT NAME - QUALITY PLAN - HT XLPE CABLE				
				BIDDER/ VENDOR		QUALITY PLAN NUMBER: PE-QP-999-507-E001A, R0		DOC NO -				
SHEET 7 OF 11		SYSTEM		ITEM : HT XLPE Power Cables		SECTION		VOLUME III				
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
1	2	3	4	5	6	7	8	9	P	W	V	11
5.0	Packing	5. Marking & Colour Coding 6. Acceptance Tests (Refer Note-F) 7. Type Tests (Refer Note-F) Sealing Identification	MA CR CR MA	Visual Phy, Elect. Tests FRLS Tests Physical & Electrical Tests Visual	As per IS -do- Sample # 100%	-do- -do- -do- As per IS	Approved Data Sheet -do- -do- As per IS	-do- -do- -do- -do-	2 2 2 2	1 1 1 1	- - - -	# Refer Annexure to QAP enclosed

NOTES:-

- (A) JOINTS IN WIRE SHALL BE AS PERMITTED BY IS / BHEL SPECIFICATION, VENDOR TO CERTIFY THE SAME.
- (B) NO REPAIR OF CORE INSULATION PERMITTED
- (C) RECORD OF RAW MATERIAL, PROCESS & ALL STAGES SHALL BE CERTIFIED BY VENDORS QC. AND ARE LIABLE TO AUDIT CHECK BY PURCHASER.
- (D) FILLERS/DUMMY CORES ETC. SHALL BE AS PER APPROVED DATA SHEET
- (E) VENDOR SHALL FURNISH COMPLIANCE CERTIFICATE TO THE INSPECTION AGENCY CONFIRMING THE PACKING AS PER BHEL SPECIFICATION.
- (F) **FOR LIST OF ROUTINE, TYPE & ACCEPTANCE TESTS, REFER ANNEXURE TO QAP ENCLOSED.**

LEGEND : P : PERFORMER W: WITNESSER V: VERIFIER 1- BHEL / MAHAGENCO / TPIA 2-VENDOR 3-SUB-VENDOR CHP: CUSTOMER HOLD POINT WHICH WILL BE DECIDED AT CONTRACT STAGE

BHEL		PARTICULARS		BIDDER/ VENDOR	
		NAME			
		SIGNATURE			
		DATE			

 BHARAT HEAVY ELECTRICALS LIMITED PROJECT ENGINEERING MANAGEMENT	
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SIGNATURE	
INITIALS OF DEALING ENGINEER	Nishu Manu
DATE	28.1.2021
DEPARTMENT	Electrical

BIDDER'S/VENDORS COMPANY SEAL

Annexure to Quality Plan

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 1 drum for every 10 drums or less of each type and size of cable/ lot.
 - b) Electrical tests to be conducted on one drum of every size & voltage grade of cables.
 - c) FRLS test & Flammability Test to be conducted on every size & voltage grade of cables. Sampling quantity as per appendix -D of IS 7098-2, D2.2.

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:
 - a) Acceptance tests shall be as per 1 drum for every 10 drums or less of each type and size of cable/ lot.
 - b) FRLS test & Flammability Test to be conducted on every size & voltage grade of cables. Sampling quantity as per appendix -D of IS 7098-2, D2.2.

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.
2. Sampling: Routine tests shall be conducted on 100% cable drums.



S. No.	TEST	APPLICABLE FOR	TEST CONDUCTION REQUIRED AS	REFERENCE STANDARD	REMARKS
1.0	Tests for Conductor				
I.	Annealing test	For copper conductor only	T, A	IS 10810 Pt 1	<i>Internal in process Test Report to be furnished for acceptance test</i>
II.	Tensile test	For aluminium conductor only <i>(Not applicable for compacted circular or shaped conductor)</i>	T, A	IS 10810 Pt 2	
III.	Wrapping test	For aluminium conductor only <i>(Not applicable for compacted circular or shaped conductor)</i>	T, A	IS 10810 Pt 3	
IV.	Resistance test	For Al/Cu	T, A, R	IS 10810 Pt 5	
2.0	Tests for Armour Wires/Strips				
I.	Measurement of dimensions	Applicable for Aluminium wire & GS wire/Strip	T,A	IS 10810 Pt 36	
II.	Tensile test	Applicable for Aluminium wire & GS wire/Strip	T, A	IS 10810 Pt 37	
III.	Elongation at break test	Applicable for GS wire/Strip only	T, A	IS 10810 Pt 37	

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SIGNATURE INITIALS OF DEALING ENGINEER DATE DEPARTMENT	<table border="1" style="width: 100%;"> <tr> <td style="text-align: center;"> Nishu Manu 28.1.2021 Electrical </td> </tr> </table>	 Nishu Manu 28.1.2021 Electrical
 Nishu Manu 28.1.2021 Electrical		

53622/2024/PS-PEM-EL

Annexure to Quality Plan



S. No.	TEST	APPLICABLE FOR	TEST CONDUCTION REQUIRED AS	REFERENCE STANDARD	REMARKS
IV.	Torsion test	For GS round wire only	T, A	IS 10810 Pt 38	
V.	Winding test	For GS strip only	T, A	IS 10810 Pt 39	
VI.	Resistivity test	Applicable for Aluminium wire & GS wire	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 Aluminium wires only	T, A	IS 10810 Pt 3	
3.0	Physical Tests for XLPE Insulation & PVC sheath				
I.	Test for thickness & Eccentricity	Applicable for XLPE insulation, HRPVC inner sheath & For HRPVC inner/outer sheath only	T, A	IS 10810 Pt 6	
II.	Tensile strength and elongation test at break	Applicable for XLPE insulation & For HRPVC inner/outer sheath only			
(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 XLPE insulation & For HRPVC inner/outer sheath only	T	IS 10810 Pt 11	
IV.	Loss of mass in air oven test	For HRPVC inner/outer sheath only	T	IS 10810 Pt 10	
V.	Hot deformation test	For HRPVC inner/outer sheath only	T	IS 10810 Pt 15	
VI.	Heat shock test	For HRPVC inner/outer sheath only	T	IS 10810 Pt 14	
VII.	Shrinkage test	For XLPE insulation & For HRPVC inner/outer sheath only	T	IS 10810 Pt 12	
VIII.	Thermal stability test	For HRPVC inner/outer sheath only	T	IS 10810 Pt 60	
IX.	Hot set test	For XLPE insulation only	T, A	IS 10810 Pt 30	
X.	Water absorption (gravimetric) test	For XLPE insulation only	T	IS 10810 Pt 33	
XI.	Degree of cross-linking	For XLPE insulation only	T	IS 7098-II	
4.0	Tests On Extruded Semi-conducting Screen				
I.	Test for Strippability	Applicable for Semi-conducting Strippable screen	T	IS 7098-II	Not applicable since it is bonded type
II.	Volume Resistivity	Applicable for Semi-conducting Strippable screen	T	IS 7098-II	
III.	Test for cross linking		A	IS 7098-II	
5.0	Improved Fire performance (FR-LSH) Tests				

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DEPARTMENT	Electrical

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Annexure to Quality Plan

S. No.	TEST	APPLICABLE FOR	TEST CONDUCTION REQUIRED AS	REFERENCE STANDARD	REMARKS
I.	Oxygen index test	<i>For inner/outer sheath only</i>	T, A	IS 10810 Pt 58 / ASTMD 2863	<i>Sample shall be as per IS 7098,Part 2</i>
II.	Smoke density test	<i>For inner/outer sheath only</i>	T, A	ASTMD 2843	
III.	Acid gas generation test	<i>For inner/outer sheath only</i>	T, A	IS 10810 Pt 59 / IEC-754-1	
IV.	Temperature Index Test	<i>For inner/outer sheath only</i>	T,A	IS 10810 Pt 64 / ASTMD 2863	
6.0	Flammability Tests				
I.	Flammability test for bunched cables	For complete cable	T,A	IEC-60332 (Part-3)	
II.	Flammability test for single cable	For complete cable	T,A	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	
7.0	Electrical Tests				
I.	High Voltage Test	For complete cable	T, A, R	IS 10810 Pt 45	
II.	Insulation Resistance Test (Volume resistivity method)	For complete cable	T, A	IS 10810 Pt 43	
III.	Partial discharge test (shall be carried out on full drum length)		T,A,R	IS 10810 Pt 46	
IV.	Bending Test followed by Partial Discharge test		T	IS 10810 Pt 50	
V.	Dielectric Power Factor Test (i) As a function of voltage (ii) As a function of temperature		T	IS 10810 Pt 48	
VI.	Heat Cycle Test		T	IS 10810 Pt 49	
VII.	Impulse Withstand Test		T	IS 10810 Pt 47	
VIII.	Thermal ageing test	For complete cable	T	IS 7098-II	
IX.	<i>Flammability Test</i>	<i>For HRPVC sheathed cable</i>	T	<i>IS 10810 Pt 53</i>	
8.0	Anti-rodent and Termite Repulsion test	For HRPVC outer sheath only	A	Refer Note	

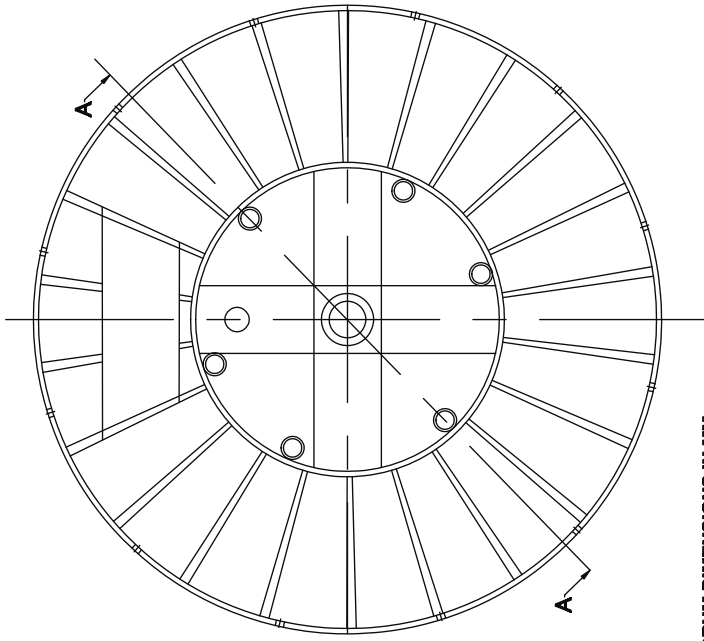
	BHARAT HEAVY ELECTRICALS LIMITED PROJECT ENGINEERING MANAGEMENT
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DATE	28.1.2021
DEPARTMENT	Electrical

Note: A few chipping of the PVC compound is slowly ignited on a porcelain dish or cubicle in a muffle furnace at about 600 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.

STEEL DRUM DRAWING (TYPICAL)

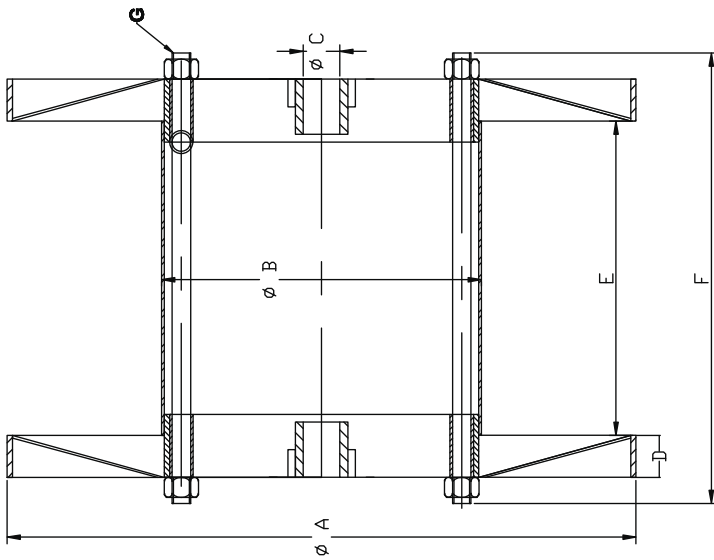
ANNEXURE-C TO SECTION-II


- Dwg. not to scale.
- ALL DIMENSIONS ARE IN MM.



APPROXIMATE DRUM DIMENSIONS IN MM
 ALL DIMENSIONS AND VALUES ARE
 TYPICAL AND ARE DEPENDENT ON
 CABLE WEIGHT.

A	FLANGE	2200
B	BARREL	1200
C	CENTRAL HOLE	100
D	FLANGE	50
E	TRAVERSE	1400
F	GROSS WIDTH	1600
G	STUD SIZE	16 MM.



	TECHNICAL SPECIFICATION FOR HT XLPE POWER CABLE 1X660 MW BHUSAWAL TPS	SPECIFICATION NO. PE-TS-415-507-E001	
		REVISION 0	DATE: 29.12.2023
		SHEET 1 OF 1	

DRAWINGS & DOCUMENTS Delivery Schedule

Documents shall be submitted after placement of order for BHEL & customer's approval as per the schedule specified below:

BHEL Drawing No.	Drawing Title	Vendor Sub (Days)*	Bhel comment (Days)	Vendor Sub (Days)#	Bhel and Customer comment/approval (Days)
Primary Documents					
PE-V1-415-507-E101	TECHNICAL DATA SHEET - HT XLPE POWER CABLES	7	3	2	18
PE-V1-415-507-E103	CROSS SECTION DRGS. - HT XLPE POWER CABLES	7	3	2	18
PE-V1-415-507-E912	QUALITY PLAN - HT XLPE POWER CABLES	7	3	2	18
Secondary Documents					
PE-V1-415-507-E104	TYPE TEST REPORTS FOR TEST CONDUCTED - HT XLPE POWER CABLES	WITHIN ONE WEEK AFTER CONDUCTION OF TYPE TESTS.			
NOTES:					
a) * 1st submission within indicated days from date of purchase order					
b) # Submission (within indicated days) after incorporating all BHEL comments					
c) Primary documents shall be considered for Delay analysis and secondary documents shall be for engineering completion purpose					

Notes:

1. Vendor shall submit the dates for drawing/document submission/BHEL comments/ resubmission after approval of documents.



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Cir. No. 22/DIV/CAB/05

07 June 2023

To Cable Division and Utilities/SEBS, listed of purchasing organisations

Sub: Correction in amendment to Price Variation Clause for MV and EHV Cables wef Apr 2023

IEEMA recently published amended Price Variation Clause for MV and EHV Cables wef Apr 2023 vide Cir. No. 07/DIV/CAB/05 and 06/DIV/CAB/05 dated 08 May 2023. After publishing IEEMA found some corrections to be done in the below factor tables:

For EHV Cables -

Table: 3d (SMIF): Variation factor for Copper in Lead + Cu wire construction (CuFpb)

For MV Cables -

Table: H4 (c) 3.3 KV (E) Unscreened arm

And note added for Table: H5 (a) & Table: H5 (b) as "Fillers added in above factors"

Factor of 3.3 KV (UE) Screened Armoured cables shall be as per factor of IEEMA Circular for 3.3kV (E) Screened Arm cables

The corrected factor tables are attached and request to all stakeholders to replace these tables with earlier published factor tables.

All other factor tables and guidelines remains unchanged as per Cir No. 07/DIV/CAB/05 and 06/DIV/CAB/05 dated 08 May 2023.

Director

Encl.: corrected factor tables for amended PV clause for MV Cables wef Apr 23.



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TABLE : H4 (c)
VARIATION FACTOR FOR STEEL WIRE ARMOUR (FeW)

THREE CORE ARMoured XLPE INSULATED 3.3 to 33 KV POWER CABLES WITH Al / Cu CONDUCTOR

Nominal Cross Sectional Area in Sq. mm	3.3 KV (E) Unscreened arm	3.3 KV (E) screened arm	6.6 KV (E)	11 KV (E) / 6.6 KV (UE)	11 KV (UE)	22 KV (E)	33 KV (E)	33 KV (UE)
25	1.258	1.358	1.457	1.612	2.509	1.503	-	-
35	1.361	1.465	1.569	1.853	2.644	2.797	2.517	-
50	1.682	1.685	1.687	2.321	2.800	2.921	4.569	4.603
70	2.033	1.959	1.979	2.503	3.219	3.347	4.809	4.935
95	2.202	2.355	2.507	2.718	4.019	4.200	5.437	6.553
120	2.371	2.523	2.675	2.882	4.241	4.416	6.713	6.820
150	2.870	2.812	2.847	3.265	4.447	4.621	6.976	7.088
185	3.121	3.215	3.309	4.148	4.726	5.289	7.356	7.489
240	3.758	3.993	4.227	4.442	5.442	6.651	7.718	7.890
300	4.099	4.562	5.024	5.182	6.894	7.084	8.187	8.359
400	5.750	6.161	6.572	6.658	7.433	7.657	8.760	8.960
500	6.716	6.747	6.777	6.861	7.588	7.797	8.830	9.629
630	7.492	7.116	7.465	7.477	8.209	8.386	9.413	10.365

TABLE : H5 (a)
VARIATION FACTOR FOR Polymer (CCFAl/CCFCu)

SINGLE CORE ARMoured XLPE INSULATED 3.3 to 33 KV POWER CABLES WITH Al / Cu CONDUCTOR

Nominal Cross Sectional Area (in Sq. mm)	3.3 KV(E) Unscreened ARM	3.3 KV (E) screened 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	33 KV (UE) ARM
35	0.123	0.197	0.259	0.278	0.330	0.376	0.468	0.493
50	0.152	0.209	0.272	0.294	0.379	0.394	0.483	0.530
70	0.170	0.227	0.295	0.317	0.404	0.419	0.508	0.583
95	0.184	0.244	0.317	0.338	0.435	0.449	0.554	0.609
120	0.197	0.261	0.337	0.392	0.457	0.472	0.576	0.634
150	0.194	0.303	0.389	0.413	0.477	0.492	0.597	0.656
185	0.224	0.322	0.414	0.445	0.502	0.539	0.674	0.767
240	0.276	0.354	0.456	0.479	0.558	0.573	0.711	0.806
300	0.294	0.377	0.489	0.506	0.587	0.602	0.811	0.915
400	0.333	0.450	0.569	0.578	0.687	0.703	0.866	0.974
500	0.367	0.493	0.675	0.679	0.809	0.826	1.056	1.139
630	0.438	0.611	0.735	0.739	0.873	0.928	1.168	1.290
800	0.529	0.734	0.863	0.866	1.027	1.05	1.189	1.380
1000	0.648	0.880	1.031	1.035	1.138	1.158	1.402	1.619

Note: The above factors are for PVC and Zero Halogen low smoke (LSZH) and for PE factor, the above factor will be multiplied by 0.63
 Fillers added in above factors





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TABLE : H5 (a)
VARIATION FACTOR FOR Polymer (CCFAL/CCFCu)

SINGLE CORE UNARMoured XLPE INSULATED 3.3 to 33 KV POWER CABLES WITH Al / Cu CONDUCTOR

Nominal Cross Sectional Area (in Sq. mm)	3.3 KV(E) Unscreened ARM	3.3 KV(E) screened 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	33 KV (UE) ARM
35	0.158	0.191	0.224	0.252	0.323	0.342	0.361	0.380
50	0.177	0.209	0.240	0.269	0.342	0.361	0.520	0.539
70	0.198	0.232	0.265	0.296	0.370	0.391	0.551	0.572
95	0.233	0.261	0.288	0.318	0.396	0.450	0.582	0.636
120	0.253	0.282	0.310	0.342	0.454	0.477	0.613	0.636
150	0.269	0.299	0.328	0.361	0.476	0.500	0.638	0.662
185	0.292	0.323	0.354	0.420	0.508	0.532	0.719	0.743
240	0.322	0.371	0.419	0.455	0.547	0.572	0.766	0.791
300	0.355	0.408	0.461	0.490	0.585	0.610	0.863	0.888
400	0.423	0.474	0.524	0.539	0.683	0.711	0.932	0.960
500	0.477	0.553	0.629	0.635	0.743	0.825	1.059	1.141
630	0.548	0.620	0.691	0.697	0.866	0.898	1.144	1.176
800	0.672	0.749	0.826	0.833	1.016	1.051	1.320	1.355
1000	0.789	0.877	0.964	0.964	1.099	1.200	1.488	1.589

Note: The above factors are for PVC and Zero Halogen low smoke (LSZH) and for PE factor the above factor will be multiplied by 0.63
 Fillers added in above factors

TABLE : H5 (b)
VARIATION FACTOR FOR POLYMER (CCFAI / CCFCu)

THREE CORE ARMoured XLPE INSULATED 3.3 to 33 KV POWER CABLES WITH Al / Cu CONDUCTOR

Nominal Cross Sectional Area (in Sq. mm)	3.3 KV (E) Unscreened ARM	3.3 KV (E) screened 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	33 KV (UE) ARM
35	0.374	0.634	0.990	1.142	1.604	1.782	-	
50	0.445	0.702	1.119	1.260	1.834	2.046	2.864	3.070
70	0.547	0.863	1.290	1.396	2.011	2.284	3.219	3.380
95	0.594	0.990	1.440	1.647	2.269	2.428	3.367	3.721
120	0.732	1.214	1.692	1.877	2.498	2.715	3.646	4.020
150	0.812	1.355	1.906	2.061	2.767	2.931	3.927	4.216
185	0.960	1.589	2.086	2.406	3.028	3.180	4.166	4.529
240	1.130	1.832	2.484	2.744	3.398	3.580	4.589	4.917
300	1.219	2.201	2.912	3.161	3.840	4.016	5.029	5.325
400	1.313	2.561	3.530	3.664	4.353	4.666	5.736	5.911
500	1.652	3.138	3.925	3.971	4.621	4.878	5.913	6.625
630	1.949	3.774	4.487	4.982	5.225	5.477	6.696	7.445

Note: The above factors are for PVC and Zero Halogen low smoke (LSZH) and for PE factor the above factor will be multiplied by 0.63
 Fillers added in above factors





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IEEMA (PVC)/MV SCREEN CABLE/2019 (R-1)

Effective from: 01 April 2023

Cir. No. 07/DIV/CAB/05

08 May 2023

To Cable Division and Utilities/SEBS, listed of purchasing organisations

Sub: Amendment to Price Variation Clause for MV Cables

IEEMA MV Cable PV formula is applicable from Sep 2019. With the coming demand for cables; Cable manufacturers' requested IEEMA to publish following missing factors from formula document of MV Cable effective from Sep 2019; since some of the users were procuring such cables and demanding these factors and also for the correction in the SMIF factor for Copper Wire Metallic Screen for MV and EHV cables.

IEEMA Cable Technical committee discussed the subject in depth and IEEMA collected the variation factors and finalised in consensus. The average factors are tabled in annexure which are effective from 01 Apr 2023 and accordingly modified the formulae, attached with circular.

New evolved variation factors and corrections in formulae are as below:

1. Variation factors for Polymer (CCFAL/CCFCu), Table: H5 (a) are added for Single core unarmored XLPE insulated 3.3 to 33 KV Power cables with Al / Cu conductor
2. Variation factors for 33 KV (UE) and 3.3 KV (screened) are added
3. The formula for copper screen factor given in IEEMA MV Cable PV clause for all formulae wef Sep 19 is for copper wires only and copper tape binder if provided, its area would be additional.

The SMIF, weight factor for Copper Wire Metallic Screen has been modified as under:

SMIF = $(A \times D \times LF)/1000$, where D = Density (= 8.89 for Cu), LF = Lay Factor (=1.07, for Copper Wire Metallic Screen and counter helix tape)

4. Considering the fluctuations in the prices; and as suggested by members, IEEMA will be publishing a separate price for XLPE for EHV Cables (Above 66 KV) in IEEMA Cable price variation circular from 01 Apr 2023 onwards. This price will be applicable for XLPE in all EHV Cable (Above 66 KV) formulae from 01 Apr 2023 onwards. And correction/change in existing "XLPE - HV Cable" being mentioned in IEEMA Price circulars with "XLPE - MV Cable" applicable for MV cables.
5. For the better clarity and application of prices, it is also agreed upon to change/replace the existing PVC grades "CW 22" & "HR-11" being mentioned in IEEMA Price circulars with generic PVC names as under;

CW 22 to be changed to "PVC" &
 HR 11 to be changed to "HR PVC"





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As discussed and agreed in consensus, the understanding for above generic PVC grades is that "PVC" will be considered for PVC insulation and PVC sheath of General Purpose PVC insulated LV cables as per IS 1554 (I) suitable max conductor temperature of 70 °C, whereas "HRPVC" will be considered for Heat Resisting PVC insulation and Heat Resisting PVC sheath of HRPVC insulated LV Cables as per IS 1554 (I) and also for Heat Resisting PVC sheath of XLPE insulated LV cables as per IS 7098 (I) & Heat Resisting PVC sheath of XLPE insulated HT Cables as per IS 7098 (Part-2).

6. There is regular requirement of 3.3 kV DC cables for Metro Projects, with Galvanized Steel (GS) wire/strip armouring, in view of this, Variation Factors for GS wire/ Strip armouring for Single core 3.3 kV cables are collected and the table of average variation factor is evolved.
7. As suggested by stake holders and in consensus with IEEMA Cable Tech committee, prices of Steel for armouring for following thickness are published in IEEMA Cable PVC from 01 Jan 2023 and are effective/applicable from 01 Jan 2023.
 Round wire 2.0 mm dia, Round wire 2.5 mm dia, Round wire 3.15 mm dia, Round wire 4.0 mm dia

We are enclosing amended price variation clause for MV Cables along with applicable table of variation factors and additional table of variation factors which are effective from 01 Mar 2023. We recommend all stakeholders to incorporate these changes in all the contracts/tenders henceforth for settlement of price variation from 01 Apr 2023 onwards.

Director

Encl.: Amended PV clause for MV Cables along with table of variation Factors



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IEEMA (PVC)/MV SCREEN CABLE/2019 (R-1)

Effective from: 01 April 2023

Material Price Variation Clause for 3.3-33 KV XLPE Insulated Armoured Single & Three core Screen 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 Ex-Works Price quoted/confirmed (in Rs/Km)

ALUMINIUM

AIF Variation factor for Aluminium

AI Price of Aluminum. This price is as applicable **one** month prior to the date of delivery.

Alo Price of Aluminium. This price is as applicable **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 **one** month prior to the date of delivery.

Cuo Price of CC copper rods. This price is as applicable **one** month prior to the date of tendering.

POLYMER COMPOUND (PVC/PE/Zero Halogen low smoke)

PVC Price of PVC Compound / PE / Zero Halogen low smoke. This price is as applicable on **one** month prior to the date of delivery.

PVCo Price of PVC Compound / PE / Zero Halogen low smoke. This price is as applicable on **one** month prior to the date of tendering.

(the relevant price of Polymer Compound is to be selected depending upon the type of compound used for the cable)

CCFAI Variation factor for PVC compound / PE / Zero Halogen low smoke for aluminum conductor cable.

CCFCu Variation factor for PVC compound / PE / Zero Halogen low smoke for copper conductor cable.

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.



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IEEMA (PVC)/MV SCREEN CABLE/2019 (R-1)

Effective from: 01 April 2023

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

COPPER TAPE

SMIFS Variation factor for Copper tape

SMIF1 Price of CC copper rods. This price is as applicable **one** month prior to the date of delivery.

SMIF0 Price of CC copper rods. This price is as applicable **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)/--/-- for 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, date of manufacturer's dispatch note is to be considered as the date of delivery) or contracted delivery date (including any agreed extension thereto) whichever is earlier.

Notes: All prices of raw materials are exclusive of GST amount. 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/s
3. Price of XLPE Compound (in Rs/MT) is the ex-works price, as quoted by the manufacturer/s
4. Price of Polymer Compound (in Rs/MT) is the ex-work price, as quoted by the manufacturer/s
5. Price of Zero halogen low smoke (LSZH) (in Rs/MT) is the ex-work price, as quoted by the manufacturer/s
6. Price of CC copper rods (in Rs/MT) is ex-works price as quoted by the primary producer
7. Price of galvanized steel strip / steel wire (in Rs/MT) is ex-works price as quoted by the manufacturer for Round steel Wire and Flat steel strip (the relevant price of steel strip or steel wire is to be selected depending upon the type of armouring of the cable)



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IEEMA (PVC)/MV SCREEN CABLE/2019 (R-1)

Effective from: 01 April 2023

Price variation formulae

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

$P = P_o + AIF (AI - AIo) + XLFAL(CC - Cco) + SMIFS (SMIF1 - SMIF0) + CCFAl (PVCc - PVCco)$
 For Single Core unarmoured cables Aluminium factor (AIF) shall be referred from Table ALP

Table References:

ALP	Aluminium conductor Factor in single core (for unarmoured cable) ; AIF
H1	Aluminium Armour Factor for Armour with Al Cond.
H2(a)	XLPE Compound Factor ; XLFAI
H3(a)	Copper Tape Factor ; SMIFS
H5(a)	Polymer factor for Single core cable ; CCFAl

Note: For cases where specific Earth Fault Current through Screen is required, Screen area as approved by the customer in Datasheet/Earth Fault Current calculation of Screen shall be used to derive SMIF as below:

If A= Area of Metallic Screen in Approved Datasheet / Calculation Sheet

D= Density= 8.89 for Cu. & 2.703 for Al; LF = Lay Factor (=1.07, for Copper Wire Metallic Screen and counter helix tape)

$$SMIF = (A \times D \times LF) / 1000$$

H. For Copper conductor XLPE insulated 3.3 to 33 kV Single Core Armoured power cables

$P = P_o + CuF (Cu - Cu0) + XLFCu(CC - Cco) + SMIFS (SMIF1 - SMIF0) + AIF(AI - AIo) + CCFAl (PVCc - PVCco)$

For Single Core unarmoured cables Aluminium factor (AIF) shall be 0

Table References:

CuP	Copper conductor Factor in single core ; CuF
H2(a)	XLPE Compound Factor ; XLFCu
H3(a)	Copper Tape Factor ; SMIFS
H4(a)	Aluminium Armour factor ; AIF
H5(a)	Polymer factor for Single core cable ; CCFCu

Note: For cases where specific Earth Fault Current through Screen is required, Screen area as approved by the customer in Datasheet/Earth Fault Current calculation of Screen shall be used to derive SMIF as below

If A= Area of Metallic Screen in Approved Datasheet / Calculation Sheet

D= Density= 8.89 for Cu. & 2.703 for Al; LF = Lay Factor (=1.07, for Copper Wire Metallic Screen and counter helix tape)

$$SMIF = (A \times D \times LF) / 1000$$



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IEEMA (PVC)/MV SCREEN CABLE/2019 (R-1)

Effective from: 01 April 2023

I. For Aluminium conductor XLPE insulated 3.3 to 33 kV Three Core Armoured power cables

$$P = P_o + AIF (AI - AIo) + XLFAL(CC-Cco) + SMIF (SMIF1-SMIF0) + FeF(FeF1-FeF0) + CCFAl (PVCc - PVCco)$$

For unarmoured Three Core cables, Steel Armour factor (FeF for Strip & FeW for Wire) shall be 0

Table References:

ALP	Aluminium conductor Factor in three core; AIF
H2(b)	XLPE Compound Factor ; XLFAl
H3(b)	Copper Tape Factor ; SMIF
H4(b)	Steel Strip Armour Factor ; FeF
H4(c)	Steel Wire Armour ; FeW
H5(b)	Polymer factor for Three Core cable ; CCFAl

Note: For cases where specific Earth Fault Current through Screen is required, Screen area as approved by the customer in Datasheet/Earth Fault Current calculation of Screen shall be used to derive SMIF as below

If A= Area of Metallic Screen in Approved Datasheet / Calculation Sheet

D= Density= 8.89 for Cu. & 2.703 for Al; LF = Lay Factor (=1.07, for Copper Wire Metallic Screen and counter helix tape)

$$SMIF = (A \times D \times LF)/1000$$

J. For Copper conductor XLPE insulated 3.3 to 33 kV Three Core Armoured power cables

$$P = P_o + CuF (Cu - Cuo) + XLFCu(CC-Cco) + SMIF(SMIF1-SMIF0) + FeF(FeF1-FeF0) + CCFCu (PVCc - PVCco)$$

For Three Core unarmoured cables, Steel Armour factor (FeF for Strip & FeW for Wire) shall be 0

Table References:

CuP	Copper conductor Factor in three core; CuF
H2(b)	XLPE Compound Factor; XLFCu
H3(b)	Copper Tape Factor; SMIF
H4(b)	Steel Strip Armour Factor; FeF
H4(c)	Steel Wire Armour Factor; FeW
H5(b)	Polymer factor for Three Core cable; CCFCu

Note: For cases where specific Earth Fault Current through Screen is required, Screen area as approved by the customer in Datasheet/Earth Fault Current calculation of Screen shall be used to derive SMIF as below

If A= Area of Metallic Screen in Approved Datasheet / Calculation Sheet

D= Density= 8.89 for Cu. & 2.703 for Al; LF = Lay Factor (=1.07, for Copper Wire Metallic Screen and counter helix tape)

$$SMIF = (A \times D \times LF)/1000$$





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IEEMA (PVC)/MV SCREEN CABLE/2019 (R-1)

Effective from: 01 April 2023

K. For Aluminium conductor XLPE insulated 3.3 kV Single Core Armoured power cables

$$P = P_o + AIF (AI - AIo) + XLFAL(CC - Cco) + CCFAl (PVCc - PVCco) + FeF(FeF1 - FeF0)$$

For Single Core unarmoured cables Aluminium factor (AIF) shall be referred from Table ALP

Table References:

ALP	Aluminium conductor Factor in single core (for unarmoured cable) ; AIF
H1	Aluminium Armour Factor for Armour with Al Cond.
H2(a)	XLPE Compound Factor ; XLFAl
H4(d)	Steel Strip Armour Factor ; FeF / Steel Wire Armour Factor ; FeW for 3.3KV cables
H5(a)	Polymer factor for Single core cable ; CCFAl

Note: For cases where specific Earth Fault Current through Screen is required, Screen area as approved by the customer in Datasheet/Earth Fault Current calculation of Screen shall be used to derive SMIF as below

If A= Area of Metallic Screen in Approved Datasheet / Calculation Sheet

D= Density= 8.89 for Cu. & 2.703 for Al; LF = Lay Factor (=1.07, for Copper Wire Metallic Screen and counter helix tape) **SMIF = (A x D x LF)/1000**

L. For Copper conductor XLPE insulated 3.3 kV Single Core Armoured power cables

$$P = P_o + CuF (Cu - Cu0) + XLFCu(CC - Cco) + AIF(AI - AIo) + CCFAl (PVCc - PVCco) + FeF(FeF1 - FeF0)$$

For Single Core unarmoured cables Aluminium factor (AIF) shall be 0

Table References:

CuP	Copper conductor Factor in single core ; CuF
H2(a)	XLPE Compound Factor ; XLFCu
H4(a)	Aluminium Armour factor ; AIF
H4(d)	Steel Strip Armour Factor ; FeF / Steel Wire Armour Factor ; FeW for 3.3KV cables
H5(a)	Polymer factor for Single core cable ; CCFCu

Note: For cases where specific Earth Fault Current through Screen is required, Screen area as approved by the customer in Datasheet/Earth Fault Current calculation of Screen shall be used to derive SMIF as below

If A= Area of Metallic Screen in Approved Datasheet / Calculation Sheet

D= Density= 8.89 for Cu. & 2.703 for Al; LF = Lay Factor (=1.07, for Copper Wire Metallic Screen and counter helix tape) **SMIF = (A x D x LF)/1000**

The PV factor for metallic screen will be computed based on approved screen area in case of cables having a specific short circuit capacity

Authorized Signatory





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TABLE ALP

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

Nominal Cross Sectional Area (in Sq. mm.)	1 core	3 core
25	0.073	0.219
35	0.101	0.302
50	0.137	0.410
70	0.197	0.593
95	0.274	0.821
120	0.346	1.036
150	0.425	1.279
185	0.533	1.605
240	0.703	2.099
300	0.879	2.635
400	1.126	3.374
500	1.418	4.256
630	1.828	5.494
800	2.340	7.018
1000	2.951	8.834





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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	3 core
25	0.240	0.720
35	0.332	0.993
50	0.451	1.348
70	0.648	1.950
95	0.901	2.700
120	1.138	3.407
150	1.398	4.207
185	1.753	5.279
240	2.312	6.904
300	2.891	8.667
400	3.703	11.097
500	4.664	13.998
630	6.012	18.070
800	7.696	23.082
1000	9.706	29.055





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

Nominal Cross Sectional Area (in Sq. mm.)	Aluminium Factor for Aluminium Armoured Cable with Aluminium Conductor							
	3.3 KV(E) unshielded Arm	3.3 KV(E) shielded Arm	6.6 KV (E)	11 KV (E)/ 6.6 KV (UE)	11 KV (UE)	22 KV (E)	33 KV (E)	33 KV (UE)
35	0.251	0.268	0.284	0.301	0.344	0.358	0.473	0.528
50	0.312	0.324	0.336	0.352	0.397	0.408	0.672	0.695
70	0.385	0.397	0.409	0.423	0.469	0.501	0.723	0.775
95	0.476	0.488	0.500	0.518	0.637	0.656	0.856	0.883
120	0.561	0.574	0.586	0.601	0.726	0.744	0.949	0.985
150	0.653	0.666	0.678	0.696	0.823	0.842	1.050	1.094
185	0.773	0.785	0.797	0.893	0.949	0.965	1.183	1.247
240	0.997	1.030	1.063	1.083	1.139	1.154	1.387	1.463
300	1.209	1.240	1.271	1.283	1.333	1.307	1.753	1.877
400	1.438	1.497	1.556	1.565	1.620	1.636	2.046	2.217
500	1.873	1.887	1.901	1.910	2.110	2.128	2.484	2.613
630	2.337	2.349	2.361	2.369	2.580	2.595	2.978	3.147
800	3.007	3.039	3.071	3.080	3.145	3.163	3.588	3.789
1000	3.737	3.739	3.741	3.749	3.804	3.822	4.565	4.891





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TABLE : H2 (a)
VARIATION FACTOR FOR XLPE(XLFAI/XLFCu)
SINGLE CORE ARMOURED /UNARMOURED XLPE INSULATED 3.3 to 33 KV POWER CABLES WITH AI / Cu CONDUCTOR

Nominal Cross-Sectional Area (in Sq. mm.)	XLPE Factor for Armoured/ Unarmoured Cable with AL /CU Conductor							
	3.3 KV(E) unscreened Arm	3.3 KV(E) screened Arm	6.6 KV (E)	6.6 KV (UE) / 11 KV (E)	11 KV (UE)	22 KV (E)	33 KV (E)	33 KV (UE)
25	0.110	0.117	0.131	0.170	0.279	-	-	-
35	0.122	0.129	0.137	0.175	0.284	0.317	0.522	0.575
50	0.135	0.144	0.151	0.191	0.307	0.341	0.563	0.620
70	0.155	0.165	0.172	0.215	0.342	0.379	0.615	0.678
95	0.174	0.185	0.193	0.241	0.377	0.417	0.670	0.732
120	0.192	0.205	0.212	0.262	0.407	0.449	0.713	0.785
150	0.209	0.223	0.229	0.283	0.437	0.481	0.757	0.832
185	0.228	0.244	0.250	0.308	0.471	0.518	0.809	0.888
240	0.255	0.271	0.279	0.343	0.519	0.569	0.883	0.961
300	0.280	0.296	0.322	0.372	0.560	0.613	0.943	1.030
400	0.326	0.345	0.392	0.420	0.625	0.683	1.041	1.133
500	0.388	0.407	0.461	0.469	0.694	0.757	1.142	1.236
630	0.467	0.490	0.520	0.529	0.777	0.845	1.265	1.356
800	0.567	0.595	0.593	0.602	0.874	0.949	1.407	1.494
1000	0.656	0.688	0.665	0.660	0.955	1.036	1.525	1.624

Note : XLPE factors include Semicons for Conductor & Insulation screen





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TABLE – H2 (b)
VARIATION FACTOR FOR XLPE (XLFAI/XLFCu)

THREE CORE ARMoured /UNARMoured XLPE INSULATED 3.3 to 33 KV POWER CABLES WITH Al / Cu CONDUCTOR

Nominal Cross-Sectional Area (in Sq. mm)	3.3 KV unscreened Arm	3.3 KV screened 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	33 KV (UE) ARM
25	0.315	0.315	0.394	0.511	0.838	-	-	-
35	0.339	0.350	0.427	0.545	0.880	0.982	1.638	-
50	0.378	0.387	0.474	0.600	0.957	1.065	1.751	1.858
70	0.435	0.445	0.541	0.679	1.067	1.183	1.916	2.034
95	0.489	0.499	0.604	0.755	1.171	1.295	2.071	2.194
120	0.537	0.554	0.661	0.822	1.265	1.396	2.210	2.355
150	0.585	0.601	0.719	0.890	1.359	1.497	2.350	2.494
185	0.642	0.660	0.784	0.968	1.468	1.614	2.513	2.665
240	0.717	0.734	0.873	1.074	1.615	1.773	2.732	2.882
300	0.781	0.804	1.006	1.167	1.744	1.928	2.919	3.089
400	0.886	0.910	1.227	1.314	1.948	2.130	3.229	3.399
500	0.956	1.085	1.421	1.446	2.148	2.381	3.588	3.689
630	1.129	1.285	1.582	1.609	2.382	2.630	3.940	4.068

Note : XLPE factors include Semicons for Conductor & Insulation screen





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TABLE – H3 (a)

VARIATION FACTOR FOR COPPER TAPE (SMIFS)

SINGLE CORE ARMoured /UNARMoured XLPE INSULATED 3.3 to 33 KV POWER CABLES WITH Al / Cu CONDUCTOR

Nominal Cross-Sectional Area in sq.mm.	3.3 KV Screened	6.6 KV (E)	6.6 KV (UE) / 11 KV (E)	11 KV (UE)	22 KV (E)	33 KV (E)	33 KV (UE)
	ARM	ARM	ARM	ARM	ARM	ARM	ARM
35	0.016	0.018	0.020	0.025	0.026	0.016	0.035
50	0.016	0.019	0.022	0.026	0.028	0.035	0.038
70	0.020	0.022	0.024	0.029	0.030	0.037	0.040
95	0.022	0.024	0.026	0.031	0.032	0.039	0.043
120	0.022	0.025	0.028	0.032	0.034	0.041	0.045
150	0.025	0.027	0.029	0.034	0.035	0.042	0.046
185	0.027	0.029	0.031	0.036	0.038	0.045	0.049
240	0.030	0.032	0.034	0.039	0.040	0.047	0.052
300	0.034	0.035	0.036	0.043	0.043	0.050	0.054
400	0.039	0.040	0.041	0.046	0.047	0.054	0.062
500	0.045	0.045	0.045	0.050	0.051	0.058	0.066
630	0.048	0.049	0.050	0.054	0.056	0.063	0.071
800	0.055	0.055	0.055	0.060	0.061	0.068	0.077
1000	0.056	0.060	0.058	0.065	0.066	0.073	0.082





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TABLE – H3 (b)
VARIATION FACTOR FOR COPPER TAPE (SMIF)

THREE CORE ARMOURED /UNARMOURED XLPE INSULATED 3.3 to 33 KV POWER CABLES WITH Al / Cu CONDUCTOR

Nominal Cross-Sectional Area in sq.mm.	3.3 KV Screened	6.6 KV (E)	6.6 KV (UE) / 11 KV (E)	11 KV (UE)	22 KV (E)	33 KV (E)	33 KV (UE)
	ARM	ARM	ARM	ARM	ARM	ARM	
35	0.049	0.055	0.061	0.072	0.079	-	-
50	0.053	0.059	0.065	0.076	0.083	0.104	0.123
70	0.059	0.065	0.071	0.082	0.090	0.111	0.130
95	0.065	0.071	0.077	0.088	0.096	0.117	0.137
120	0.071	0.077	0.083	0.094	0.101	0.123	0.144
150	0.076	0.082	0.088	0.099	0.106	0.128	0.149
185	0.082	0.088	0.094	0.105	0.113	0.134	0.157
240	0.091	0.097	0.103	0.114	0.121	0.143	0.166
300	0.102	0.106	0.110	0.122	0.129	0.150	0.174
400	0.120	0.122	0.124	0.135	0.142	0.164	0.198
500	0.134	0.135	0.136	0.147	0.155	0.176	0.211
630	0.149	0.149	0.149	0.160	0.168	0.190	0.228





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TABLE : H4 (a)
VARIATION FACTOR FOR ALUMINIUM (AIF)
SINGLE CORE ARMOURED XLPE INSULATED 3.3 to 33 KV POWER CABLES WITH
Cu CONDUCTOR

Nominal Cross Sectional Area (in Sq. mm.)	Aluminium Factor for Aluminium Armoured Cable with Copper Conductor							
	3.3 KV(E) unscreened Arm	3.3 KV(E) screened Arm	6.6 KV (E)	11 KV (E)/ 6.6 KV (UE)	11 KV (UE)	22 KV (E)	33 KV (E)	33 KV (UE)
35	0.153	0.170	0.187	0.204	0.247	0.258	0.372	0.426
50	0.179	0.191	0.203	0.220	0.262	0.275	0.425	0.456
70	0.196	0.208	0.219	0.233	0.278	0.311	0.444	0.501
95	0.213	0.225	0.237	0.254	0.373	0.392	0.470	0.523
120	0.228	0.241	0.253	0.268	0.393	0.410	0.488	0.545
150	0.243	0.256	0.269	0.287	0.414	0.432	0.504	0.567
185	0.261	0.273	0.285	0.381	0.437	0.455	0.526	0.600
240	0.324	0.357	0.389	0.410	0.465	0.480	0.556	0.633
300	0.365	0.397	0.428	0.440	0.490	0.510	0.737	0.834
400	0.432	0.452	0.471	0.480	0.536	0.552	0.783	0.895
500	0.489	0.503	0.517	0.526	0.726	0.744	0.844	0.955
630	0.544	0.556	0.568	0.572	0.787	0.801	0.902	1.034
800	0.706	0.747	0.787	0.797	0.862	0.880	0.982	1.111
1000	0.824	0.845	0.865	0.867	0.923	0.940	1.324	1.504





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TABLE : H4 (b)

VARIATION FACTOR FOR STEEL STRIP ARMOUR (FeF)

THREE CORE ARMoured XLPE INSULATED 3.3 to 33 KV POWER CABLES WITH Al / Cu CONDUCTOR

Nominal Cross Sectional Area Sq. mm.	3.3 KV (E) unscreened arm	3.3 KV (E) screened arm	6.6 KV (E)	11 KV (E) / 6.6 KV (UE)	11 KV (UE)	22 KV (E)	33 KV (E)	33 KV (UE)
25	0.551	0.553	0.604	0.656	0.814	-	-	-
35	0.645	0.645	0.645	0.731	0.879	0.937	-	-
50	0.675	0.684	0.703	0.761	0.937	0.966	1.181	1.301
70	0.761	0.764	0.761	0.849	0.996	1.055	1.289	1.393
95	0.820	0.828	0.849	0.907	1.083	1.113	1.348	1.454
120	0.879	0.924	0.907	0.966	1.142	1.172	1.406	1.531
150	0.966	0.988	0.966	1.055	1.201	1.259	1.494	1.592
185	1.025	1.051	1.055	1.113	1.259	1.318	1.553	1.668
240	1.142	1.147	1.142	1.231	1.377	1.406	1.641	1.760
300	1.231	1.258	1.259	1.318	1.465	1.524	1.758	1.852
400	1.348	1.402	1.406	1.435	1.582	1.641	1.876	1.990
500	1.454	1.500	1.573	1.642	1.714	1.758	2.095	2.100
630	1.632	1.680	1.745	1.943	1.889	1.918	2.150	2.280

TABLE : H4 (c)

VARIATION FACTOR FOR STEEL WIRE ARMOUR (FeW)

THREE CORE ARMoured XLPE INSULATED 3.3 to 33 KV POWER CABLES WITH Al / Cu CONDUCTOR

Nominal Cross Sectional Area in Sq. mm	3.3 KV (E) Unscreened arm	3.3 KV (E) screened arm	6.6 KV (E)	11 KV (E) / 6.6 KV (UE)	11 KV (UE)	22 KV (E)	33 KV (E)	33 KV (UE)
25	1.258	1.358	1.457	1.612	2.509	1.503	-	-
35	1.361	1.465	1.569	1.853	2.644	2.797	2.517	-
50	1.682	1.685	1.687	2.321	2.800	2.921	4.569	4.603
70	1.938	1.959	1.979	2.503	3.219	3.347	4.809	4.935
95	2.202	2.355	2.507	2.718	4.019	4.200	5.437	6.553
120	2.371	2.523	2.675	2.882	4.241	4.416	6.713	6.820
150	2.776	2.812	2.847	3.265	4.447	4.621	6.976	7.088
185	3.121	3.215	3.309	4.148	4.726	5.289	7.356	7.489
240	3.758	3.993	4.227	4.442	5.442	6.651	7.718	7.890
300	4.099	4.562	5.024	5.182	6.894	7.084	8.187	8.359
400	5.750	6.161	6.572	6.658	7.433	7.657	8.760	8.960
500	6.716	6.747	6.777	6.861	7.588	7.797	8.830	9.629
630	6.767	7.116	7.465	7.477	8.209	8.386	9.413	10.365





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TABLE : H4 (d)

VARIATION FACTOR FOR STEEL WIRE ARMOUR (FeW/FeF)

SINGLE CORE ARMoured XLPE INSULATED 3.3 KV POWER CABLES WITH Al / Cu CONDUCTOR

Nominal Cross section area in sq. mm	Single Core 3.3 kV	
	FeF	FeW
25	0.276	0.385
35	0.303	0.409
50	0.314	0.442
70	0.331	0.528
95	0.341	0.584
120	0.369	0.629
150	0.395	0.676
185	0.423	0.731
240	0.464	0.92
300	0.504	0.982
400	0.573	1.215
500	0.613	1.359
630	0.696	1.518

TABLE : H5 (a)

VARIATION FACTOR FOR Polymer (CCFAL/CCFCu)

SINGLE CORE ARMoured XLPE INSULATED 3.3 to 33 KV POWER CABLES WITH Al / Cu CONDUCTOR

Nominal Cross Sectional Area (in Sq. mm)	3.3 KV(E) Unscreened ARM	3.3 KV(E) screened 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	33 KV (UE) ARM
35	0.123	0.197	0.259	0.278	0.330	0.376	0.468	0.493
50	0.152	0.209	0.272	0.294	0.379	0.394	0.483	0.530
70	0.170	0.227	0.295	0.317	0.404	0.419	0.508	0.583
95	0.184	0.244	0.317	0.338	0.435	0.449	0.554	0.609
120	0.197	0.261	0.337	0.392	0.457	0.472	0.576	0.634
150	0.194	0.303	0.389	0.413	0.477	0.492	0.597	0.656
185	0.224	0.322	0.414	0.445	0.502	0.539	0.674	0.767
240	0.276	0.354	0.456	0.479	0.558	0.573	0.711	0.806
300	0.294	0.377	0.489	0.506	0.587	0.602	0.811	0.915
400	0.333	0.450	0.569	0.578	0.687	0.703	0.866	0.974
500	0.367	0.493	0.675	0.679	0.809	0.826	1.056	1.139
630	0.438	0.611	0.735	0.739	0.873	0.928	1.168	1.290
800	0.529	0.734	0.863	0.866	1.027	1.05	1.189	1.380
1000	0.648	0.880	1.031	1.035	1.138	1.158	1.402	1.619

Note: The above factors are for PVC and Zero Halogen low smoke (LSZH) and for PE factor, the above factor will be multiplied by 0.63





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TABLE : H5 (a)

VARIATION FACTOR FOR Polymer (CCFAL/CCFCu)

SINGLE CORE UNARMoured XLPE INSULATED 3.3 to 33 KV POWER CABLES WITH Al / Cu CONDUCTOR

Nominal Cross Sectional Area (in Sq. mm)	3.3 KV(E) Unscreened ARM	3.3 KV(E) screened 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	33 KV (UE) ARM
35	0.158	0.191	0.224	0.252	0.323	0.342	0.361	0.380
50	0.177	0.209	0.240	0.269	0.342	0.361	0.520	0.539
70	0.198	0.232	0.265	0.296	0.370	0.391	0.551	0.572
95	0.233	0.261	0.288	0.318	0.396	0.450	0.582	0.636
120	0.253	0.282	0.310	0.342	0.454	0.477	0.613	0.636
150	0.269	0.299	0.328	0.361	0.476	0.500	0.638	0.662
185	0.292	0.323	0.354	0.420	0.508	0.532	0.719	0.743
240	0.322	0.371	0.419	0.455	0.547	0.572	0.766	0.791
300	0.355	0.408	0.461	0.490	0.585	0.610	0.863	0.888
400	0.423	0.474	0.524	0.539	0.683	0.711	0.932	0.960
500	0.477	0.553	0.629	0.635	0.743	0.825	1.059	1.141
630	0.548	0.620	0.691	0.697	0.866	0.898	1.144	1.176
800	0.672	0.749	0.826	0.833	1.016	1.051	1.320	1.355
1000	0.789	0.877	0.964	0.964	1.099	1.200	1.488	1.589

Note: The above factors are for PVC and Zero Halogen low smoke (LSZH) and for PE factor the above factor will be multiplied by 0.63

TABLE : H5 (b)

VARIATION FACTOR FOR POLYMER (CCFAI / CCFCu)

THREE CORE ARMoured XLPE INSULATED 3.3 to 33 KV POWER CABLES WITH Al / Cu CONDUCTOR

Nominal Cross Sectional Area (in Sq. mm)	3.3 KV (E) Unscreened ARM	3.3 KV (E) screened 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	33 KV (UE) ARM
35	0.374	0.634	0.990	1.142	1.604	1.782	-	
50	0.445	0.702	1.119	1.260	1.834	2.046	2.864	3.070
70	0.547	0.863	1.290	1.396	2.011	2.284	3.219	3.380
95	0.594	0.990	1.440	1.647	2.269	2.428	3.367	3.721
120	0.732	1.214	1.692	1.877	2.498	2.715	3.646	4.020
150	0.812	1.355	1.906	2.061	2.767	2.931	3.927	4.216
185	0.960	1.589	2.086	2.406	3.028	3.180	4.166	4.529
240	1.130	1.832	2.484	2.744	3.398	3.580	4.589	4.917
300	1.219	2.201	2.912	3.161	3.840	4.016	5.029	5.325
400	1.313	2.561	3.530	3.664	4.353	4.666	5.736	5.911
500	1.652	3.138	3.925	3.971	4.621	4.878	5.913	6.625
630	1.949	3.774	4.487	4.982	5.225	5.477	6.696	7.445

Note: The above factors are for PVC and Zero Halogen low smoke (LSZH) and for PE factor the above factor will be multiplied by 0.63



Revised ANNEXURE A

Maharashtra State Power Generation Company Limited			
Bhusawal Project (1x660MW)			
Proforma of Vendor Approval			
Sr. No.	Information/ Particulars required	Details furnished along with documents thereof	Remarks if any
1	Name of System /Package/Item:		
2	Name of agency on whom order for the main work is placed		
3	Approval for (Name of construction material)	HT XLPE POWER CABLE	
4	Name of the vendors specified in contract document for this material		
5	Name of the proposed Sub Contractor(Vendor)		
6	Reasons for asking new vendor		
7	Details of supporting documents in lieu of above reasons		
8	Specific requirement of material in terms of dia, size, quantity etc.		
9	When the material is required & for which structure		
10	Whether vendor is Partnership/ Pvt./Public Ltd. Company		
11	Particular of registration with Government		
	i) GST registration No.		
	ii) Company registration No. & Incorporation Certificate		
	iii) PF & ESIC Certificate.		
	iv) Pan No.		
12	Address of vendor's factory		
13	Contact No. of vendor's representative for additional information		
14	Production Business Area		
16	Average annual turnover for last three years as per CA's Certificate		
17	Name of Companies where the vendor is registered		
18	Details of orders completed last 3 years (Quantity & amount)		
19	Details of orders in hand (Quantity & amount)		
20	Maximum value & quantity of work executed during last 3 years		
21	Name of the reputed, well known clients to whom the vendor has supplied the material		
22	End users Performance Certificate (Name & documents) along with the relevant PO.		
23	Any additional information		
24	Recommendation		