

TENDER DOCUMENT FOR

**DESIGN, ENGINEERING, MANUFACTURING,
SUPPLY, LAYING, JOINTING, TESTING AND
COMMISSIONING OF 33 & 66KV CABLES WITH
REQUIRED ACCESSORIES & DISMANTLING AS PER
THE SCOPE OF WORK, FOR BYPL, DELHI (INDIA)**

ON

TURNKEY BASIS

IN

BSES YAMUNA POWER LTD.

NIT NO CMC/BY/19-20/RB/SV/60 REV 01

Due Date for Submission: 28.01.2020, 15:00 HRS

**BSES YAMUNA POWER LIMITED (BYPL)
SHAKTI KIRAN BUILDING, KARKARDOOMA,
DELHI-110032
CIN: U40109DL2001PLC111525
TEL: 011 3999 7111
WEBSITE: www.bsesdelhi.com**

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used for any purpose other than, for which it is supplied.*

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VOLUME – I

INFORMATION TO BIDDER (ITB)

OF

**DESIGN, ENGINEERING, MANUFACTURING,
SUPPLY, LAYING, JOINTING, TESTING AND
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VOLUME – I: INFORMATION TO BIDDER (ITB)

1.00 EVENT INFORMATION

- 1.01 BSES Yamuna Power Ltd (hereinafter referred to as "**BYPL**") invites sealed tenders in 2 envelopes for following scope of works:

Sr.	Scheme Description	Circuit Description	Estimate Cost Value In INR	EMD Value In INR
1	SCHEME NO: EE19SH1029 FOR PROJECT – DELHI METRO PHASE IV (MAUJPUR – MUKANDPUR CORRIDOR OF DMRC) DESIGN, ENGINEERING, MANUFACTURING, SUPPLY, LAYING, JOINTING, TESTING AND COMMISSIONING OF 33 & 66KV CABLES WITH REQUIRED ACCESSORIES & DISMANTLING AS PER THE SCOPE OF WORK, FOR BYPL, DELHI (INDIA)	BYPL Yamuna Vihar to Bhagirathi Grid Ckt 1 & 2	28.00 Crore	28.00 Lakh
2		BYPL Yamuna Vihar to East of Loni Grid Ckt 1 & 2		
3		BYPL Bhagirathi to Ghonda Grid Ckt 1 & 2		
4		DTL Wazirabad to Yamuna Vihar Grid Ckt 1 & 2		
5		DTL Wazirabad to Sonia Vihar Grid Ckt 1 & 2		
6		DTL Wazirabad to Ghonda Grid Ckt 1 & 2		
7		DTL Wazirabad to Bhagirathi Grid Ckt 1 & 2		
8		BYPL Yamuna Vihar to Sonia Vihar Grid Ckt 1 & 2 (interconnector)		
9		BYPL Bhagirathi to Karawal Nagar Grid Ckt 1 & 2		
10		BYPL Bhagirathi to Dwarkapuri Grid Ckt 1		

The bidder must qualify the requirements as specified in clause 2.0 stated below.

All envelopes shall be duly super scribed "DESIGN, ENGINEERING, MANUFACTURING, SUPPLY, LAYING, JOINTING, TESTING AND COMMISSIONING OF 33 & 66KV CABLES WITH REQUIRED ACCESSORIES & DISMANTLING AS PER THE SCOPE OF WORK, FOR BYPL, DELHI (INDIA)"

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Bid shall be submitted in two (02) parts. Details of part are as follow:

Part A – Techno Commercial Bid

Part B – Price Bid

- 1.1. The schedule of specifications with detail terms & conditions can be obtained from address given below against submission of non-refundable demand draft of **₹ 1,180/-** drawn in favour of BSES Yamuna Power Ltd, payable at Delhi. The tender documents & detail terms and conditions can also be downloaded from the website www.bsesdelhi.com --> **BSES YAMUNA POWER LTD --> Tender --> Open Tenders**

In case tender papers are downloaded from the above website, then the bidder has to enclose a demand draft covering the cost of bid documents.

- 1.2. Bids will be received up to **24.03.2020, 15:00 PM.** at the address given below.

Part A of the Bid shall be opened on **24.03.2020, 15:30 PM.**

Part B of the Bid will be opened in case of Techno-Commercially qualified Bidders and the date of opening of same shall be intimated in due course. It is the sole responsibility of the bidder to ensure that the bid documents reach this office on or before the last date.

**Head of Department
Contracts & Materials Deptt.
BSES Yamuna Power Ltd
Ground Floor
Shaktikiran Building, Karkardooma
Delhi 110032**

- 1.3 BSES Yamuna Power Ltd reserves the right to accept/reject any or all tenders without assigning any reason thereof in the event of following:
- a) Tender fee of requisite value.
 - b) Earnest Money Deposit (EMD) of **₹ 28.00 Lakh** is not deposited in shape of Demand Draft/Pay Order/Banker's Cheque /Bank Guarantee drawn in favor of BSES Yamuna Power Ltd, payable at Delhi.
 - c) The offer does not contain prices indicating break-up towards all taxes & duties in prescribed format.
 - d) Complete Technical details are not enclosed.
 - e) Tender is received after due date and time.
 - f) Technical offer contains any prices.
 - g) Prices are not FIRM and subject to Price Variation.

2.00 QUALIFICATION CRITERIA

The prospective bidder must qualify all of the following requirements and shall be eligible to participate in the bidding who meets following requirements and management has a right to disqualify those bidders who do not meet these requirements.

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2.02 **Technical Criteria:**

SI No.	Criteria	Documents to be submitted by bidder
1	The bidder should have own manufacturing facility for 66KV 3CX300 & 66KV 1CX1000 MM ² or higher voltage grade Power Cable from last 3 years.	Cable manufacturing and factory incorporation certificate
2	The bidder should have supplied at least 150 km of 66KV or higher grade cable in last 3 years to Utilities/SEB/PSU	i. Summary list of executed Purchase orders ii. Purchase order copies iii. Material delivery clearance certificate copy
3	Bidder should have experience of turnkey execution including design, supply, installation, testing & commissioning project of 66KV or higher voltage grade cables in at least one utility/SEB/PSU having minimum 10 KM cable quantity in last 3 years.	i. Turnkey Purchase order/Work order copy ii. Work completion certificate copy
4	Performance certificate for minimum 1 year satisfactory performance from at least two utilities/SEB/PSUs of 66KV or higher voltage grade power cables, out of which one certificate should be of more than 10KM cable quantity.	Performance certificate
5	Bidder should have valid CPRI/ERDA Type test report of offered cable design as well as offered straight through joint and end termination joints	Relevant Type test report
6	The bidder must possess valid ISO 9001:2000 certification and valid BIS License or Equivalent International License.	Valid copy of BIS License or Equivalent International License.
7	The bidder should possess valid Electrical Contractor License issued by competent statutory agency to undertake work in NCT Delhi. In case bidder is not having this license, suitable sub-contractor having the valid license shall be engaged for works at site where copy of valid license shall be submitted to BYPL before the start of the work OR Bidder to give the undertaking that it will be obtained by them before the start of the work at site.	i. Electrical Contractor License Copy ii. Undertaking if not available

2.02 **Commercial Criteria:**

SI No.	Criteria	Documents to be submitted by bidder
1	The bidder must have adequate Financial Stability and status to meet the financial obligation pursuant to the scope of work and shall have average annual turnover of minimum Rs 200 Crore during last three (3) Financial Years preceding the date of opening of bid.	Duly certified CA certificate to be submitted

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SI No.	Criteria	Documents to be submitted by bidder
2	An undertaking (self certificate) that the bidder has not been blacklisted/debarred by any central/state government institution including electricity boards.	Undertaking
3	The bidder should have registered under GST ACT and shall submit PAN, EPF and GST Registration Number, in addition to other statutory compliances. The bidder must submit the copy of registrations and submit an undertaking that the bidder shall comply all the statutory compliances as per the applicable laws/rules etc before the start of the work.	Relevant Statutory Documents Copy

Notwithstanding anything stated above, BYPL reserves the right to assess bidder's capability to perform the contract, assess the capability and installed capacity of the Bidder for carrying out the supplies, should the circumstances warrant such assessment in the overall interest of the purchaser. In this regard the decision of the purchaser is final.

3.00 BIDDING AND AWARD PROCESS

Bidders are requested to submit their offer strictly in line with this tender document. **NO DEVIATION IS ACCEPTABLE.** BYPL shall response to the clarifications raised by various bidders and the will be distributed to all participating bidders through website.

3.01 BID SUBMISSION

The bidders are required to submit the bids in 2(two) parts and submitted in **1 original + 1 Duplicate** to the following address:

**Head of Department
Contracts & Material Deptt.
BSES Yamuna Power Ltd
3rd Floor, A Block
Shaktikiran Building, Karkardooma
Delhi 110032**

PART A :: TECHNICAL **BID** comprising of following:

Sr. No	Descriptions	Type of Documents
Commercial :		
1	Tender Fee - Demand Draft (Rs.1180/-) (Incl GST)	Non-refundable demand draft for Rs 1180/- in case the forms are downloaded from website
2	EMD	In prescribed format
3	Power-of-Attorney	In prescribed stamp paper & format

Sr. No	Descriptions	Type of Documents
4	PQR Compliances	Documentary evidence in support of qualifying criteria like : 1. Details of constitution of the company (Proprietary/Limited/etc along with the details), Memorandum of Association of the company 2. Bidders shall submit the certified annual Balance sheets for the last completed three (3) financial years 3. Supportive document on Positive Net worth. Credit rating/solvency certificate from competent authority. 4. Copies of Orders, Execution /Performance Certificate & Other Documents to support qualification Criteria
5	Signed Tender document	Original Tender documents duly stamped & signed on each page as token of acceptance
6	Black listing undertaking	Bidder should submit a Self undertaking signed by its Authorized Signatories that the Bidder or any of their sub contractor has not been blacklisted/barred by any Govt. Organization or Regulatory Agencies in India or abroad.
7	No litigation Certificate	Duly signed No Litigation Certificate as per attached format.
8	Commercial Terms and Conditions	Acceptance on Commercial Terms and Conditions viz Delivery schedule/period, Payment terms, PBG etc.
9	Acceptance on Reverse Auction	Duly signed Acceptance Form For Participation In Reverse Auction Event as per attached format
10	Bid Form (Unpriced) Duly Signed	Duly Signed Bid Form as per attached format
11	Un price Bid Duly Signed	Duly Signed Un price Bid as per attached format
Technical:		
12	Technical Details/ Filled in GTP/Drawings	Bidder shall submit duly filled GTP with all Technical documents and Drawings.
13	Field Quality and assurance Plan (QAP)	Bidder shall submit the detailed QAP plan in their technical proposal.
14	Type Test Reports	Bidders shall submit the copy of type test reports in their technical bids in support of PQR conditions
15	Project Implementation Plan and Methodology	Bidder shall submit detail Project Implementation plan and methodology in their technical bid.
16	Testing Facilities	Bidder shall submit the details of testing facilities available at their works/factory.

Sr. No	Descriptions	Type of Documents
17	Organization Chart & Manpower Details.	Bidder shall submit the details of Manpower to be deployed for project management with qualification and experience.
18	List of Current Commitments/ Work In Progress.	Bidder shall submit the list of projects (Current Commitments/Work in Progress)

- PART B :: FINANCIAL BID** comprising of (01 original only)
- Price strictly in the Format enclosed indicating Break up of basic price, taxes & duties, transportation etc

3.02 TIME SCHEDULE

The bidders should complete the following within the dates specified as under:

S.No.	Steps	Due date
1	Last Date of Sale of Bid Documents	23.03.2020
2	Date of Site Visit (If require)	-
3	Pre-Bid Meeting	-
4	Last Date of Queries, if any	-
5	Last Date of Receipt of Bid Documents	24.03.2020, 15:00HRS
6	Date & Time of Opening of PART A - Technical and Commercial Bid	24.03.2020, 15:30HRS

This is a two part bid process. Bidders are to submit the bids in 2(Two) parts
Both these parts should be furnished in separate sealed covers super scribing NIT no. DUE DATE OF SUBMISSION, with particulars as **PART-A TECHNICAL BID & COMMERCIAL TERMS & CONDITIONS** and **Part-B FINANCIAL BID** and these sealed envelopes should again be placed in another sealed cover which shall be submitted before the due date & time specified.

Part – A:: Technical Bid should not contain any cost information whatsoever and shall be submitted within the due date.

PART B:: This envelope will be opened internally after techno-commercial evaluation and only of the qualified bidders.

Bidder has to submit the item wise price bifurcation in bid. Un priced copy must be attached with the Part A (Technical Bid). Reverse Auction will be carried out on Lump sum Basis/Total Landed Cost i.e. Supply + Services

REVERSE AUCTION CLAUSE :: Purchaser reserves the right to use reverse auction as optional tool through SAP – SRM as an integral part of the entire tendering process. All techno-commercially qualified bidders shall participate in reverse auction.

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Notwithstanding anything stated above, the Purchaser reserves the right to assess bidder's capability to perform the contract, should the circumstances warrant such assessment in the overall interest of the purchaser. In this regard the decision of the purchaser is final. Bidder to submit their acceptance as per format attached ANNEXURE-C

Bidder shall bids for one or more packages, however bid to be submitted for complete package comprising of Supply, Installation, testing and Commissioning of Grid, In-feed and Outgoing feeders as per scope of work/ BOQ of respective package for each and every items & activities.

BIDS RECEIVED AFTER DUE DATE AND TIME MAY BE LIABLE TO REJECTION

4.00 AWARD DECISION

- 4.01 Purchaser intends to award the business on a lowest bid basis, so suppliers are encouraged to submit the bid competitively. The decision to place purchase order/LOI solely depends on purchaser on the cost competitiveness across multiple lots, quality, delivery and bidder's capacity, in addition to other factors that Purchaser may deem relevant.
- 4.02 In the event of your bid being selected by purchaser (and / or its affiliates) and you subsequent DEFAULT on your bid; you will be required to pay purchaser (and / or its affiliates) an amount equal to the difference in your bid and the next lowest bid on the quantity declared in NIT/RFQ.
- 4.03 In case any bidder is found unsatisfactory during the Project execution, the award will be cancelled and BYPL reserves the right to award other bidders who are found fit.
- 4.05 The purchaser reserves all the rights to award the contract to one or more bidders so as to meet the Project execution requirement or nullify the award decision without citing any reason.
- 4.06 Qty Variation: The purchaser reserves the rights to vary the quantities as per the actual requirements.

5.00 MARKET INTEGRITY

We have a fair and competitive marketplace. The rules for bidders are outlined in the Terms & Conditions. Bidders must agree to these rules prior to participating. In addition to other remedies available, we reserves the right to exclude a bidder from participating in future markets due to the bidder's violation of any of the rules or obligations contained in the Terms & Condition. Bidders who violate the marketplace rules or engage in behavior that disrupts the fair execution of the marketplace restricts a bidder to length of time, depending upon the seriousness of the violation. Examples of violations include, but are not limited to:

- Failure to honor prices submitted to the marketplace.
- Breach of the terms of the published in Request For Quotation/NIT.

6.00 SUPPLIER CONFIDENTIALITY

All information contained in this RFQ is confidential and shall not be disclosed, published or advertised in any manner without written authorization from BYPL. This includes all bidding information submitted.

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All RFQ documents remain the property of BYPL and all suppliers are required to return these documents to BYPL upon request.

Suppliers who do not honor these confidentiality provisions will be excluded from participating in future bidding events.

7.00 CONTACT INFORMATION

Technical clarification, if any, as regards this RFQ shall be sought in writing and sent by post/courier to following address. The same shall not be communicated through phone

	Technical	Commercial
Contact Person	Mr Ashwani Aggarwal Copy to : Mr. Rakesh Bansal	Mr Rakesh Bansal & Rajesh Srivastava
Address	BSES Yamuna Power Ltd , 3 rd floor, B Block, Shaktikiran Building, Karkardooma, Delhi 110032	C&M Deptt. 3 rd Floor , A-Block, BSES Yamuna Power Ltd Shaktikiran Building, Karkardooma, Delhi 110032
E-Mail ID	ashwani.aggarwal@relianceada.com	rakesh.bansal@relianceada.com rajesh.r.srivastava@relianceada.com

8.00 BID FORM

The Bidder shall submit one "Original", "Copy- 1", of the Un price Bid Form, Supporting Documents & Technical Data Sheets duly filled in as per attached specification/BOM etc enclosed.

9.00 EMD

The bidder shall furnish, as part of its bid, an EMD amounting as specified in the RFQ. The EMD is required to protect the Purchaser against the risk of Bidder's conduct which would warrant forfeiture.

The EMD shall be denominated in any of the following form:

- Bank Guarantee drawn in favour of BSES Yamuna Power Ltd, payable at Delhi.
- EMD shall be valid for One Hundred Eighty (180) days after due date of submission or amended due date of submission drawn in favour of BSES Yamuna Power Ltd.

The EMD may be forfeited in case of:

- the Bidder withdraws its bid during the period of specified bid validity
- or
- the case of a successful Bidder, if the Bidder does not
 - accept the Purchase Order, or
 - furnish the required contract performance BG.

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10.00 BID PRICES

- 10.01 Bidders shall quote for the entire Scope of Supply/Work with a break-up of prices for individual items and Taxes & Duties. The total Bid Price shall also cover all the Supplier's obligations mentioned in or reasonably to be inferred from the Bidding Documents in respect of Design, Supply, Transportation to site, all in accordance with the requirement of Bidding Documents. The Bidder shall complete the appropriate Price Schedules included herein, stating the Unit Price for each item & total Price with taxes, duties & freight upto destination.
- 10.02 The prices offered shall be inclusive of all costs as well as Duties, Taxes and Levies paid or payable during execution of the supply work, breakup of price constituents, should be there.
- 10.03 Prices quoted by the Bidder shall be **"Firm"** and not subject to any price adjustment during the performance of the Contract. **A Bid submitted with an adjustable price/ Price Variation Clause will be treated as non-responsive and rejected.**
- 10.04 The qty break-up shown else-where in Price Schedule is tentative. The bidder shall ascertain himself regarding material required for completeness of the entire work. Any item not indicated but is required to complete the job, shall be deemed to be included in the prices quoted.
- 10.05 The format for price bid is attached as Annexure B.

11.00 BID CURRENCIES

- 11.01 Prices shall be quoted in Indian Rupees Only.

12.00 PERIOD OF VALIDITY OF BIDS

- 12.01 Bids shall remain valid for 180 days from the due date of submission of the Bid & subsequent corrigendum/amendment/extension of due date of submission.
- 12.02 Notwithstanding Clause above, the Purchaser may solicit the Bidder's consent to an extension of the Period of Bid Validity. The request and the responses thereto shall be made in writing and sent by post/courier/e-mail.

13.00 ALTERNATIVE BIDS

- 13.01 Bidders shall submit Bids, which comply with the Bidding Documents. Alternative Bids will not be considered. The attention of Bidders is drawn to the provisions regarding the rejection of Bids in the terms and conditions, which are not substantially responsive to the requirements of the Bidding Documents.

14.00 FORMAT AND SIGNING OF BID

- 14.01 The original Bid Form and accompanying documents, clearly marked "Original Bid" plus copy1, must be received by the Purchaser at the date, time and place specified pursuant to Clauses 15.0 and 16.0. In the event of any discrepancy between the original and the copies, the original shall govern.

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- 14.02 The original and copies of the Bid shall be typed or written in indelible ink and shall be signed by the Bidder or a person or persons duly authorized to sign on behalf of the Bidder. Such authorization shall be indicated by written Power-of-Attorney accompanying the Bid.
- 14.03 The Bid shall contain no interlineations, erasures or overwriting except as necessary to correct errors made by the Bidder, in which case such corrections shall be initialed by the person or persons signing the Bid.

15.00 SEALING AND MARKING OF BIDS

- 15.01 Bid submission: One original, & copy1 (hard copies) of all the Bid Documents shall be sealed and submitted to the Purchaser before the closing time for submission of the bid.
- 15.02 The Technical Documents and the EMD shall be enclosed in a sealed envelope and the said envelope shall be superscribed with —"Technical & EMD". The price bid shall be inside another sealed envelope with superscribed "Financial Bid". Both these envelopes shall be sealed inside another big envelope. All the envelopes should bear the Name and Address of the Bidder and marking for the Original, & copy1. The envelopes should be superscribed with —"Tender Notice No. & Due date of opening".
- 15.03 The Bidder has the option of sending the Bids in person. Bids submitted by Email/Telex/Telegram /Fax will be rejected. No request from any Bidder to the Purchaser to collect the proposals from Courier/Airlines/Cargo Agents etc shall be entertained by the Purchaser.

16.00 DEADLINE FOR SUBMISSION OF BIDS

- 16.01 The original Bid, together with the required copies, must be received by the Purchaser at the address specified earlier.
- 16.02 The Purchaser may, at its discretion, extend the deadline for the submission of Bids by amending the Bidding Documents, in which case all rights and obligations of the Purchaser and Bidders previously subject to the deadline will there after be subject to the deadline as extended.

17.00 ONE BID PER BIDDER

- 17.01 Each Bidder shall submit only one Bid by itself. No **Joint Venture/consortium is acceptable**. A Bidder who submits or participates in more than one Bid will cause all those Bids to be rejected.

18.00 LATE BIDS

- 18.01 Any Bid received by the Purchaser after the deadline for submission of Bids prescribed by the Purchaser, pursuant to Clause 16.0, will be declared "Late" and may be rejected and returned unopened to the Bidder.

19.00 MODIFICATIONS AND WITHDRAWAL OF BIDS

- 19.01 The Bidder is not allowed to modify or withdraw its Bid after the Bid's submission.

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20.00 THE PURCHASER'S RIGHT TO ACCEPT ANY BID AND TO REJECT ANY OR ALL BIDS

20.01 The Purchaser reserves the right to accept or reject any Bid and to annul the Bidding process and reject all Bids at anytime prior to award of Contract, without thereby incurring any liability to the affected Bidder or Bidders or any obligation to inform the affected Bidder or Bidders of the grounds for the Purchaser's action.

21.00 AWARD OF CONTRACT

The Purchaser will award the Contract to the successful Bidder whose Bid has been Determined to be the lowest-evaluated responsive Bid, provided further that the Bidder has been determined to be qualified to satisfactorily perform the Contract. Purchaser reserves the right to award order to other bidders in the tender, provided it is required for timely execution of project & provided he agrees to come to the lowest rate.

22.00 LETTER OF INTENT/ NOTIFICATION OF AWARD

The letter of intent/ Notification of Award shall be issued to the successful Bidder whose bids have been considered responsive, techno-commercially acceptable and evaluated to be the lowest (L1). The successful Bidder shall be required to furnish a letter of acceptance within 7 days of issue of the letter of intent /Notification of Award by Purchaser. The date of LOI/LOA shall be treated as Start date of Project.

23.00 CONTRACT PERFORMANCE BANK GAURANTEE

Within 15 days of the receipt of Notification of Award/ Letter of Intent/PO from the Purchaser, the successful Bidder shall furnish Contract Performance Bank Guarantee towards faithful performance of Contract for an amount of 10% (Ten percent) of the Contract Price. The Performance Bond shall be valid upto completion period/handing over, whichever is earlier plus 3 months claim period. Upon submission of the performance security, the EMD shall be released. 03 (three) nos. separate CPBG's shall be submitted against Supply, ETC & Civil Contract.

24.00 PACKAGE COMPLETION PERIOD (PROJECT)

24.01 Vendor require to complete the project as per package wise schedule as under

Scheme Number	Package Name	Total Months for Handing over of the Package, From Zero Date	Total No. of Day for Handing over of the Package From Zero Date
EE19SH1029	DELHI METRO PHASE IV (MAUJPUR – MUKANDPUR CORRIDOR OF DMRC)	12 months	365 days

25.00 GENERAL

All the Bids shall be prepared and submitted in accordance with these instructions.

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- 25.01 Bidder shall bear all costs associated with the preparation and delivery of its Bid, and the Purchaser will in no case shall be responsible or liable for these costs.
- 25.02 The Bid should be submitted by the Bidder in whose name the bid document has been issued and under no circumstances it shall be transferred /sold to any other party.
- 25.03 The Purchaser reserves the right to request for any additional information and also reserves the right to reject the proposal of any Bidder, if in the opinion of the Purchaser, the data in support of NIT requirement is incomplete.
- 25.04 The Bidder is expected to examine all instructions, forms, terms & conditions and specifications in the Bid Documents. Failure to furnish all information required in the Bid Documents or submission of a Bid not substantially responsive to the Bid Documents in every respect may result in rejection of the Bid. However, the Purchaser's decision in regard to the responsiveness and rejection of bids shall be final and binding without any obligation, financial or otherwise, on the Purchaser.

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APPENDIX I

(FORMAT FOR EMD BANK GUARANTEE)

(To be issued in a Non Judicial Stamp Paper of Rs.50/-purchased in the name of the bank)

Whereas [*name of the Bidder*] (herein after called the "Bidder") has submitted its bid dated [*date of submission of bid*] for the supply of [*name and/or description of the goods*] (here after called the "Bid").

KNOW ALL PEOPLE by these presents that WE [*name of bank*] at [*Branch Name and address*], having our registered office at [*address of the registered office of the bank*] (herein after called the "Bank"), are bound unto BSES Yamuna Power Ltd., with its Corporate Office at Shaktikiran Building, Karkardooma, Delhi - 110032, (herein after called —the "Purchaser") in the sum of Rs. (Rupees..... only) for which payment well and truly to be made to the said Purchaser, the Bank binds itself, its successors, and assigns by these presents.

Sealed with the Common Seal of the said Bank this _____ day of _____ 20_____.

The conditions of this obligation are:

- 1 If the Bidder withdraws its Bid during the period of bid validity specified by the Bidder on the Bid Form ; or
2. If the Bidder, having been notified of the acceptance of its Bid by the Purchaser during the period of bid validity:
 - (a) fails or refuses to execute the Contract Form ,if required; or
 - (b) fails or refuses to furnish the performance security, In accordance with the Instructions to Bidders/ Terms and Conditions;

We undertake to pay to the Purchaser up to the above amount upon receipt of its first written demand, without the Purchaser having to substantiate its demand, provided that is its demand the purchaser will note that amount claimed by it is due to it, owing to the occurrence of one or both of the two condition(s), specifying the occurred condition or condition(s).

This guarantee will remain in force up to and including One Hundred Eighty (180) days after the due date of submission bid, and any demand in respect thereof should reach the Bank not later than the above date.

(Stamp & signature of the bank)

Signature of the witness

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BID FORM

To

Head of Department
Contracts & Material Deptt.
BSES Yamuna Power Ltd
Shaktikiran Building, Karkardooma,
Delhi 110032

Sir,

1 We understand that BYPL is desirous of procuring..... for it's licensed distribution network area in Delhi

2 Having examined the Bidding Documents for the above named works, we the undersigned, offer to deliver the goods in full conformity with the Terms and Conditions and technical specifications for the sum indicated in Price Bid or such other sums as may be determined in accordance with the terms and conditions of the contract .The amounts are in accordance with the Price Schedules attached herewith and are made part of this bid.

3 If our Bid is accepted, we under take to deliver the entire goods as) as per delivery schedule mentioned in Section IV from the date of award of purchase order/letter of intent.

4 If our Bid is accepted, we will furnish a performance bank guarantee for an amount of 10% (Ten)percent of the total contract value for due performance of the Contract in accordance with the Terms and Conditions.

5 We agree to abide by this Bid for a period of 180 days from the due date of bid submission and it shall remain binding upon us and may be accepted at any time before the expiration of that period.

6 We declare that we have studied the provision of Indian Laws for supply of equipments/materials and the prices have been quoted accordingly.

7 Unless and until Letter of Intent is issued, this Bid, together with your written acceptance there of, shall constitute a binding contract between us.

8 We understand that you are not bound to accept the lowest, or any bid you may receive.

9 There is provision for Resolution of Disputes under this Contract, in accordance with the Laws and Jurisdiction of Contract.

Dated this..... day of..... 20

Signature..... In the capacity of

.....duly authorized to sign for and on behalf of

(IN BLOCK CAPITALS)

ACCEPTANCE FORM FOR PARTICIPATION IN REVERSE AUCTION EVENT

(To be signed and stamped by the bidder)

BSES Yamuna Power Ltd (hereinafter referred to as "**BYPL**") intends to use the reverse auction through SAP-SRM tool as an integral part of the entire tendering process. All the bidders who are found as techno commercial qualified based on the tender requirements shall be eligible to participate in the reverse auction event.

The following terms and conditions are deemed as accepted by the bidder on participation in the bid event:

1. BYPL shall provide the user id and password to the authorized representative of the bidder. (Authorization letter in lieu of the same be submitted along with the signed and stamped acceptance form)
2. BYPL will make every effort to make the bid process transparent. However, the award decision by BYPL would be final and binding on the bidder.
3. The bidder agrees to non-disclosure of trade information regarding the purchase, identity of BYPL, bid process, bid technology, bid documentation, bid details, and etc.
4. The bidder is advised to understand the auto bid process to safeguard themselves against any possibility of non-participation in the auction event.
5. In case of bidding through internet medium, bidders are further advised to ensure availability of the entire infrastructure as required at their end to participate in the auction event. Inability to bid due to telephone line glitch, internet response issues, software or hardware hangs; power failure or any other reason shall not be the responsibility of BYPL.
6. In case of intranet medium, BYPL shall provide the infrastructure to bidders, further, BYPL has sole discretion to extend or restart the auction event in case of any glitches in infrastructure observed which has restricted the bidders to submit the bids to ensure fair & transparent competitive bidding. In case of an auction event is restarted, the best bid as already available in the system shall become the start price for the new auction.
7. In case the bidder fails to participate in the auction event due any reason whatsoever, it shall be presumed that the bidder has no further discounts to offer and the initial bid as submitted by the bidder as a part of the tender shall be considered as the bidder's final no regret offer. Any offline price bids received from a bidder in lieu of non-participation in the auction event shall be out rightly rejected by BYPL.
8. The bidder shall be prepared with competitive price quotes on the day of the reverse auction event.
9. The prices as quoted by the bidder during the auction event shall be inclusive of all the applicable taxes, duties and levies and shall be FOR Landed Cost basis at BYPL site.
10. The prices submitted by a bidder during the auction event shall be binding on the bidder.
11. No requests for time extension of the auction event shall be considered by BYPL.
12. The original price bids of the bidders shall be reduced on pro-rata basis against each line item based on the final all inclusive prices offered during conclusion of the auction event for arriving at contract amount.

Signature & seal of the Bidder

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Year	Name of client	Details of contract & date	Cause of Litigation/arbitration and dispute	Disputed amount

CURRENT CONTRACT COMMITMENTS / WORK IN PROGRESS

Year	Name of client	Details of contract & date	Value of outstanding work	Estimated completion date

FINANCIAL DATA

(Duly Certified by Chartered Accountant)

	Actual in previous 5 financial years				
	FY 18-19	FY 17-18	FY 16-17	FY 15-16	FY 14-15
Total assets					
Current assets					
Total Liability					
Current Liability					
Profit before taxes					
Profit after taxes					

ANNEXURE - SCHEDULE OF DEVIATIONS

Vendor shall refrain from taking any deviations on this TENDER. Still in case of any deviations, all such deviations from this tender shall be set out by the Bidder, Clause by Clause in this schedule and submit the same as a part of the Technical Bid.

Unless **specifically** mentioned in this schedule, the tender shall be deemed to confirm the BYPL's specifications:

SL NO	Clause No.	Page No.	NIT Clause descriptions	Details of Clarification/deviation with justifications

VENDOR CODE OF CONDUCT

Purchaser is committed to conducting its business in an ethical, legal and socially responsible manner. To encourage compliance with all legal requirements and ethical business practices, Purchaser has established this Vendor Code of Conduct (the "Code") for Purchaser's Vendors. For the purposes of this document, "Vendor" means any company, corporation or other entity that sells, or seeks to sell goods or services, to Purchaser, including the Vendor's employees, agents and other representatives.

Fundamental to adopting the Code is the understanding that a business, in all of its activities, must operate in full compliance with the laws, rules and regulations of the countries in which it operates. This Code encourages Vendors to go beyond legal compliance, drawing upon internationally recognized standards, in order to advance social and environmental responsibility.

I. Labour and Human Rights

Vendors must uphold the human rights of workers, and treat them with dignity and respect as understood by the international community.

- Fair Treatment - Vendors must be committed to a workplace free of harassment. Vendors shall not threaten workers with or subject them to harsh or inhumane treatment, including sexual harassment, sexual abuse, corporal punishment, mental coercion, physical coercion, verbal abuse or unreasonable restrictions on entering or exiting company provided facilities.

- Antidiscrimination - Vendors shall not discriminate against any worker based on race, colour, age, gender, sexual orientation, ethnicity, disability, religion, political affiliation, union membership, national origin, or marital status in hiring and employment practices such as applications for employment, promotions, rewards, access to training, job assignments, wages, benefits, discipline, and termination. Vendors shall not require a pregnancy test or discriminate against pregnant workers except where required by applicable laws or regulations or prudent for workplace safety. In addition, Vendors shall not require workers or potential workers to undergo medical tests that could be used in a discriminatory way except where required by applicable law or regulation or prudent for workplace safety.

- Freely Chosen Employment - Forced, bonded or indentured labour or involuntary prison labour is not to be used. All work will be voluntary, and workers should be free to leave upon reasonable notice. Workers shall not be required to hand over government-issued identification, passports or work permits as a condition of employment.

- Prevention of Under Age Labor - Child labor is strictly prohibited. Vendors shall not employ children. The minimum age for employment or work shall be 15 years of age, the minimum age for employment in that country, or the age for completing compulsory education in that country, whichever is higher. This Code does not prohibit participation in legitimate workplace apprenticeship programs that are consistent with Article 6 of ILO Minimum Age Convention No. 138 or light work consistent with Article 7 of ILO Minimum Age Convention No. 138.

- Juvenile Labor - Vendors may employ juveniles who are older than the applicable legal minimum age for employment but are younger than 18 years of age, provided they do not perform work likely to jeopardize their health, safety, or morals, consistent with ILO Minimum Age Convention No. 138.

- Minimum Wages - Compensation paid to workers shall comply with all applicable wage laws, including those relating to minimum wages, overtime hours and legally mandated benefits. Any Disciplinary wage deductions are to conform to local law. The basis on which workers are being paid is to be clearly conveyed to them in a timely manner.

- . Working Hours - Studies of good manufacturing practices clearly link worker strain to reduced productivity, increased turnover and increased injury and illness. Work weeks are not to exceed maximum set by local law. Further, a work week should not be more than 60 hours per week, including overtime, except in emergency or unusual situations. Workers should be allowed at least one day off per seven-day week.

- . Freedom of Association - Open communication and direct engagement between workers and management are the most effective ways to resolve workplace and compensation issues. Vendors are to respect the rights of workers to associate freely and to communicate openly with management regarding working conditions without fear of reprisal, intimidation or harassment. Workers' rights to join labour unions seek representation and or join worker's councils in accordance with local laws should be acknowledged.

II. Health and Safety

Vendors must recognize that in addition to minimizing the incidence of work-related injury and illness, a safe and healthy work environment enhances the quality of products and services, consistency of production and worker retention and morale. Vendors must also recognize that ongoing worker input and education is essential to identifying and solving health and safety issues in the workplace.

The health and safety standards are:

- . Occupational Injury and Illness - Procedures and systems are to be in place to prevent, manage, track and report occupational injury and illness, including provisions to: a) encourage worker reporting; b) classify and record injury and illness cases; c) provide necessary medical treatment; d) investigate cases and implement corrective actions to eliminate their causes; and e) facilitate return of workers to work.

- . Emergency Preparedness - Emergency situations and events are to be identified and assessed, and their impact minimized by implementing emergency plans and response procedures, including: emergency reporting, employee notification and evacuation procedures, worker training and drills, appropriate fire detection and suppression equipment, adequate exit facilities and recovery plans.

- . Occupational Safety - Worker exposure to potential safety hazards (e.g., electrical and other energy sources, fire, vehicles, and fall hazards) are to be controlled through proper design engineering and administrative controls, preventative maintenance and safe work procedures (including lockout/tagout), and ongoing safety training. Where hazards cannot be adequately controlled by these means, workers are to be provided with appropriate, well-maintained, personal protective equipment. Workers shall not be disciplined for raising safety concerns.

- . Machine Safeguarding - Production and other machinery is to be evaluated for safety hazards. Physical guards, interlocks and barriers are to be provided and properly maintained where machinery presents an injury hazard to workers.

- .Industrial Hygiene - Worker exposure to chemical, biological and physical agents is to be identified, evaluated, and controlled. Engineering or administrative controls must be used to control overexposures. When hazards cannot be adequately controlled by such means, worker health is to be protected by appropriate personal protective equipment programs.

- .Sanitation, Food, and Housing - Workers are to be provided with ready access to clean toilet, facilities potable water and sanitary food preparation, storage, and eating facilities. Worker dormitories provided by the Participant or a labour agent are to be maintained clean and safe, and provided by the Participant or a labour agent, hot water for bathing and showering, and adequate heat and ventilation and reasonable personal space along with reasonable entry and exit privileges.

- . Physically Demanding Work - Worker exposure to the hazards of physically demanding tasks, including manual material handling and heavy or repetitive lifting, prolonged standing and highly repetitive or forceful assembly tasks is to be identified, evaluated and controlled.

III. Environmental

Vendors should recognize that environmental responsibility is integral to producing world class products. In manufacturing operations, adverse effects on the environment and natural resources are to be minimized while safeguarding the health and safety of the public.

The environmental standards are:

- . Product Content Restrictions - Vendors are to adhere to applicable laws and regulations regarding prohibition or restriction of specific substances including labeling laws and regulations for recycling and disposal. In addition, Vendors are to adhere to all environmental requirements specified by Purchaser.
- . Chemical and Hazardous Materials - Chemical and other materials posing a hazard if released to the environment are to be identified and managed to ensure their safe handling, movement storage, recycling or reuse and disposal.
- . Air Emissions - Air emissions of volatile organic chemicals, aerosols, corrosives, particulates, ozone depleting chemicals and combustion by-products generated from operations are to be characterized, monitored, controlled and treated as required prior to discharge.
- . Pollution Prevention and Resource Reduction - Waste of all types, including water and energy, are to be reduced or eliminated at the source or by practices such as modifying production, maintenance and facility processes, materials substitution, conservation, recycling and re-using materials.
- . Wastewater and Solid Waste - Wastewater and solid waste generated from operations industrial processes and sanitation facilities are to be monitored, controlled and treated as required prior to discharge or disposal.
- . Environmental Permits and Reporting - All required environmental permits (e.g. discharge monitoring) and registrations are to be obtained, maintained and kept current and their operational and reporting requirements are to be followed.

IV. Ethics

Vendors must be committed to the highest standards of ethical conduct when dealing with workers, Vendors, and customers.

- . Corruption, Extortion, or Embezzlement - Corruption, extortion, and embezzlement, in any form, are strictly prohibited. Vendors shall not engage in corruption, extortion or embezzlement in any form and violations of this prohibition may result in immediate termination as an Vendor and in legal action.
- . Disclosure of Information - Vendors must disclose information regarding its business activities, structure financial situation, and performance in accordance with applicable laws and regulations and prevailing industry practices.
- . No Improper Advantage - Vendors shall not offer or accept bribes or other means of obtaining undue or improper advantage.
- . Fair Business, Advertising, and Competition - Vendors must uphold fair business standards in advertising, sales, and competition.
- . Business Integrity - The highest standards of integrity are to be expected in all business interactions. Participants shall prohibit any and all forms of corruption, extortion and embezzlement. Monitoring and enforcement procedures shall be implemented to ensure conformance.

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- . Community Engagement - Vendors are encouraged to engage the community to help foster social and economic development and to contribute to the sustainability of the communities in which they operate.
- . Protection of Intellectual Property - Vendors must respect intellectual property rights; safeguard customer information; and transfer of technology and know-how must be done in a manner that protects intellectual property rights.

V. Management System

Vendors shall adopt or establish a management system whose scope is related to the content of this Code. The management system shall be designed to ensure (a) compliance with applicable laws, regulations and customer requirements related to the Vendors' operations and products; (b) conformance with this Code; and (c) identification and mitigation of operational risks related to this Code. It should also facilitate continual improvement.

The management system should contain the following elements:

- . Company Commitment - Corporate social and environmental responsibility statements affirming Vendor's commitment to compliance and continual improvement.
- . Management Accountability and Responsibility - Clearly identified company representative[s] responsible for ensuring implementation and periodic review of the status of the management systems.
- . Legal and Customer Requirements - Identification, monitoring and understanding of applicable laws, regulations and customer requirements.
- . Risk Assessment and Risk Management - Process to identify the environmental, health and safety and labour practice risks associated with Vendor's operations. Determination of the relative significance for each risk and implementation of appropriate procedural and physical controls to ensure regulatory compliance to control the identified risks.
- . Performance Objectives with Implementation Plan and Measures - Areas to be included in a risk assessment for health and safety are warehouse and storage facilities, plant/facilities support equipment, laboratories and test areas, sanitation facilities (bathrooms), kitchen/cafeteria and worker housing /dormitories. Written standards, performance objectives, and targets an implementation plans including a periodic assessment of Vendor's performance against those objectives.
- . Training - Programs for training managers and workers to implement Vendor's policies, procedures and improvement objectives.
- . Communication - Process for communicating clear and accurate information about Vendor's performance, practices and expectations to workers, Vendors and customers.
- . Worker Feedback and Participation - Ongoing processes to assess employees' understanding of and obtain feedback on practices and conditions covered by this Code and to foster continuous improvement.
- . Audits and Assessments - Periodic self-evaluations to ensure conformity to legal and regulatory requirements, the content of the Code and customer contractual requirements related to social and environmental responsibility.
- . Corrective Action Process - Process for timely correction of deficiencies identified by internal or external assessments, inspections, investigations and reviews.
- . Documentation and Records - Creation of documents and records to ensure regulatory compliance and conformity to company requirements along with appropriate confidentiality to protect privacy.

The Code is modeled on and contains language from the Recognized standards such as International Labour Organization Standards (ILO), Universal Declaration of Human Rights (UDHR), United Nations Convention against Corruption, and the Ethical Trading Initiative (ETI) were used as references in preparing this Code and may be useful sources of additional information

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**SPECIAL CONDITIONS OF CONTRACT
(SCC)**

OF

**DESIGN, ENGINEERING, MANUFACTURING,
SUPPLY, LAYING, JOINTING, TESTING AND
COMMISSIONING OF 33 & 66KV CABLES WITH
REQUIRED ACCESSORIES & DISMANTLING AS PER
THE SCOPE OF WORK, FOR BYPL, DELHI (INDIA)**

ON

TURNKEY BASIS

IN

BSES YAMUNA POWER LTD.

**BSES YAMUNA POWER LIMITED (BYPL)
SHAKTI KIRAN BUILDING, KARKARDOOMA,
DELHI-110032
CIN: U40109DL2001PLC111525
TEL: 011 3999 7111
WEBSITE: www.bsesdelhi.com**

***This document is a property of BYPL. This is not transferable and shall not be
used for any purpose other than, for which it is supplied.***

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SPECIAL CONDITIONS OF CONTRACT

1.0 PRIORITY OF CONTRACT DOCUMENTS:

The several documents forming the Contract are to be taken as mutually explanatory of one another, but in case of ambiguities or discrepancies, the same shall be explained and adjusted by the Purchaser, who shall thereupon issue to the Contractor instructions thereon. In such event, unless otherwise provided in the Contract, the priority of the documents forming the Contract shall be as follows:

1. The Contract Agreement
2. The Letter of Acceptance/ Intent
3. Agreed Minutes of the Contract Negotiation Meetings
4. Agreed Minutes of the contract Technical Meetings
5. Instruction To Bidders (ITB)
6. Special Condition of Contract (SCC)
7. General Condition of Contract (GCC)
8. Erection Conditions of Contract (ECC)
9. Civil Conditions of Contract
10. The Priced Bill of Quantities
11. The Particular Technical Specifications
12. The General Technical Specifications
13. The Submitted Tender, including all Appendices and/or Addenda, the latest taking precedence.

2.0 SCOPE OF WORK:

The scope of work under this contract shall include the turnkey execution on End to End Basis, including but not limited to design, manufacturing, inspection & testing, dispatches, loading, unloading, storage at site, erection & installation, testing of the installation, associated civil work, commissioning, Handing over to the purchaser including comprehensive marine cum storage cum erection Insurance (MSE) on "Single Point Responsibility Basis"

The entire scope of work under the contract shall be executed strictly as per the NIT conditions and the technical specification.

Scope of work shall mainly include:

1. The Scope of work under the package shall include all Supply, Survey , Design, Engineering , Manufacturing, Shop testing, Inspection, packing, dispatch, loading, unloading and storage at site, Marine cum Storage cum Erection Insurance policy, assembly, Erection, Structural and Civil work, complete pre-commissioning checks, testing and commissioning at site, obtaining statutory clearance & certification from Chief Electrical Inspector of Delhi and any other statutory authority for charging the substation and handing over of complete package.

2. The scope shall also include supply at site of all barricading, free-issued materials if any (including installation, transportation, loading & unloading), dewatering, watch and ward and transportation of scrap (generated at Site), balance free-issued material, dismantled material from site to site , site to BYPL store including loading & unloading and no additional charges shall be paid against these activities. Used barricading material will be taken back by contractor soon after job is handed over or as directed by BYPL Engineering Incharge. No additional cost for these items will be paid to the Bidder. Any leakage, pilferage and damage of the material shall be in vendor's scope.
3. Contractor shall submit the detailed PERT chart/L2 Network for the execution of the package awarded for BYPL review and approval with major intermediate milestone as mentioned in Annexure- I. Contractor shall strictly adhere to the implementation schedule as per the project plan submitted and approved.
4. All the materials supplied against this contract shall be as per BYPL approved "Makes" and "Specifications" ONLY.
5. Permission for road cutting from Road owning agencies, Tree cutting and other statutory clearances (including all coordination and liasoning) shall be obtained by Bidder. However, All direct Fee shall be borne by BYPL.
6. Wherever BYPL specifications are not available, relevant IS/IEC to be followed. All Drawings mentioned in the Tender Specification and others required for completion of the work shall be submitted and approval of BYPL Engineer in Charge obtained before commencement of any job. Drawing submission process shall not be deemed complete until all the requirements are complied during the submission of the same.
7. The Contractor shall have own testing equipments like IR Tester, Hi Pot Test Kit and Earth Tester with valid Calibration Certificates for testing the cables.
8. The Contractor shall have own Safety equipment like Neon Tester, Portable Earth, Earthing discharge rod etc. along with valid Calibration Certificates of all the equipment.
9. The Bidder should have all major tools and tackles required for execution of work like Bench Machine, Rollers, Jack for lifting the Cable drum along with valid test certificates etc.
10. Any material not specifically mentioned In BOQ but required for successful Erection, Testing and Commissioning of the package awarded shall be deemed to be in the scope of the bidder.
11. Successful Bidder shall depute Safety officer and Quality officer at site separately for each package and for the entire duration of the project and they shall submit the safety report and quality report to BYPL Site In charge on weekly basis.
12. Any item/work, not specifically mentioned in the NIT condition and technical specification but essentially required for completion of the work shall be the responsibility of the contractor

13. All Statutory Compliances (wherever applicable) required to complete the work as defined above are in the scope of contractor.
14. R&R clearance shall also be part of contractors scope of work , However all Statutory payment shall be borne by BYPL.
15. Electrical inspection clearance certification from Chief Electrical Inspector of Delhi and any other statutory authority for charging the substation are in scope of Contractors.

3.0 CONTRACT PRICES:

The contract price shall be including all the detailed scope as specified in the contract for the package awarded and shall be inclusive of all taxes and duties (GST) as applicable.

Prices are inclusive of all taxes and duties including labour cess.

However, IT as per applicable rate will be deducted from your bills as Tax Deduction at Source (TDS).

GST is included in the contract price awarded , however GST payment shall be made on submission of GST Registration and self declaration on your letter head stating that contractor have deposited/or will deposit the Tax as per the applicable GST laws. Contractor shall furnish your GST registration number.

4.0 QUANTITIES VARIATION UNDER THE AWARDED CONTRACT:

Contract Unit rate shall applicable for the any addition/reduction in quantities to the extent as Specified below:

For Cable feed: Quantities may vary as per the site requirements

5.0 FIRM CONTRACT PRICES:

The contract price shall remain "Firm" throughout the contract execution. No Price Variation and/or escalation on any account shall be payable to the Contractor for any reason whatsoever.

6.0 STATUARY VARIATION IN TAXES:

The total order value shall remain **FIRM**. However in case of any statutory variation in GST, or Taxes, duties and Levies imposed by Competent Authorities by way of fresh notification(s) shall be borne by BYPL on submission of the documentary evidence.

Any variation in taxes shall be applicable only to the direct/price breakup as mentioned in the contract.

7.0 **COMPLETION TIME:**

Scheme Number	Package Name	Total Months for Handing over of the Package, From Zero Date	Total No. of Day for Handing over of the Package From Zero Date
EE19SH1029	DELHI METRO PHASE IV (MAUJPUR – MUKANDPUR CORRIDOR OF DMRC)	12 months	365 days

Detailed Execution schedule, including intermediate milestone for the execution of the Package is attached as “**Annexure- I**”.

8.0 **BANK GUARANTEE:**

Bank Guarantee	To be submitted on	Valid Upto (tentative)
Contract Performance Guarantee (10% of total Contract value)	Within 15 days of Issue of Order.	Valid till 90 days beyond the Project Completion period/Handing Over.
Bank Guarantee against Advance (For the advance amount)	Invoice for Advance amount along with advance bank guarantee.	Valid till Completion of supplies/work under the contract.
Equipment Performance Bank Guarantee (10% of total Contract value)	Time of claiming the last payment and Issuance of Final Taking over certificate from Purchaser / Owner,	Valid till Completion of Defect Liability Period plus 3 months.

9.0 **LIQUIDATED DAMAGES:**

9.1 **LD FOR DELAY IN COMPLETION OF WORK:**

Time is essence of the Contract.

After issuance of the Letter of Intent, the contractual network / L2 network will be finalized and approved by the BYPL. Contractor shall strictly adhere to the completion schedule and intermediate milestones agreed.

If the Contractor fails to successfully hand over the Packages awarded within the agreed contract completion schedule the contractor shall pay to the Purchaser/ Owner, Liquidated damages for the delayed period at the rate of 0.5% of the total contract price per each week of delay or Pro-rata thereof, by which the Completion is delayed.

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Maximum LD for delay is 10% of Contract Value.

It is agreed that liquidated damages are a genuine Pre-estimate of damages and not by way of penalty.

9.2 LD ON INTERMEDIATE MILESTONE:

Liquidated Damages shall be applicable on the delay in achieving Intermediate milestone as agreed in the L2 Network which shall be at the rate of **0.5% of the total contract price per each week of delay of Intermediate milestone or Pro-rata** thereof, by which the Milestones are delayed.

LD on delay in milestone activities shall be redeemable if the delays are covered subsequently and the package is handed over within the agreed schedule .

9.3 OVER ALL LIQUIDATED DAMAGES:

The overall Maximum LD for delay is 10% of Contract Value.

However, the total Liquidated Damages for delay will be limited as hereinafter provided below.

Notwithstanding the above, in the event the Contractor fails to complete the package as per the schedule; and delays the "Handling Over" of the package up to a period for which the liquidated damage for time delay becomes more than ten percent (10%) of the Contract Price, then the Purchaser at his sole discretion, shall be entitled to treat the failure as an act of default by the Contractor and same shall entitle the Purchaser to terminate the Contract.

The liquidated damages for delay will be recovered at the sole discretion of the Purchaser from the Contract Price or from other securities/BG's available with the Purchaser or jointly.

10.0 LIABILITY & DAMAGES:

10.1 Limitation of Liability for Clause 9.1 and 9.2 above: The aggregate amount of Supplier liability to Purchaser for all Late Completion Liquidated Damages and Performances (Considered in aggregate), shall not exceed 10% of Contract Price.

10.2 Aggregate Liability of Supplier: Supplier's / Contractor liability to Purchaser under or in connection with the Supply and Erection Contract shall not exceed 110% of the respective Contract Price.

11.0 WARRANTEE/DEFECT LIABILITY PERIOD:

Warranty /Defect Liability Period shall be of **Twenty Four (24) months** from the date of Final Take over of Packages by Purchaser.

The Contractor shall be liable to rectify all defects in the works done by the Contractor under this Contract, or from any act or omission of the contractors during Warranty / Defect Liability Period.

Contractor shall replace/ Repair all the materials / items supplied under the contract against any defect or failure, which arise due to faulty materials, workmanship or design for the entire defects liability period.

If during the defects liability period any materials / items are found to be defective, these shall be replaced or rectified by the bidder at his own cost within the agreed time schedule from the date of receipt of intimation. The bidder shall depute their service personnel within 48 hours in case of emergency and shall ensure the availability of manpower/spares for the same during warranty period.

12.0 LATENT DEFECT LIABILITY PERIOD:

At the end of warranty period, the Supplier's Liability ceases except for latent defects.

Notwithstanding the completion of the Warranty Period, the Supplier shall be responsible for expeditiously making good by repair or replacement at its option and at its cost and expense any Latent Defect which appears before the expiry of the Latent Defects Liability Period.

The Contractor's Liability for latent defects warranty shall be limited to a period of Five (5) years from end of Warranty Period for all the supply items and the work executed under the contract.

For the purpose of this clause, the latent defects shall be the defects inherently lying within the material or arising out of design deficiency or the design deficiency of the implementation process adopted, which do not manifest themselves during Warranty period.

13.0 INSURANCE:

Contractor shall, at his own cost shall take Comprehensive Marine cum Storage cum Erection insurance policy for the total Project cost.

Contractor shall take, at his own cost, Third party insurance and suitable insurance policy for his own men and material.

The insurance covers to be taken by the Contractor shall be in a joint name of Purchaser and the Contractor. The Contractor shall, however, be authorized to deal directly with Insurance Company or companies during the contract period and shall be responsible in regard to maintenance of all insurance covers.

Any loss or damage to the equipment during handling, transportation, storage, erection, putting into satisfactory operation and all activities to be performed till

the successful completion of and handling over Performance Guarantee tests of the plant shall be to the account of the Contractor. The Contractor shall be responsible for preference of all claims and make good for the damage or loss by way of repairs and/or replacement of the equipment, damaged or lost.

For all the insurance policies taken, Contractor shall be responsible for settlement of claims with the underwriters without any liability on the purchaser and will arrange replacements / rectification expeditiously without waiting for the settlement of insurance claim, at contractor's own cost and this shall not entitle the Contractor for any extension of Time and Cost Overrun.

Marine Transit risk on supply of material on 110% of captioned value & Erection all risk cover on 100% of Project cost which cover include any loss or damage not limited to AOG perils, earthquake and act of terrorism.

14.0 DRAWINGS/DOCUMENTS:

Drawings will be supplied to the Contractor by Purchaser as per Agreed Master Documents List (MDL), Technical Specifications, BOQ and as mentioned in GCC.

15.0 TERMS OF PAYMENT:

A) FOR SUPPLY OF EQUIPMENT AND MATERIALS:

- A. 65% prorata of supply value item wise shall be payable against R/A bills for supply of equipments and materials within 45 days against receipt & acceptance of material at site and submission of following documents duly certified by BYPL Project-in-charge, complete in all respects:
 - a) Signed copy of accepted Purchase Order (for first payment)
 - b) LR / RR / BL as applicable
 - c) Challan as applicable
 - d) Two (02) copies of Supplier's detailed Recipient Invoice showing Commodity description, quantity, unit price, total price and basis of delivery, and being 100% of the value of the consignment claimed.
 - e) Two (02) copies of Supplier's transporter invoice duly receipted by BYPL Stores & Original certificate issued by BYPL confirming receipt of the subject material at Stores/Site and acceptance of the same as per the provisions of the contract.
 - f) Two (02) copies Packing List / Detailed Packing List
 - g) Approved Test certificates / Quality certificates, if applicable
 - h) Certificate of Origin, if applicable
 - i) Material Dispatch Clearance Certificate (MDCC)
 - j) Insurance Policy / Certificate, if applicable

- k) Warranty / Guarantee Certificate, if applicable
 - l) Check list for bill submission.
 - m) Performance Bank Guarantee equivalent to 10% of Supply value of the Contract valid upto Defect Liability period for 36 months from the date of handing over of the scheme plus 3 months Claim period.
- B. 20% prorata on account of supply value of the actual executed value after installation/erection of material duly certified by BYPL Project-in- charge.
- C. Balance 15% on account of supply value of the actual executed value shall be paid in 30 days after completion of successful acceptance testing, commissioning and handing over of complete systems duly certified by BYPL Engineer-in-Charge specified in the tender and on submission of performance Bank Guarantee of 10% amount, in our format valid up to a defect liability period from the date of handing over of the scheme including submission of Electrical Inspector Clearance Certificate, Compliance of final punch point, No Demand Certificate, Letter of Indemnity by the supplier (The format of No Demand Certificate and Letter of Indemnity are attached as Annexure) and after reconciliation & adjustments of payments, if any towards quantities of materials issued from purchaser's stock and consumed by the contractor for expeditious completion of the job.

B) FOR ERECTION, INSTALLATION AND TESTING & COMMISSIONING:

Payment shall be made to you as under:

- i) 85% pro-rata payment of total installation value of the actual executed value shall be made progressively on submission of your running invoices on Monthly basis duly certified by our Engineer In charge & shall be paid within 30 days on receipt of such bills at our office.
- ii) Balance 15% on account of total installation value of the actual executed value payable shall be paid in 30 days after completion of successful acceptance testing, commissioning and handing over of complete systems duly certified by BYPL Engineer-in-Charge specified in the tender and on submission of performance Bank Guarantee of 10% amount, in our format valid up to a defect liability period from the date of handing over of the scheme including submission of Electrical Inspector Clearance Certificate, Compliance of final punch point, No Demand Certificate, Letter of Indemnity by the supplier (The format of No Demand Certificate and Letter of Indemnity are attached as Annexure) and after reconciliation & adjustments of payments, if any towards quantities of materials issued from purchaser's stock and consumed by the contractor for expeditious completion of the job.

16.0 ARBITRATION:

The venue of arbitration shall be New Delhi.

17.0 UNFORESEEABLE SUB-SURFACE CONDITIONS:

Notwithstanding anything contained elsewhere in the contract, if during the execution stage, the Contractor encounters on the Site any sub-surface conditions

Special Conditions of Contract - SCC (CMC/BY/19-20/RB/SV/60)	Page 10 of 15	33 & 66 KV CABLE WORKS ON TURNKEY BASIS
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that are different from those envisaged from the soil testing / data available at the site, or the Contractor's own testing, which necessitates corrective action / changes in the method(s) of work, all costs related with such changes shall be borne by the Contractor. These conditions shall no way be compensated either for time, or costs, by the Purchaser.

18.0 FORCE MAJEURE:

Force Majeure Events:

For the purpose of this Agreement, Force Majeure means any act, event or circumstance, or combination of acts, events or circumstances, which materially and adversely affects the affected

Party's performance of its obligations pursuant to the terms of this Agreement, but only if and to the extent that such acts, events or circumstances are not within the affected Party's reasonable control, were not reasonably foreseeable and could not have been prevented or overcome by the affected Party through the exercise of reasonable skill or care.

18.1 Political Force Majeure Events:

Which shall comprise the following acts, events and circumstances:

i) Act of war (whether declared or undeclared), invasion, armed conflict or act of foreign enemy, blockade, embargo, revolution, riot insurrection, civil commotion, act of terrorism or sabotage, in each case occurring inside or directly involving India:

ii) Strikes, lockouts or other difficulties, which are politically motivated (rather than motivated primarily by a desire to improve compensation or working conditions of those involved) or are caused in whole or part by another event of Political Force Majeure or are part of a nation-wide or regional strike, or other generalised labour action occurring within India; (excluding such events which are site specific and attributable to the Supplier);

iii) Radioactive contamination or ionising radiation or chemical contamination originating from a source in India or resulting from another Political Force Majeure Event;

18.2 Non Political Force Majeure events comprising the following acts, events and circumstances:

i) Flood, cyclone, lightning, earthquake, drought, storm or any other extreme effect of the natural elements;

ii) Epidemic, or plague;

- iii) Fire or explosion;
- iv) Strikes, lockouts or other labour difficulties not included above (excluding such events which are Site specific and attributable only to the contractor)
- v) Air crash, shipwreck or trainwreck or loss of or damage to any major component of the Facility arising in the course of transit.

18.3 Burden of Proof:

In the event that the Parties are unable in good faith to agree that a Force Majeure Event has occurred, the Parties shall submit the dispute for resolution pursuant to clause , provided that the burden of proof as to whether a Force Majeure Event has occurred shall be upon the Party claiming a Force Majeure Event.

18.4 Excused Performance:

The Party claiming Force Majeure shall give notice to the other Party of any Force Majeure Event as soon as reasonably practical after becoming aware of its existence, but not later than **twenty four (24) hours** after the date on which such Party knew or should reasonably have known of the commencement of the Force Majeure Event. Notwithstanding the above, if the Force Majeure Event results in a breakdown of communications rendering it not reasonably practicable to give notice within the applicable time limit specified herein, then the Party claiming Force Majeure shall give such notice as soon as reasonably practicable after the reinstatement of communications, but not later than forty eight (48) hours after such reinstatement.

- (a) The Party claiming Force Majeure shall give notice to the other Party of:
 - i) The cessation of the relevant Force Majeure Event; and
 - ii) The cessation of the effects of such Force Majeure Event on the enjoyment by such Party of its rights or the performance by it of its obligations under this Agreement;
as soon as practicable after becoming aware thereof.
- (b) The suspension of performance shall be of no greater scope and of no longer duration than is reasonably required by the Force Majeure Event.
- (c) No liability of either Party which arose before the occurrence of the Force Majeure Event causing the suspension of performance shall be excused as a result of the occurrence, including, without limitation, liability for the timely payment of money otherwise due and earned by performance of tasks required under this Agreement by any Party.
- (d) Any Party claiming Force Majeure shall use its reasonable efforts to mitigate and overcome the effects of any act, event or circumstance of Force Majeure as soon as practicable after the occurrence of a Force Majeure Event, including by mutual agreement the expenditure of reasonable sums of money, and

to co-operate with the other Party to develop and implement a plan of remedial and reasonable alternative measures to remove the Force Majeure Event, provided, however, that no Party shall be required under this provision, to settle any strike or other labour dispute on terms it reasonably considers to be unfavourable to it. The Party claiming Force Majeure shall furnish weekly written reports to the other Party with respect to its progress in overcoming the effects of the act, event or circumstance of Force Majeure together with such supporting documentation and information as the other Party reasonably requires regarding the claim of Force Majeure.

(e) When the affected Party is able to resume performance of its obligations under this Agreement that Party shall give the other Party written notice to that effect and shall promptly resume performance hereunder.

18.5 Limitations:

Anything in this Agreement to the contrary notwithstanding:

(a) The affected Party shall not be relieved from obligations under this Agreement to the extent that the gross negligence of the affected Party (or, in the case of Supplier, The

Purchaser's Suppliers or any Subcontractor) contributes to or aggravates the Force Majeure Event ; and

(b) The existence of a Force Majeure Event shall not excuse the affected Party from its obligations to make payment of any monies otherwise due and payable by the affected Party pursuant to this Agreement.

18.6 Consequences of Force Majeure

Neither Party shall be considered in default or in breach of its obligations under this Agreement to the extent that performance of such obligations is prevented by any circumstances of a Force Majeure Event.

19.0 SUSPENSION OF WORK:

Purchaser reserves the right to suspend and reinstate execution of the whole or any part of the Works without invalidating the provisions of the Contract. Orders for suspension or reinstatement of the works will be issued to the Contractor in writing. The time for Completion of the Works will be extended for a period equal to duration of the suspension.

For an aggregate suspension period of less than Six (6) months the Contractor shall not claim any reimbursement. Any necessary and demonstrable costs incurred by the Contractor, as a result of suspension of the Works beyond the above period, will

be paid by The Purchaser, provided such costs are substantiated to the satisfaction of The Purchaser. For this purpose, only the direct costs incurred shall be considered and this shall exclude any overheads, incidentals or profit. The Purchaser's decision in this regard will be final and binding. The Purchaser shall not be responsible for any liability if suspension or delay is due to some default on the part of the Contractor or its sub-contractor. Purchaser's decision in this regard shall be final and binding. Purchaser shall not be responsible for any liability if suspension is caused due to some default on the part of the supplier and its sub suppliers.

20.0 FINAL TAKING OVER OF THE PACKAGES:

Upon successful completion of testing and Commissioning of the all the items/work under the package awarded and all the testing conducted to the Purchaser/Owner's satisfaction, the Purchaser shall issue to the Contractor a "Taking over Certificate" as a proof of the final acceptance of the packages only after receipt of such certificate from the Owner to Purchaser.

21.0 OPERATION:

Not Applicable

22.0 CONSTRUCTION WATER AND POWER:

Construction Water and power shall be arranged by Contractor at his own cost.

ANNEXURE - I

EXECUTION SCHEDULE

Contractor shall submit the detailed PERT chart/L2 Network for the execution of the package awarded for BYPL review and approval.

However the major milestone shall be as under:

SL NO	DESCRIPTION OF MATERIAL	TIMELINE
1	Zero Date (Letter of Award)	Zero Date
2	Mobilization of manpower	15 days from Zero Date
3	Submission of Drawings/Documents/calculations for	30 days from Zero Date
4	Engineering Approval	60 days from Zero Date
6	Procurement/Supplies	100 days from Zero Date
6	Testing & Commissioning of 33 & 66kV line	160 days from Zero Date or as per the mutually agreed schedule
8	Handing Over	365 days from Zero Date or as per the mutually agreed schedule

**GENERAL CONDITIONS OF CONTRACT
(GCC-SUPPLY)**

OF

**DESIGN, ENGINEERING, MANUFACTURING,
SUPPLY, LAYING, JOINTING, TESTING AND
COMMISSIONING OF 33 & 66KV CABLES WITH
REQUIRED ACCESSORIES & DISMANTLING AS PER
THE SCOPE OF WORK, FOR BYPL, DELHI (INDIA)**

ON

TURNKEY BASIS

IN

BSES YAMUNA POWER LTD.

**BSES YAMUNA POWER LIMITED (BYPL)
SHAKTI KIRAN BUILDING, KARKARDOOMA,
DELHI-110032
CIN: U40109DL2001PLC111525
TEL: 011 3999 7111
WEBSITE: www.bsesdelhi.com**

***This document is a property of BYPL. This is not transferable and shall not be
used for any purpose other than, for which it is supplied.***

General Conditions of Contract – GCC SUPPLY (CMC/BY/19-20/RB/SV/60)	Page 1 of 16	33 & 66 KV CABLE WORKS ON TURNKEY BASIS
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GENERAL CONDITIONS OF CONTRACT (GCC)-SUPPLY

The General Condition of Contract shall form a part of specifications, contract document.

1. PRIORITY AND CONTENT OF CONTRACT DOCUMENTS:

The several documents forming the Contract are to be taken as mutually explanatory of one another, but in case of ambiguities or discrepancies, the same shall be explained and adjusted by the Purchaser, who shall thereupon issue to the Contractor, instructions thereon. In such event, unless otherwise provided in the Contract, the priority of the documents forming the Contract shall be as follows:

1. The Contract Agreement
2. The Letter of Acceptance/ Intent
3. Agreed Minutes of the Contract Negotiation Meetings.
4. Agreed Minutes of the contract Technical Meetings.
5. Instruction To Bidders (ITB)
6. Special Condition of Contract (SCC)
7. General Condition of Contract (GCC)
8. Erection Conditions of Contract (ECC)
9. Civil Conditions of Contract
10. The Priced Bill of Quantities
11. The Particular Technical Specifications
12. The General Technical Specifications
13. The Submitted Tender, including all Appendices and/or Addenda, the latest taking precedence.

All the materials, literature, data and information of any sort given by the contractor along with its bid proposal subject to the approval of the purchaser.

2. CONTRACT LANGUAGE:

All documents, instructions, catalogues, brochures, pamphlets, design data, norms and calculations, drawings, operation, maintenance and safety manuals, reports, labels, on deliveries and any other data shall be in English Language only.

The Contract documents and all correspondence between the BYPL, Third Parties associated with the contract, and the Bidder shall be in English language.

However, all signboards required indicating "Danger" and/or security at site and otherwise statutory required shall be in English, Hindi.

3. DEFINITIONS AND INTERPRETATION:

Definitions TO BE FOLLOWED UNDER THE CONTRACT shall have following meanings:

3.1 COMPANY / PURCHASER / OWNER: Means BSES Yamuna Power Ltd, a company incorporated under the Companies Act 1956 and having its office at Shaktikiran Building, Karkardooma, Delhi - 110032, which expression shall include its authorized representatives, agents, successors and assigns.

3.2 CONTRACTOR: Shall mean the successful Tenderer / vendor to whom the contract has been awarded.

3.3 Rate: The unit rates for the work to be carried out at site shall be as per finalized unit rates through tender. The finalized rates shall be firm for the entire duration of work to be carried out by the Contractor under the work order and are not subject to escalation for any reason whatsoever.

3.4. CONTRACT SPECIFICATION: The terms "CONTRACT Specification" shall mean the Technical specification of the work as agreed by you and description of work as detailed in Annexure-I enclosed herewith and all such particulars mentioned directly/referred to or implied as such in the contract.

3.5. SITE: The terms "Site" shall mean the working location in BYPL area. Under this tender, working location shall be as mentioned elsewhere.

3.6. ENGINEER IN CHARGE: "Engineer In-charge" means the Company's authorized representative for the purpose of carrying out the work.

3.7 APPLICABLE LAW: Applicable Laws means the constitution of India and any act, rule, regulations, directive, notification, code, order or instruction having its force of law enacted or issued by any competent legislature or Governmental Agency (including those related to taxes, duties, assessments, expropriation and compulsory acquisition) as may be in effect from time to time the implications thereof shall be deemed a Change in Law or Change in Permits.

3.8 OTHER CLEARANCES: Means any consent, approval, permit or other authorisation which is required to be granted by authorities (local, government or any other) essential to start/complete the work.

3.9 DEFECT LIABILITY PERIOD: Shall mean the period during which the contractor shall remain liable for repair or replacement of any defective part of the work performed under the contract, free of cost.

3.10 TENDER SPECIFICATION: The terms "Tender Specification" shall mean the Indian Standard specification of the work and description of work as detailed in Tender document/Tender enclosed and all such particulars mentioned directly/referred to or implied as such in the Tender.

3.11. CONTRACT PRICE shall mean the price referred to in the "Letter of Intent/Purchase Order".

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3.12 CONTRACT PERIOD shall mean the period during which the "Contract" shall be executed as agreed between the Supplier and the Purchaser in the Contract inclusive of extended contract period for reason beyond the control of the Supplier and/or Purchaser due to force majeure.

3.13 CODES AND SPECIFICATION shall mean all the applicable codes and standards as indicated in the Specification.

3.14 CHANGE OF WORK means any addition to, deletion from, suspension of or other modification, to the Work, or to the quality, function or as delineated in this Contract, including any such addition, deletion, suspension or other modification, which requires a change in one or more of the Technical Specifications and the completion schedule

3.15 EPC means Engineering, Procurement and Construction wherein the EPC contractor is made responsible for all the activities from design, procurement, supply, storage construction, commissioning and handover of the project to owner.

3.16 EFFECTIVE DATE OF CONTRACT means the date of issue/award of contract shall be the Effective Date of Contract or Contract Commencement date.

3.17 CONTRACT COMMENCEMENT DATE means the date of issue/award of contract shall be the Effective Date of Contract or Contract Commencement date.

3.18 CONTRACT COMPLETION DATE means the date of expiry of Guarantee/defect liability Period shall be deemed as the Contract Completion Date.

4. EXAMINATION OF SITE AND LOCAL CONDITIONS:

The contractor is deemed to have visited the site of the work and ascertained therefore all site conditions and information pertaining to his work.

Before submitting the bid, all bidders will at their expenses make or obtain any additional information, investigations, explorations, test and studies and obtain any additional information and data which pertains to the physical conditions at or contiguous to the site or otherwise which may affect cost, progress, performance of the work and which the bidder deems necessary to determine its Bid for performing the work in accordance with the time and other terms and conditions of the tender/contract documents.

The company shall not accept any claim whatsoever arising out of the difficult site/terrain/local conditions, if an

5. LANGUAGE AND MEASUREMENT:

The CONTRACT issued to the contractor by the company and all correspondence and documents relating to the CONTRACT placed on the Contractor shall be written in English language.

Metric System shall be followed for all dimension, units etc.

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6. TIME – THE ESSENCE OF CONTRACT:

The time and the date of Contract Execution completion of the "Package" as stipulated in the Letter of Intent/ Purchase order issued to the Supplier shall be deemed to be the essence of the "Contract". The "Entire Package" has to be completed and handed over not later than the aforesaid Schedule.

7. PROGRESS REPORT:

The supplier shall submit weekly/fortnightly/monthly progress report as desired by the Purchaser's Engineer in Charge and in the format mutually agreed between the parties.

8. SCOPE OF WORK:

The scope of work under this contract shall include the turnkey execution on End to End Basis , including but not limited to design, manufacturing, inspection & testing, dispatches, loading , unloading ,storage at site, erection & installation, testing of the installation, associated civil work ,commissioning ,handing over to the purchaser including comprehensive marine cum storage cum erection Insurance (MSE) on "Single Point Responsibility Basis" on turnkey Basis for the following packages:

Scheme Number	Package Name	Total Months for Handing over of the Package, From Zero Date	Total No. of Day for Handing over of the Package From Zero Date
EE19SH1029	DELHI METRO PHASE IV (MAUJPUR – MUKANDPUR CORRIDOR OF DMRC)	12 months	365 days

Brief Scope of Work related to all the supplies for the successful completion, testing & commissioning and final handover for the above packages shall be as per the NIT conditions with the following salient details.

Any item/work, not specifically mentioned in the NIT condition and technical specification but essentially required for completion of the work shall be the responsibility of the contractor. The "Scope of Supply" shall be on the basis of Bidder's responsibility, completely covering the obligations, responsibility and supplies provided in this Bid enquiry whether implicit or explicit.

9. QUANTITY VARIATION AND EXTRA ITEM/WORK:

The purchaser reserves the rights to vary the quantity as below:

- a) For Cable feed: Quantity may vary as per the site requirements.

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The Bill of Quantity break-up shown else-where in Price Schedule is tentative. The bidder shall ascertain himself regarding material required for completeness of the entire work. Any item not indicated but is required to complete the job, shall be deemed to be included in the prices quoted.

Payment will be made on the basis of actual quantity of supplies/actual measurement of works accepted by BYPL and not on the basis of contract quantity.

10. FIRM CONTRACT PRICES:

The rates finalized for this order shall be firm for the entire duration of work carried out by the Contractor under the order and are not subject to any variation and escalation for any reason whatsoever.

11 CONTRACT RATES:

The rates finalized for this order shall be firm for the entire duration of work carried out by the Contractor under the order and are not subject to any variation and escalation for any reason whatsoever.

The cost of insurance during loading/unloading of materials/ equipments during its storage and handling/erection at site for installation is included in the contractor's scope and value is included in the unit rates finalized.

The unit rates finalized are also inclusive of Insurance policy taken as defined in Special Conditions Contracts (SCC) Though Bidders shall indicate the value separately.

Cost of operation as per the requirement specified in NIT , for the duration of Six (6) months are included in the contract prices, However Bidder shall indicate the separate value for the same.

12 TAXES AND DUTIES:

Prices are inclusive of all taxes and duties including labour cess.

GST is included in the contract price awarded , however GST payment shall be made on submission of GST Registration and self declaration on your letter head stating that contractor have deposited/or will deposit the Tax as per the applicable GST laws. Contractor shall furnish your GST registration number.

13 STATUTORY VARIATION:

Any statutory variations i.e. increase/decrease in Taxes / Duties introduces by central Govt. / State Govt. of shall be reimbursed/recovered to/from Contractor against documentary evidence and proof. Any variation in taxes shall be applicable only to the direct/price breakup as mentioned in the contract.

14 CHANGE OF LAW:

"Change in Law" means:

- a) any enactment or issue of any new Applicable Law,
- b) any amendment, alteration, modification, or repeal of any existing Applicable Law or any new or modified directive or order there under,
- c) any change or variation in taxes payable in connection with and under this Agreement in each case with respect to a), b), and c) above coming into effect after the date of this Agreement.

15 SPECIFICATIONS AND STANDARDS:

The Bidder shall follow all codes and standards referred in the Contract Document. Codes and standards not specifically mentioned in the Contract Document may be followed by the Bidder with the prior written approval of BYPL, provided materials, supplies and equipment according to the standard are equal to or better than the corresponding standards specified in the Contract.

Product manufactures /makes names mentioned in the Contract documents are for the purpose of establishing the type and quality of products to be used. The Bidder shall not change the brand name and qualities of the bought out items without the prior written approval of the BYPL. All such products and equipment shall be used or installed in strict accordance with original manufacturer's recommendations, unless otherwise directed by the BYPL. In any circumstances the codes, specimen and standards prescribed by any government agency should not be violated.

16 QUALITY ASSURANCE AND INSPECTION:

Immediately on award of contract, the bidder shall prepare detailed quality assurance plan/test procedure identifying the various stages of manufacture, quality checks performed at each stage, raw material inspection and the Customer hold points. The document shall also furnish details of method of checking, inspection and acceptance standards / values and get the approval of Purchaser before proceeding with manufacturing. However, Purchaser shall have right to review the inspection reports, quality checks and results of suppliers' in house inspection department which are not Customer hold points and the supplier shall comply with the remarks made by purchaser or his representative on such reviews with regards to further testing, rectification or rejection, etc. In case of standard items, BYPL shall forward the standard QAP which is to be followed by vendor during manufacturing.

Witness and Hold points are critical steps in manufacturing, inspection and testing where the supplier is obliged to notify the Purchaser in advance so that it may be witnessed by the Purchaser. Final inspection is a mandatory hold point. The supplier to proceed with the work past a hold point only after clearance by purchaser or a witness waiver letter from BYPL.

The performance of waiver of QA activity by Purchaser at any stage of manufacturing does not relieve the supplier of any obligation to perform in accordance with and meet all the requirements of the procurement documents and also all the codes & reference documents mentioned in the procurement document nor shall it preclude subsequent rejection by the purchaser.

On completion of manufacturing, the items can only be dispatched after receipt of dispatch instructions issued by the Purchaser.

All in-house testing and inspection shall be done without any extra cost. The in-house inspection shall be carried out in presence of BYPL/BYPL authorized third party inspection agency. Cost of Futile/abortive visit(s) shall be debited from the invoices.

Purchaser reserves the right to send any material being supplied to any recognized laboratory for testing, wherever necessary and the cost of testing shall be borne by the Bidder. In case the material is found not in order with the technical requirement / specification, the charges along with any other penalty which may be levied is to be borne by the bidder.

17 ERRORS AND OMISSIONS:

The Supplier shall be responsible for all discrepancies, errors and omissions in the drawings, documents or other information submitted by him, irrespective of whether these have been approved, reviewed or otherwise accepted by the BYPL or not. However any error in design/drawing arising out of any incorrect data/written information from BYPL will not be considered as error and omissions on part of the Supplier.

18 PACKING, PACKING LIST & MARKING:

Packing: Supplier shall pack or shall cause to be packed all Commodities in crates/boxes/drums/containers/cartons and otherwise in such a manner as shall be reasonably suitable for shipment by road or rail to BYPL, Delhi/New Delhi stores/site without undue risk of damage in transit.

Packing List: The contents of each package shall be itemized on a detailed list showing the exact weight, extreme outside dimensions (length, width & weight) of each container/box/drum/carton, Item SAP Code, PO No & date. One copy of the packing list shall be enclosed in each package delivered.

19 PRICE BASIS FOR SUPPLY OF MATERIALS:

Bidders shall quote their prices on Landed Cost Basis and separate price for each item.

Bidders shall quote FIRM prices for supply to BYPL Delhi/New Delhi stores inclusive of all packing, forwarding, loading at manufacturer's premises, unloading at site/stores and payment of GST. Storage of material is under the bidder Scope. Bidder shall arrange transit Insurance as per clause nos. 8 mentioned in Volume -1 Special Condition of Contract (SCC).

20 TERMS OF PAYMENT AND BILLING – SUPPLY:

Terms of payment and Billing shall be as specified in Volume –I, Special Condition of Contract.

21 COMMISSIONING SPARES AND TOOLS & TACKLES:

Commissioning Spares shall be deemed to be included in the quoted price.

22 RETURN, REPLACEMENT OR SUBSTITUTION:

BYPL shall give Supplier notice of any defective Commodity promptly after becoming aware thereof. BYPL may in its discretion elect to return defective Commodities to Supplier for replacement, free of charge to BYPL, or may reject such Commodities and purchase the same or similar Commodities from any third party. In the latter case BYPL shall furnish proof to Supplier of the cost of such substitute purchase. In either case, all costs of any replacement, substitution, shipping, labour and other related expenses incurred in connection with the return and replacement or for the substitute purchase of a Commodity hereunder should be for the account of Supplier. BYPL may set off such costs against any amounts payable by BYPL to Supplier. Supplier shall reimburse BYPL for the amount, if any, by which the price of a substitute Commodity exceeds the price for such Commodity as quoted in the Bid.

23 PERFORMANCE GUARANTEE:

Performance Guarantee shall be as specified in Volume –I, Special Condition of Contract.

24 WARRANTY/DEFECTS LIABILITY PERIOD:

All supplies made/Work executed shall be guaranteed against any defect or failure which may arise due to faulty materials, design or workmanship for a period of 24 months from the date of final handing over of the entire package as defined in SCC.

If during the Defect Liability Period any work are found to be defective, shall be immediately rectified or repaired, upto BYPL satisfaction, by the contractor at his own cost within 10 days from the date of receipt of intimation from BYPL.

Under no circumstances any extra claim in terms of time and cost shall be entertained for such repair/rectification.

25 SUPPORT BEYOND THE GUARANTEE PERIOD:

The Bidder shall ensure availability of spares and necessary support for a period of at least Twenty (20) years post completion of guarantee period of equipments supplied against the contract.

26 DOCUMENTATION:

The Bidder's shall procure all equipment from BYPL approved sources as per attached specifications. The Bidder shall submit 5 copies of Material/Type Test Certificates, O&M Manuals,

and Approved & As-built drawings. The Bidder shall ensure for the strict compliance to the specifications and Field Quality Procedures issued by BYPL Engineer in-charge.

27 FORFEITURE:

Each Performance Bond established under the contract shall contain a statement that it shall be automatically and unconditionally forfeited without recourse and payable against the presentation by BYPL of this Performance Bond, to the relevant bank referred to above, together with a simple statement that supplier has failed to comply with any term or condition set forth in the Contract. Each Performance BG established under will be automatically and unconditionally forfeited without recourse if BYPL in its sole discretion determines that supplier has failed to comply with any term or condition set forth in the contract.

28 SUSPENSION OR EXTENSION:

Purchaser reserves the right to suspend and reinstate execution of the whole or any part of the Works without invalidating the provisions of the Contract. Orders for suspension or reinstatement of the works will be issued to the Contractor in writing. The time for Completion of the Works will be extended for a period equal to duration of the suspension.

For an aggregate suspension period of less than Six (6) months the Contractor shall not claim any reimbursement. Any necessary and demonstrable costs incurred by the Contractor, as a result of suspension of the Works beyond the above period, will be paid by The Purchaser, provided such costs are substantiated to the satisfaction of The Purchaser. For this purpose, only the direct costs incurred shall be considered and this shall exclude any overheads, incidentals or profit. The Purchaser's decision in this regard will be final and binding. The Purchaser shall not be responsible for any liability if suspension or delay is due to some default on the part of the Contractor or its sub-contractor. Purchasers decision in this regard shall be final and binding. Purchaser shall not be responsible for any liability if suspension is caused due to some default on the part of the supplier and its sub suppliers.

29 TERMINATION DUE TO CONTRACTORS DEFAULT:

The Purchaser may terminate the contract after giving 7(seven) days notice if any of following occurs

- a) Contractor fails to complete execution of works within the approved schedule of works, terms and conditions
- b) In case the contractor commits any Act of Insolvency, or adjudged insolvent
- c) Has abandoned the contract
- d) Has failed to commence work or has suspended the progress of works
- e) Has failed to proceed the works with due diligence and failed to make such due progress

30 EVENTS OF DEFAULT:

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BYPL may, without prejudice to any of its other rights or remedies under the Work Order or in law, terminate the whole or any part of this Work Order by giving written notice to the Contractor, if in the opinion of BYPL, contractor has neglected to proceed with the works with due diligence or commits a breach of any of the provisions of this work order including but not limited to any of the following cases:

- a) Failing to complete execution of work within the terms specified in this work order.
- b) Failing to complete works in accordance with the approved schedule of works.
- c) Failing to meet requirements of specifications, drawings, and designs as approved by BYPL.
- d) Failing to comply with any reasonable instructions or orders issued by BYPL in connection with the works.
- e) Failing to comply with any of the terms or conditions of this work order.
- (f) Supplier fails or refuses to deliver supplies conforming to this NIT / specifications, or fails to deliver supplies within the period specified in PO or any extension thereof
- (g) Supplier becomes insolvent or unable to pay its debts when due, or commits any act of bankruptcy, such as filing any petition in any bankruptcy, winding-up or reorganization proceeding, or acknowledges in writing its insolvency or inability to pay its debts; or the Supplier's creditors file any petition relating to bankruptcy of Supplier;
- (i) Supplier otherwise fails or refuses to perform or observe any term or condition of the Contract and such failure is not remediable or, if remediable, continues for a period of 30 days after receipt by the Supplier , of notice of such failure from BYPL.

In the event BYPL terminates this work order, in whole or in part, on the occurrence of any event of default, BYPL reserves the right to engage any other subcontractor or agency to complete the work or any part thereof, and in addition to any other right BYPL may have under this work order or in law including without limitation the right to penalize for delay under clause 15.0 of this work order, the contractor shall be liable to BYPL for any additional costs that may be incurred by COMPANY for the execution of the Work.

31 CONSEQUENCES OF DEFAULT:

- (a) If an Event of Default shall occur and be continuing, BYPL may forthwith terminate the Contract by written notice.
- (b) In the event of an Event of Default, BYPL may, without prejudice to any other right granted to it by law, or the Contract, take any or all of the following actions;
- (c) present for encashment to the bank the relevant Performance Bond;
- (d) Purchase the same or similar Commodities from any third party; and/or

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- (e) Recover any losses and/or additional expenses BYPL may incur as a result of Supplier's default

32. RISK & COST:

If the Contractor fails to execute the work as per NIT specification / as agreed in the contract within the scheduled period and even after the extended period, the contract shall be terminated and BYPL reserves the right to get the work executed from any other source at the Risk & Cost of the Contractor.

The Extra Expenditure so incurred shall be debited to the Contract.

33 ARBITRATION:

To the best of their ability, the parties hereto shall endeavor to resolve amicably between themselves all disputes arising in connection with this LOA. If the same remain unresolved within thirty (30) days of the matter being raised by either party, either party may refer the dispute for settlement by arbitration. The arbitration to be undertaken by two arbitrators, one each to be appointed by either party. The arbitrators appointed by both the parties shall mutually nominate a person to act as presiding arbitrator before entering upon the reference in the event of a difference between the two arbitrators and the award of the said presiding arbitrator in such a contingency shall be conducted in accordance with the provisions of the Indian Arbitration & Conciliation Act, 1996 and the venue of such arbitration shall be in the city of New Delhi only.

34 TERMINATION FOR CONVENIENCE OF BYPL:

BYPL at its sole discretion may terminate the contract by giving 30 days prior notice in writing or through email to the Supplier. BYPL shall pay the Supplier for all the supplies/ services rendered till the actual date of contract termination against submission of invoice by the Supplier to that effect.

35 LIQUIDATED DAMAGES:

Liquidated damages shall be as per Volume –I, Special Condition of Contract.

36 TRANSFER AND SUB-LETTING:

The Supplier shall not sublet, transfer, assign or otherwise part with the Contract or any part thereof, either directly or indirectly, without prior written permission of the Purchaser

37 RECOVERIES:

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Whenever under this contract any money is recoverable from and payable by the bidder, the purchaser shall be entitled to recover such sum by appropriating in part or in whole by deducting any sum due to which any time thereafter may become due from the supplier in this or any other contract. Should the sum be not sufficient to cover the full amount recoverable the bidder shall pay to the purchaser on demand the remaining balance.

38 WAIVER:

Failure to enforce any condition herein contained shall not operate as a waiver of the condition itself or any subsequent breach thereof.

39 INDEMNIFICATION:

Notwithstanding contrary to anything contained in this NIT, Supplier shall at his costs and risks make good any loss or damage to the property of the Purchaser and/or the other Supplier engaged by the Purchaser and/or the employees of the Purchaser and/or employees of the other Supplier engaged by the Purchaser whatsoever arising out of the negligence of the Supplier while performing the obligations under this contract.

40 PATENT RIGHTS AND ROYALTY:

If, in the course of performance of its functions and duties as envisaged by the scope of the present GCC, the Bidder acquires or develops, any unique knowledge or information which would be covered, or, is likely to be covered within the definition of a trademark, copyright, patent, business secret, geographical indication or any other form of intellectual property right, it shall be obliged, under the terms of this present GCC, to share such knowledge or information with BYPL. All rights, with respect to, or arising from such intellectual property, as afore mentioned, shall solely vest in BYPL.

Moreover, the Bidder undertakes not to breach any intellectual property right vesting in a third party/parties, whether by breach of statutory provision, passing off, or otherwise. In the event of any such breach, the Bidder shall be wholly liable to compensate, indemnify or make good any loss suffered by such third party/parties, or any compensation/damages arising from any legal proceeding/s, or otherwise. No liability of BYPL shall arise in this respect, and any costs, damages, expenses, compensation payable by BYPL in this regard to a third party/parties, arising from a legal proceeding/s or otherwise, shall be recoverable from the Bidder.

41 CONFIDENTIALITY:

Bidder and its employees or representatives thereof shall strictly maintain the confidentiality of various information they come across while executing the contract as detailed below.

Documents

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All maps, plans, drawings, specifications, schemes and other documents or information related to the Contract/Project and the subject matter contained therein and all other information given to the Bidder by BYPL in connection with the performance of the contract shall be held confidential by the Bidder and shall remain the property of the BYPL and shall not be used or disclosed to third parties by the Bidder for any purpose other than for which they have been supplied or prepared. The Bidder may disclose to third parties, upon execution of confidentiality agreements, such part of the drawings, specifications or information if such disclosure is necessary for the performance of the Work provided such third parties agree in writing to keep such information confidential to the same extent and degree as provided herein, for the benefit of the BYPL.

Geographical Data

Maps, layouts and photographs of the site including its surrounding regions showing vital installation for national security of country or those of BYPL shall not be published or disclosed to the third parties or taken out of the country without prior written approval of the BYPL and upon execution of confidentiality agreements satisfactory to the BYPL with such third parties prior to disclosure.

Violation

In case of violation of this clause, the Bidder is liable to pay compensation and damages as may be determined by the competent authority of BYPL.

42 DISPUTE RESOLUTION & ARBITRATION:

To the best of their ability, the parties hereto shall endeavor to resolve amicably between themselves all disputes arising in connection with this contract. If the same remain unresolved within thirty (30) days of the matter being raised by either party, either party may refer the dispute for settlement by arbitration. The arbitration to be undertaken by two arbitrators, one each to be appointed by either party. The arbitrators appointed by both the parties shall mutually nominate a person to act as presiding arbitrator before entering upon the reference in the event of a difference between the two arbitrators and the award of the said presiding arbitrator in such a contingency shall be conducted in accordance with the provisions of the Indian Arbitration & Conciliation Act, 1996 and the venue of such arbitration shall be in the city of New Delhi only. The language of proceedings, documents and communication shall be English.

Suspension of Work on Account of Arbitration

The reference to negotiation/arbitration shall proceed notwithstanding that the Works shall not then be or be alleged to be complete, provided always that the obligations of the Purchaser and the Supplier shall not be altered by reasons of arbitration being conducted during the progress of the Works. In no event shall the Supplier be entitled to suspend the Execution of the Works or part of the Works to which the Dispute relates on account of arbitration and payments to the Supplier shall continue to be made in terms of the Contract.

The laws and jurisdiction of contract

Where recourse to a Court is to be made in respect of any matter, the courts at Delhi shall have exclusive jurisdiction.

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**ERECTION CONDITIONS OF CONTRACT
(ECC)**

OF

**DESIGN, ENGINEERING, MANUFACTURING,
SUPPLY, LAYING, JOINTING, TESTING AND
COMMISSIONING OF 33 & 66KV CABLES WITH
REQUIRED ACCESSORIES & DISMANTLING AS PER
THE SCOPE OF WORK, FOR BYPL, DELHI (INDIA)**

ON

TURNKEY BASIS

IN

BSES YAMUNA POWER LTD.

**BSES YAMUNA POWER LIMITED (BYPL)
SHAKTI KIRAN BUILDING, KARKARDOOMA,
DELHI-110032
CIN: U40109DL2001PLC111525
TEL: 011 3999 7111
WEBSITE: www.bsesdelhi.com**

***This document is a property of BYPL. This is not transferable and shall not be
used for any purpose other than, for which it is supplied.***

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GENERAL TERMS & CONDITIONS - ERECTION, TESTING & COMMISSIONING

The Erection Condition of the contract shall form a part of the specifications, contract documents.

1. PRIORITY OF CONTRACT DOCUMENTS:

The several documents forming the Contract are to be taken as mutually explanatory of one another, but in case of ambiguities or discrepancies, the same shall be explained and adjusted by the Purchaser, who shall thereupon issue to the Contractor, instructions thereon. In such event, unless otherwise provided in the Contract, the priority of the documents forming the Contract shall be as follows:

1. The Contract Agreement
2. The Letter of Acceptance/ Intent
3. Agreed Minutes of the Contract Negotiation Meetings.
4. Agreed Minutes of the contract Technical Meetings.
5. Instruction to Bidders (ITB)
6. Special Condition of Contract (SCC)
7. General Condition of Contract (GCC)
8. Erection Conditions of Contract (ECC)
9. Civil Conditions of Contract
10. The Priced Bill of Quantities
11. The Particular Technical Specifications
12. The General Technical Specifications
13. The Submitted Tender, including all Appendices and/or Addenda, the latest taking precedence.

All the materials, literature, data and information of any sort given by the contractor along with its bid proposal subject to the approval of the purchaser.

2. DEFINITIONS AND INTERPRETATION:

Definitions TO BE FOLLOWED UNDER THE CONTRACT shall have following meanings:

2.1 COMPANY / PURCHASER / OWNER: Means BSES YAMUNA Power Ltd, a company incorporated under the Companies Act 1956 and having its office at Shaktikiran Building, Karkardooma, Delhi -110032, which expression shall include its authorized representatives, agents, successors and assigns.

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2.2 CONTRACTOR: Shall mean the successful Tenderer / vendor to whom the contract has been awarded.

2.3 Rate: The unit rates for the work to be carried out at site shall be as per finalized unit rates through tender. The finalized rates shall be firm for the entire duration of work to be carried out by the Contractor under the work order and are not subject to escalation for any reason whatsoever.

2.4. CONTRACT SPECIFICATION: The terms "CONTRACT Specification" shall mean the Technical specification of the work as agreed by you and description of work as detailed in Annexure-I enclosed herewith and all such particulars mentioned directly/referred to or implied as such in the contract.

2.5. SITE: The terms "Site" shall mean the working location in BYPL area. Under this tender, working location shall be as mentioned elsewhere

2.6. ENGINEER IN CHARGE: "Engineer In-charge" means the Company's authorized representative for the purpose of carrying out the work.

2.7 APPLICABLE LAW: Applicable Laws means the constitution of India and any act, rule, regulations, directive, notification, code, order or instruction having its force of law enacted or issued by any competent legislature or Governmental Agency (including those related to taxes, duties, assessments, expropriation and compulsory acquisition) as may be in effect from time to time the implications thereof shall be deemed a Change in Law or Change in Permits.

2.8 OTHER CLEARANCES: Means any consent, approval, permit or other authorisation which is required to be granted by authorities (local, government or any other) essential to start/complete the work.

2.9 DEFECT LIABILITY PERIOD: Shall mean the period during which the contractor shall remain liable for repair or replacement of any defective part of the work performed under the contract, free of cost.

2.10 TENDER SPECIFICATION: The terms "Tender Specification" shall mean the Indian Standard specification of the work and description of work as detailed in Tender document/Tender enclosed and all such particulars mentioned directly/referred to or implied as such in the Tender.

2.11. CONTRACT PRICE shall mean the price referred to in the "Letter of Intent/Purchase Order".

2.12 CONTRACT PERIOD shall mean the period during which the "Contract" shall be executed as agreed between the Supplier and the Purchaser in the Contract inclusive of extended contract period for reason beyond the control of the Supplier and/or Purchaser due to force majeure.

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2.13 CODES AND SPECIFICATION shall mean all the applicable codes and standards as indicated in the Specification.

2.14 CHANGE OF WORK means any addition to, deletion from, suspension of or other modification, to the Work, or to the quality, function or as delineated in this Contract, including any such addition, deletion, suspension or other modification, which requires a change in one or more of the Technical Specifications and the completion schedule

2.15 EPC means Engineering, Procurement and Construction wherein the EPC contractor is made responsible for all the activities from design, procurement, supply, storage construction, commissioning and handover of the project to owner.

2.16 EFFECTIVE DATE OF CONTRACT means the date of issue/award of contract shall be the Effective Date of Contract or Contract Commencement date.

2.17 CONTRACT COMMENCEMENT DATE means the date of issue/award of contract shall be the Effective Date of Contract or Contract Commencement date.

2.18 CONTRACT COMPLETION DATE means the date of expiry of Guarantee/defect liability Period shall be deemed as the Contract Completion Date.

3 EXAMINATION OF SITE AND LOCAL CONDITIONS:

The contractor is deemed to have visited the site of the work and ascertained therefore all site conditions and information pertaining to his work.

Before submitting the bid, all bidders will at their expenses make or obtain any additional information, investigations, explorations, test and studies and obtain any additional information and data which pertains to the physical conditions at or contiguous to the site or otherwise which may affect cost, progress, performance of the work and which the bidder deems necessary to determine its Bid for performing the work in accordance with the time and other terms and conditions of the tender/contract documents.

The company shall not accept any claim whatsoever arising out of the difficult site/terrain/local conditions, if an

4 LANGUAGE AND MEASUREMENT:

The CONTRACT issued to the contractor by the company and all correspondence and documents relating to the CONTRACT placed on the Contractor shall be written in English language.

Metric System shall be followed for all dimension, units etc.

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5 SCOPE OF WORK:

The scope of work under this contract shall include the turnkey execution on End to End Basis , including but not limited to design, manufacturing, inspection & testing, dispatches, loading , unloading ,storage at site, erection & installation, testing of the installation, associated civil work ,commissioning ,handing over to the purchaser including comprehensive marine cum storage cum erection Insurance (MSE) on "Single Point Responsibility Basis

Scheme Number	Package Name	Total Months for Handing over of the Package, From Zero Date	Total No. of Day for Handing over of the Package From Zero Date
EE19SH1029	DELHI METRO PHASE IV (MAUJPUR – MUKANDPUR CORRIDOR OF DMRC)	12 months	365 days

Brief Scope of Work related to Erection and Installation work including testing and commissioning and final handover for the above packages shall be as per the NIT conditions with the following salient details.

5.1 Survey, design, engineering, manufacture, shop testing, inspection, packing, dispatch, loading, unloading and storage at site including comprehensive SCE (Storage cum Erection) insurance, assembly, erection, civil structural, architectural work, complete pre-commissioning checks, testing & commissioning at site, also includes all statutory clearances & certification from State Electrical Inspector, Municipal corporation department, Fire officer, Horticulture department , various local bodies like RWA and handing over to the Owner after satisfactory commissioning of complete Packages as defined above for **Cable In feed on Turnkey Basis.**

- Schedule of work shall be as mentioned in the Bill of quantity attached herewith.
- After completion of Erection, Testing & Commissioning of the package awarded, contractor has to obtain the Electrical Inspectorate's Clearance from the Electrical Inspector of Delhi Govt.
- Contractor shall arrange any permission like Road cutting clearance etc. from the Delhi Civic authorities. All Statutory charges and direct fees shall be borne by BYPL.
- All the Labour, plant appliance, ladder, scaffoldings, materials, tool, tackles etc are included in your scope of work.
- Adequate number of engineers, supervisors and labours shall be posted at site and the list of the same along with certificate of Qualification of technical staff should be submitted by the Contractor to the Engineer In Charge for checking the adequacy immediately (within seven days) after award of contract.

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Detailed Organisation chart, along with the qualification of the manpower to be deployed shall submitted along with Bid.

- The Contractor shall also make his own arrangement for the accommodation/conveyance requirements for its staff at site.
- Contractor shall arrange storage for storing the materials, tools, tackles etc. Contractor shall be responsible for all the unloading of the material, marking, staking and storage at site. The insurance for all the storage material shall be included in the policy taken by Contractor. Contractor shall submit the copy of insurance policy to BYPL. In case of any mishappening/damage to the storage material contractor shall be responsible to lodge the claim. Under no circumstances no delay in execution shall be allowed and contractor shall immediately arrange for the replacement without waiting for the settlement.
- All the incoming and outgoing materials, equipment, tools, tackles and any other items related to said work shall be entered into the register kept for this purpose and shall be in the custody of Contractor, however company does not hold any responsibility for any loss or damage of Contractor's material etc.
- All loading/unloading, of materials at work-site shall be contractors responsibility. Involvement of Crane/Hydra/Tractor/Trailer for this type of work shall be in contractors scope. Adequate weather protection shall be provided by the contractor to keep the materials safe from sun & rain by providing covered storage space as well as using tarpaulins.

While carrying out trenchless / open digging works the existing underground cables are liable to get damaged leading to High Risk Safety Hazard to the working people.

To arrest above problem to the best degree possible, there are technology support available, like Cable Route Tracer which is an important tool to detect the live / dead cables underground to the depth upto 3 meters, comfortably. The vendor must employ Cable Route Tracer before start of excavation / trenchless job and submit reports to the Engineer-in-charge for clearance to start the job. The above will minimize the risk of cable damage and improve safety of the working people.

It may please be noted that in case bidders have no "Cable Route Tracers" with him, as a basic necessity tool. Heavy penalty will be imposed on the vendors, if the vendor damages the cables. The cable route tracer shall be of approved make of BYPL.

Special Instruction for cable laying related works:-

- a. Contractor need to conduct sheath voltage test after finishing the cable laying to check integrity of outer sheath in presence of project engineer.
- b. All cable laying tools and tackles and testing equipment shall be available with contractor in event of order.

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- c. Contractor shall submit copy of cable laying schedule to BSES in event of order so that quality checks can be done on sample basis.

6 CONTRACT RATES:

The rates finalized for this order shall be firm for the entire duration of work carried out by the Contractor under the order and are not subject to any variation and escalation for any reason whatsoever.

The cost of insurance during loading/unloading of materials/ equipments during its storage and handling/erection at site for installation is included in the contractor's scope and value is included in the unit rates finalized.

The unit rates finalized are also inclusive of barricading and watch & ward during execution and no separate charges shall be paid for the same.
The cost of training of BYPL Official shall be included in the prices quoted by vendor.

7 TAXES AND DUTIES:

Prices are inclusive of all taxes and duties including labour cess.

However, IT as per applicable rate will be deducted from your bills as Tax Deduction at Source (TDS).

GST is included in the contract price awarded , however GST payment shall be made on submission of GST Registration and self declaration on your letter head stating that contractor have deposited/or will deposit the Tax as per the applicable GST laws. Contractor shall furnish your GST registration number.

Any statutory variations i.e. increase/decrease in Taxes / Duties introduces by central Govt. / State Govt. of shall be reimbursed/recovered to/from Contractor against documentary evidence and proof.

Any variation in taxes shall be applicable only to the direct/price breakup as mentioned in the contract.

CHANGE OF LAW:

"Change in Law" means:

- a) any enactment or issue of any new Applicable Law,
- b) any amendment, alteration, modification, or repeal of any existing Applicable Law or any new or modified directive or order there under,
- c) any change or variation in taxes payable in connection with and under this

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Agreement in each case with respect to a), b), and c) above coming into effect after the date of this Agreement.

8 ACCOMODATION & CONVEYENCE FOR THE STAFF:

The Contractor shall also make his own arrangement for the accommodation/conveyance requirements for its staff at site.

9 STORAGE AT SITE:

Contractor shall arrange the storage at site with the adequate open space / closed storage for contractor's site store for storing the materials, tools, tackles etc.

All the Contractor's storage will be within the site premises. All the incoming and outgoing materials, equipment, tools, tackles and any other items related to said work shall be entered into the register kept for this purpose and shall be in the custody of Contractor, however company does not hold any responsibility for any loss or damage of Contractor's material etc. All loading/unloading, of materials at work-site shall be your responsibility. Involvement of Crane/Hydra/Tractor/Trailer for this type of work shall be in your scope.

Adequate weather protection shall be provided by the contractor to keep the materials safe from sun & rain by providing covered storage space as well as using tarpaulins. Water and Electricity Power shall be arranged by the Contractor at his own. The cost of insurance during loading/unloading of materials/ equipments during its storage and handling/erection at site for installation is included in the contractor's scope and value is including in the above mentioned

Tender value. The unit rates mentioned in annexure is inclusive of barricading and watch & ward during execution and no separate charges shall be paid for the same.

10 SECURITY, WATCH & WARD:

The contractor, at his own cost, shall arrange for the security and watch and ward of the materials, men and machineries at site. Round the clock security alongwith the CCTV shall be provided for the materials stored at the site.

11 DEFECT LIABILITY PERIOD:

Work executed shall be guaranteed against any defect or failure which may arise due to faulty materials, design or workmanship for a period of Twenty Four (24) months from the date of final handing over of the entire package as defined in SCC. If during the Defect Liability Period any works are found to be defective, shall be immediately rectified or repaired, upto BYPL satisfaction, by the contractor at his own cost within Ten (10) days from the date of receipt of intimation from BYPL.

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Under no circumstances any extra claim in terms of time and cost shall be entertained for such repair/rectification.

12 PERFORMANCE GUARANTEE:

12.01 Bank guarantee shall be drawn in favour of "BSES YAMUNA Power Ltd" as applicable. The performance Bank guarantee shall be in the format as specified by BYPL.

12.02 Contract performance bank guarantee of total 10% of the contract price shall be submitted within 15 days of award of contract with the validity till completion of the contract period.

12.03 Contractor shall submit the workmanship / equipment performance bank guarantee equivalent to the 10% of the contract value at the time of claiming the last payment as per TERMS OF PAYMENT (Erection, Testing & Commissioning)), with the validity of the bank guarantee till Defect Liability Period i.e. 24 months from the date of Handing over of entire package plus 3 months.

13 COMPLETION PERIOD:

Contractor is required to mobilize your manpower and Tools & Tackles and furnish a list of equipments to be used for erection and commence the execution activity as per instructions of Engineer In-charge. The detailed schedule and milestone completion dates would be as per the contract schedules given from time to time by Engineer In-charge at site.

The time schedule for carrying out this work and period for mobilization shall be as under:

13.1 The Contractor's team should be mobilized at site for commencement of work immediately on receipt of the order.

13.2 The entire work under this order as indicated in the scope of work shall be carried out and completed within 365 days for entire package as defined in SCC. Total completion schedule for Engineering, manufacturing, inspection & testing, packing and forwarding and Transportation till site and Erection Testing & Commissioning shall be as per the milestones timelines defined in SCC.

13.3 A detailed L2 Schedule shall be submitted by the supplier within Fifteen(15) days of LOI. The contractor shall plan parallel working (round the clock working) for completion of work as per schedule and mobilize manpower accordingly.

13.4 Progress Review Meeting between the Contractor and the Engineer In charge shall be held at site at least once in a week. Also a weekly progress report giving the

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details of the manpower engaged at site and the details of the major job completion shall be submitted to Engineer In-charge.

13.5 The above time schedule must be strictly adhered to and improved upon wherever possible. In the event we find that your work is not progressing in quality or time frame as per above agreed schedule and to our satisfaction, we reserve the right to withdraw the work in whole or in part without further notice and liability of the Company.

13.6 The completion of the work shall have to be certified by Engineer In charge.

13.7 In order to maintain the time schedule, if necessary the Contractor shall carry out the work on all Sunday & Holiday except National Holiday with prior written permission from Engineer-in-Charge.

14 CLEANLINESS & PRECAUTIONS AT SITE TO PREVENT DUST POLLUTION:

All debris shall be removed and disposed of at assigned areas on daily basis. Surplus excavated earth shall be disposed of in an approved manner. In short, the contractor shall be fully responsible for keeping the work site clean at all times. In case of non- compliance, company shall get the same done at Contractor's risk and costs.

While carrying out any civil work including road/ pit digging, plinth/ fence making, road restoration etc contractor shall adhere to below mentioned guidelines.

14.1 No construction material/ debris shall be stored on metalled road.

14.2 Wind breakers of appropriate height on all sides of ear marked area using CGI sheets shall be raised to ensure that no construction material dust fly outside ear marked area.

14.3 The construction material i.e. coarse sand, stone aggregates, excavated earth, cement and any other material to and from the site shall be transported under wet and covered condition to ensure their non-slippage en-route to avoid air contamination.

14.4 The contractor shall provide mask and helmet to every worker working on the construction site and involved in loading/unloading and carriage of construction material and construction debris to prevent inhalation of dust particles.

14.5 Over loading of vehicles shall be strictly prohibited.

14.6 The construction material at site shall be stored under wet and covered condition.

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14.7 The dumping sites for temporarily storing the excavated earth shall be properly levelled, watered and rehabilitated by plantation to avoid flying of dust.

14.8 The worker at the site shall be sensitized to adopt / observe the dust controlled measures in true spirit.

14.9 If any C&D waste is generated at site the same will be transported to the C&D waste site only and the record for the same will be maintained by the agency.

14.10 Wet jet in grinding and stone cutting is being permitted at site.

14.11 The necessary record for dust control is being maintained by the department on day to day basis and being monitored regularly.

The Execution vendors shall be responsible for all the preventive and protective environmental steps as per guidelines. Any violations from the above guidelines have been viewed very seriously by the authorities. Concerned agency is liable for the penalties / other action by the authorities, The Agency shall indemnify BYPL from all liabilities on this account

15 COMMISSIONING & ACCEPTANCE TEST:

After completion of the work, the Contractor shall conduct trial run/ operation in the presence of Engineer In charge. During such trial run the system shall be operated under the supervision of the Contractor. If any rectification/modification required during this period the Contractor shall do all necessary measures.

On satisfactory completion of above, the system shall be deemed to have energized and placed in commercial operation. The Engineer In Charge will issue an acceptance certificate.

16 WORK COMPLETION CERTIFICATION, HANDING OVER:

The work carried out by the Contractor under this order has to be certified by Engineer In-charge for satisfactory completion of work allotted to the contractor with respect to specifications / Field Quality Procedures as per applicable standards. In case of modification/correction to be carried out, contractor shall carry out the said modifications/correction without additional cost. The Contractor shall remain in close contact with Engineer In-Charge at site to report the general findings of the fieldwork during the initial as well as later stage of the work at site.

The contractor shall be solely responsible for any shortage or damage of materials issued to them handling of and / or in storage and erection at site and cost of the same will be recovered from the contractor as certified by Engineer In-Charge. Contractor must submit a periodical material reconciliation statement in the approval format with every Running Bill raise by him or end of every month whichever is

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earlier. The contractor shall maintain an accurate and exhaustive record detailing out the list of all items received by him for the purpose of erection and keep such record open for the inspection of the company.

17 PENALTY AND LIQUIDATED DAMAGES

17.1 Penalty: A penalty of 2.5% of bill amount shall be levied in each case of non-compliance of safety practices and site cleanliness.

17.2 Liquidated Damages: In the event of any delay in completion of the work beyond the stipulated time given by in order due to reasons solely attributable to the Contractor, the Contractor shall pay to the Company liquidated damages as per the clause defined in SCC

18 SAFETY CODE:

The Contractor shall ensure adequate safety precautions at site as required under the law of the land and shall be entirely responsible for the complete safety of their workman as well as other workers at site and premises. The contractor shall not deploy any worker below the age of 18 years.

The contractor shall observe the safety requirements as laid down in the contract and in case of sub-contract (only after written approval of company); it shall be the responsibility of main contractor that all safety requirements are followed by the employees and staff of the sub-contractor.

The contractor employing two hundred employees or more, including contract workers, shall have a safety coordinator in order to ensure the implementation of safety requirements of the contract and a contractor with lesser number of employees, including contract workers, shall nominate one of his employees to act as safety coordinator who shall liaise with the safety officer on matters relating to safety and his name shall be displayed on the notice board at a prominent place at the work site.

The contractor shall be responsible for non-compliance of the safety measures, implications, injuries, fatalities and compensation arising out of such situations or incidents.

In case of any accident, the contractor shall immediately submit a statement of the same to the owner and the safety officer, containing the details of the accident, any injury or casualties, extent of properly damage and remedial action taken to prevent recurrence and in addition, the contractor shall submit a monthly statement of the accidents to the owner at the end of each month.

19. STATUTORY OBLIGATIONS:

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The Contractor shall take all steps as may be necessary to comply with the various applicable laws/rules including the provisions of contract labour (Regulation & Abolition Act) 1970 as amended, minimum wages Act, 1984, Workman Compensation Act, ESI Act, PF Act, Bonus Act and all other applicable laws and rules framed there under including any statutory approval required from the Central/State Govt. Ministry of Labour. Broadly, the compliance shall be as detailed below, but not limited to:

- a) An Electrical license issued by Govt.of Delhi.
- b) PF Code No. and all employees to have PF A/c No. under PF every Act, 1952.
- c) All employees to have a temporary or permanent ESI Card as per ESI Act.
- d) ESI Registration No.
- e) PAN No.
- f) Work Contract Tax Registration Number/ GSTN Registration. g) Labour License under Contract Labour Act (R & A) Act 1970

(Engineer-in-charge responsible for execution of the job should obtain a copy of Labour License before start of the work by the contractor.)

The Contractor must follow:

- a) Third party Insurance Policy before start of work.
- b) To follow Minimum Wages Act prevailing in the state.
- c) Salary / Wages to be distributed in presence of representative of Company's representative not later than 7th of each month.
- d) To maintain Wage- cum - Attendance Register.
- e) To maintain First Aid Box at Site.
- f) Latest P.F. and E.S.I. challans pertaining to the period in which work was undertaken along with a certificate mentioning that P.F. and E.S.I. applicable to all the employees has been deducted and deposited with the Authorities within the time limits specified under the respective Acts.
- g) Workman Compensation Policy. {If applicable}
- h) Labour license before start of work. {If applicable}

20. WORKMAN COMPENSATION:

The Contactor shall take insurance policy at his own cost under the Workman Compensation Act to cover such workers who are not covered under ESI and PF by the Contractor however engaged to undertake the jobs covered under this order and a copy of this insurance policy will be given to Company for reference and records. This insurance policy shall be kept valid at all times. In case there are no worker involve other than those who are covered under ESI and PF by the Contractor, the Contractor shall certify for the same,

The contractor shall keep the company indemnified at all times, against all claims of compensation under the provision of Workmen Compensation Act 1923 and as amended from time to time or any compensation payable under any other law for the time being workman engaged by the contractor/sub-contractor/sub-agent in carrying out the job involved under this work order and against costs and

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expenses, if any, incurred by the company in connection therewith and without prejudice to make any recovery.

The company shall be entitled to deduct from any money due to or to become due to the Contractor, moneys paid or payable by way of compensation as aforesaid or cost or expenses in connection with any claims thereto and the Contractor shall abide by the decision of the Company as to the sum payable by the Contractor under the provisions of this clause.

21. STAFF AND WORKMAN:

It shall be responsibility of contractor

(a) To obtain Contract Labour License from the concerned authorities and maintain proper liaison with them. Necessary Forms for obtaining Labour License would be issued by the company. However you will bear all expenses for obtaining Labour license and registration in PF Department for your scope of work. You will deposit PF of your staff/laborer each month and all related documents should be furnished to us.

b) To obtain workman insurance cover against deployment of workers etc.

(II) To maintain, proper records relating to workmen employed, in the form of various Registers, namely,

- a) Register of workmen.
- b) Register of muster roll.
- c) Register of overtime.
- d) Register of wages.
- e) Any other register as per latest amendment Labour Act.

The records shall be in the prescribed formats only.

(III) To disburse monthly wages to your workers/ supervisors in time and in the presence of Company representatives or as directed by the Labour authorities.

(IV) To maintain proper liaison with the Project authorities, local police and all other government and local bodies.

(V) To pay your workmen at least not less than the minimum prescribed wages as per state/Central Labour laws as may be, applicable. The contractor shall, be responsible for compliance of all the provisions of minimum Wages Act, PF, ESIC Act workmen Compensation Act and Contract Labour Regulation & Abolition Act the rules made there under. In case of non-compliance of the statutory requirements. The company would take necessary action at the risk and cost of the Contractor.

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(VI) To employ required number of skilled/semi-skilled and unskilled workmen as per site requirement to complete the entire project as per schedule. To provide safety shoes, safety helmets, safety belts, gloves etc. to your worker/staff as per requirement during erection work.

(VII) To employ necessary engineering and supervisory staff for completion of the Project in time. While day-to-day management of the site and supervision of the works shall be the responsibility of your Engineer - In charge, he will report to the Engineer in charge to assist him to discharge the overall responsibility of the execution of the project.

22. HUMAN RESOURCE ISSUES:

22.1 The CONTRACTOR would execute these works through their own resources.

22.2 The CONTRACTOR shall bear all expenses/cost to be incurred towards salary, allowances, perks, traveling allowances, advances, insurance, safety measures, security, transportation and all other misc. expenses etc. of their employees/ workmen during the tenure of AMC. Also, the CONTRACTOR shall be sole responsible for making payment for Out-patient department, Hospitalization, Compensation thereof in case of any accident, injury or death.

22.3 ID CARD: No contractor will issue any ID cards to their staff on their own .All ID Cards for the workforce will be issued by BYPL Security ID Card Cell only. Contractors should maintain the records of Identity Cards of their employees and whenever any employee quits / is removed then his/her Identity card should be collected & submitted to BYPL Security ID Card Cell. Penalty will be imposed on the vendor in case of violation of the above rule. Contractors shall submit the detail list of the employees that they are going to be hire to BYPL Security before start of the contract.

22.4 The CONTRACTOR to deploy their manpower immediately for carrying out the work as specified above.

22.5 The CONTRACTOR should ensure that there are no disputes regarding service, payment etc of the persons engaged by him, anytime during the currency of the contract. At no point of time during the currency of contract, the CONTRACTOR's employees shall insist upon the COMPANY for employment, wages, and allowances or any other related matter, payment etc.

22.6 The CONTRACTOR shall not deploy the manpower below the age of 18 years.

22.7 The CONTRACTOR shall not deploy the female manpower between 7 PM to 6 AM.

22.8 The CONTRACTOR shall be directly responsible for any / all disputes arising between him and his persons and keep the COMPANY indemnified against all

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losses, damages and claims arising thereof. The CONTRACTOR shall resolve any dispute of their manpower. All the legal dues of their manpower is to be paid on due date or within 8 days on the termination of manpower.

22.9 All safety wears required for the CONTRACTOR's manpower during the execution of work such as safety shoes, safety helmets, hand gloves, safety belt, goggles etc. must be provided by the CONTRACTOR at his own cost and he shall ensure that his employees regularly use such safety gears while executing COMPANY's work.

22.10 The CONTRACTOR shall be responsible for discipline of his manpower and shall adhere to the disciplinary procedure set by the COMPANY at site. The COMPANY shall be at liberty to object to the presence of any representative or employees of the CONTRACTOR at the site, if in the opinion of the COMPANY such manpower has done any act of misconduct or negligence or otherwise undesirable, then the CONTRACTOR shall remove such a person objected to and provide a competent replacement immediately.

22.11 The CONTRACTOR shall ensure that he has complied with the following:

- has paid minimum wages to his manpower as per the rate notified from time to time by the Government of National Capital Territory of Delhi.
- Contractor shall disburse the salary of his staff through ECS only.

22.12 Deduct and deposited ESI and PF contribution. Copies of the same shall be submitted.

22.13 The COMPANY reserves the right to demand the CONTRACTOR's services on holidays as well as beyond the normal working hours. The Engineer In-charge shall communicate in writing for any work required to be done during Holidays.

22.14 The CONTRACTOR will ensure that none of their person is engaged in any unlawful activities subversive of the COMPANY's interest failing which suitable action may be taken against the CONTRACTOR as per the terms and conditions of this tender.

22.15 The CONTRACTOR shall be liable for payment of all taxes and duties as applicable, to the State/ Central Govt. or any local authority.

22.16 The CONTRACTOR's employees shall not be treated as COMPANY's employees / persons for any purpose whatsoever & facilities/ benefits applicable to the COMPANY's employees shall not be applicable to CONTRACTOR's employees. If due to any reasons whatsoever the COMPANY is made liable to meet any obligation under any of the laws & enactment etc, for any reason whatsoever the same shall be recovered from the CONTRACTOR or from any of the bills payable to him or failing which it shall be recovered as per law.

22.17 The CONTRACTOR shall be responsible and shall comply with the provision of all the STATUTORY ACTS APPLICABLE. Special attention of the CONTRACTOR is drawn

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towards the compliance of provision of the following statutes: (along with the latest amendments/additions):

- 22.17.1 The Child Labour (Prohibition and Regulation) Act, 1986.
- 22.17.2 The Contract Labour (Regulation and Abolition) Act, 1970.
- 22.17.3 The Employee's Pension Scheme, 1995.
- 22.17.4 The Employee's Provident Funds and miscellaneous provisions Act, 1952.
- 22.17.5 The Employees State Insurance Act, 1948.
- 22.17.6 The Industrial Disputes Act, 1947.
- 22.17.7 The Maternity Benefit Act 1961.
- 22.17.8 The Minimum Wages Act, 1948.
- 22.17.9 The Payment of Bonus Act, 1965.
- 22.17.10 The Payment of Gratuity Act, 1972.
- 22.17.11 The payment of Wages Act, 1936.
- 22.17.12 The Delhi Shops & Establishment Act, 1954.
- 22.17.13 The Workmen's Compensation Act. 1923.
- 22.17.14 The Employer's Liability Act, 1938.

The Contractor shall furnish the above specified compliances as per the format attached as Annexure I.

Contractor shall adhere to the Vendor Code of Conduct as specified in the NIT.

23. INSURANCE:

23 a) THIRD PARTY INSURANCE:

Before commencing the execution of the work the contractor shall take third party insurance policy at his own cost to insure against any damage or loss or injury which may occur to any property / public property or to any person or any employee or representative of any outside Agency/ the company engaged or not engaged for the work of the company, by or arising out of the execution of the work or temporary work or in carrying out of this Agreement. For third party insurance policies, the contractor shall be responsible for settlement of claims with the underwriters without any liability on the purchaser / owner and will arrange replacements / rectification expeditiously without a waiting settlement by insurance claim at contractors own cost.

23 b) ACCIDENTAL INSURANCE POLICY FOR LIFE COVER:

Before commencing the execution of the work the CONTRACTOR shall take Accidental insurance policy for the staff engaged by him for this work to insure against any loss of life which may occur during the contract for the work of the COMPANY. The policy shall have coverage of Rs. 10 Lacs (Table C- Death + Permanent Total Disability + Partial permanent Disability due to external accidents). The Contractor shall be responsible for on the spot same day claim settlement with

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the victim's legal heirs without waiting for settlement by insurance claim without any liability on BYPL. The premium amount for such life cover policy shall be borne by the contractor. The contractor shall furnish copy of policy when demanded by BYPL.

23 C) INSURANCE FOR MAN, MATERIAL & MACHINERY DEPLOYED AT SITE:

Contractor shall be responsible for the insurance for his own man , material and machinery deployed at site for the package awarded. Contractor shall furnish the copy of this insurance policy to the purchaser, prior start of work.

24. SECURITY

Adequate number of trained Security Guards shall be deployed both at the storage yard and stores as well as places of work to prevent theft and pilferage of material and accessories and various other materials. All security rules and safety rules enforced at site by company shall be strictly observed.

25. ENVIRONMENTAL, HEALTH & SAFETY PLAN:

Contractor will make ensure that the Environment, Health & Safety (EHS) requirements are clearly understood and faithfully implemented at all levels at site as per instruction of Company. Contractors must comply with these requirements:

- a) Comply with all of the elements of the EHS Plan and any regulations applicable to the work
- b) Comply with the procedures provided in the interests of Environment, Health and Safety
- c) Ensure that all of their employees designated to work are properly trained and competent
- d) Ensure that all plant and equipment they bring on to site has been inspected and serviced in accordance with legal requirement and manufacturer's or suppliers' instructions
- e) Make arrangements to ensure that all employees designated to work on or visit the site present themselves for site induction prior to commencement of work
- f) Provide details of any hazardous substances to be brought onsite
- g) Ensure that a responsible person accompanies any of their visitors to site

All contractors staff is accountable for the following:

1. Use the correct tools and equipment for the job and use safety equipment and

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protective clothing supplied, e.g. helmets, goggles, ear protection, etc. as instructed

2. Keep tools in good condition
3. Report to the Supervisor any unsafe or unhealthy condition or any defects in plant or equipment
4. Develop a concern for safety for themselves and for others
5. Prohibit horseplay
6. Not to operate any item of plant unless they have been specifically trained and are authorized to do so.

26. TEST CERTIFICATE & QUALITY ASSURANCE:

The Contractor shall procure all equipment from genuine sources as approved by the Company and as per Company specifications. The Contractor shall submit all the test certificates and joint inspection reports related to major equipment wherever applicable. The contractor shall ensure for the strict compliance to the specifications and Field Quality Procedures issued by company / Engineer in-charge.

27. SUB-CONTRACTING / SUBLETTING:

CONTRACTOR shall not assign or transfer the whole or any part of this Work Order or any other benefits accruing there from nor shall it subcontract / sublet the whole or any part of the Works without the prior written consent of COMPANY.

In the event the contractor assigns this work order, contractor's assignees shall be bound by the terms and conditions of this work order and shall , if deemed necessary by COMPANY at the time of such assignment, undertake in writing to be so bound by this Work Order.

Notwithstanding the subletting / subcontracting of any portion of the works, contractor shall remain wholly responsible for the carrying out, completion and satisfactory execution of Works in all respects in accordance with this Work Order, specification, approved drawings and data sheets.

28. INDEMNITY:

Contractor shall indemnify and save harmless COMPANY against and from any and all liabilities, claims, damages, losses or expenses arising due to or resulting from:

- a) any breach non-observance or non-performance by contractor or its employees or agents of any of the provisions of this Work Order.
- b) any act or omission of contractor or its employees or agents.
- c) any negligence or breach of duty on the part of contractor, its employees or agents including any wrongful use by it or them of any property or goods belonging to or by COMPANY.
- d) The vendor shall submit an Indemnity Bond against any damages / loss of free

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issued materials.

Contractor shall at all times indemnify COMPANY against all liabilities to other persons, including the employees or agents of COMPANY or contractor for bodily injury, damage to property or other loss which may arise out of or in consequence of the execution or completion of Works and against all costs charges and expenses that may be occasioned to COMPANY by the claims of such person

29. EVENTS OF DEFAULTS:

COMPANY may, without prejudice to any of its other rights or remedies under the Work Order or in law, terminate the whole or any part of this Work Order by giving written notice to the Contractor, if in the opinion of COMPANY, contractor has neglected to proceed with the works with due diligence or commits a breach of any of the provisions of this work order including but not limited to any of the following cases:

- a) Failing to complete execution of work within the terms specified in this work order.
- b) Failing to complete works in accordance with the approved schedule of works.
- c) Failing to meet requirements of specifications, drawings, and designs as approved by COMPANY.
- d) Failing to comply with any reasonable instructions or orders issued by COMPANY in connection with the works.
- e) Failing to comply with any of the terms or conditions of this work order.

In the event COMPANY terminates this work order, in whole or in part, on the occurrence of any event of default, COMPANY reserves the right to engage any other subcontractor or agency to complete the work or any part thereof, and in addition to any other right COMPANY may have under this work order or in law including without limitation the right to penalize for delay under clause 15.0 of this work order, the contractor shall be liable to COMPANY for any additional costs that may be incurred by COMPANY for the execution of the Work.

30. RISK & COST:

If the Contractor fails to execute the work as per specification / as per the direction of Engineer's In-charge within the scheduled period and even after the extended period, the contract shall get cancel and company reserves the right to get the work executed from any other source at the Risk & Cost of the Contractor. The Extra Expenditure so incurred shall be debited to the Contract.

31. ARBITRATION:

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To the best of their ability, the parties hereto shall endeavor to resolve amicably between themselves all disputes arising in connection with this LOA. If the same remain unresolved within thirty (30) days of the matter being raised by either party, either party may refer the dispute for settlement by arbitration. The arbitration to be undertaken by two arbitrators, one each to be appointed by either party. The arbitrators appointed by both the parties shall mutually nominate a person to act as presiding arbitrator before entering upon the reference in the event of a difference between the two arbitrators and the award of the said presiding arbitrator in such a contingency shall be conducted in accordance with this provisions of the Indian Arbitration & Conciliation Act, 1996 and the venue of such arbitration shall be in the city of New Delhi only.

32. SECRECY CLAUSE:

The technical information, drawing and other related documents forming part of work order and the information obtained during the course of investigation under this work order shall be the Company's executive property and shall not be used for any other purpose except for the execution of the work order. The technical information drawing, records and other document shall not be copied, transferred, or divulged and/ or disclosed to third party in full/part, not misused in any form whatsoever except to the extent for the execution of this work order.

These technical information, drawing and other related documents shall be returned to the Company with all approved copies and duplicates including drawing/plans as are prepared by the Contractor during the executions of this work order, if any, immediately after they have been used for agreed purpose. In the event of any breach of this provision, the contractor shall indemnify the Company against any loss, cost or damage or claim by any party in respect of such breach.

33. TERMINATION DUE TO NON PERFORMANCE:

"During the course of the execution, if at any time BSES observe and form an opinion that the work under the order is not being performed in accordance with the terms of this Agreement, BSES reserves its right to cancel this Agreement giving 15 days notice mentioning the reason for the termination of the agreement and BSES will recover all damages including losses occurred due to loss of time from Contractor.

34. TERMINATION BY EOMPLOYER CONVENIENCE:

The owner at any time terminate the contract for any reason, by giving the contractor a notice of termination. Upon receipt of the notice of termination, the contractor shall either within 14 days of receipt of such notice, or on the date specified in the notice of termination, carry out the following : Cease all further work, except for such

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work as the owner may specify in the notice of termination for the sole purpose of protecting that part of the facilities already executed, or any work required to leave the site in a clean and safe condition.

- Terminate all subcontracts, except as mentioned below.
- Remove all Contractor's equipment from the site, repatriate the contractor's and its sub-contractor's personnel from the site, remove from the site any wreckage, rubbish and debris of any kind, and leave the whole of the site in a clean and safe condition.
- Deliver to the owner the parts of the facilities executed by the contractor up to date of termination.
- To the extent legally possible, assign to the owner all right, title and benefit of the contractor to the facilities and to the plant and equipment as at the date of termination, and as may be required by the owner, in any subcontracts concluded between the contractor and its sub-contractors.
- Deliver to the owner all non-proprietary drawings, specifications and other documents prepared by the contractor or its sub-contractors as at date of termination in connection with the facilities. In the event of termination of the contract by the owner, under this clause, the owner shall pay to the contractor the following amounts after setting off the owner's claim if any under the contract:
 - a) The contract price, properly attributable to the parts of the facilities executed by the contractor as of the date of termination.
 - b) The costs reasonably incurred by the contractor in the removal of the contractor's equipment from the site and in the repatriation of the contractor's and its sub-contractors personnel.
 - c) Pre- approved and reasonable cost of satisfying all other obligations, commitments and claims that the contractor may in good faith have undertaken with third parties in connection with the contract and that are not covered above.

35. QUALITY:

Contractor shall ensure that strict quality is maintained and execution of works under this Work Order and Works are executed in conformity with the Specification.

All tools, tackles, instruments and other equipments used in the execution of the Works shall be duly calibrated as required and Contractor shall maintain proper records of such tools, tackles, instruments and / or equipment.

The contractor shall submit SQP indicating Customer Holding Point for design, manufacture, inspection, testing, packing, forwarding, transportation including shop painting and final painting for Purchaser's review and approval.

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The contractor shall submit Field Quality Assurance and Filed Quality Control Plan (FQP) indicating Customer Hold Point for unloading, receiving, storage at site, transportation, handling at site, erection, testing, pre-commissioning & commissioning for Purchaser's review and approval as per applicable provisions of Technical Specifications.

The Contractor shall submit a Field Erection Procedure for the scope of work under the Contract Agreement. The same shall be subject to the approval of the Purchaser and the work shall be carried out in accordance with such approved procedures.

36. CONSTRUCTION WATER & POWER:

Construction Water and power shall be arranged by Contractor at his own cost.

37. PROGRESS REPORTS OF WORK EXECUTION:

During the various stages of manufacturing and erection of the critical equipments in the pursuance of the Contract, the Contractor shall at its own cost submit periodic progress reports as may be reasonably required by the Purchaser with such materials as charts, networks, photographs, test certificates, etc. Such progress reports shall be in the form and size as may be required by the Purchaser and shall be submitted in adequate number of copies to be notified by the Purchaser

The quantitative progress report of the works by reference to the project schedule in sufficient detail should permit the Purchaser to assess performance, plan witness dates and evaluate forecasts, including reports on key Sub-contracts (as applicable). Within 7 days of the submission of each such report and at such other times as the Purchaser may reasonably request, the Contractor and the Purchaser shall meet to discuss progress.. Weekly progress reports shall include the following sections:

a) Executive summary

b) Description of the work and services performed and goods and materials delivered and erected during the preceding week.

c) Necessary photographs of work done in the manufacturer's shop and erection site which shall be taken when and where indicated by the Purchaser. Photographs shall be approximately 100 x 125 mm in size including a margin of 5 mm side for fixing. Adequate numbers of photographs shall be submitted indicating various stages of manufacture and erection of critical items. Each photograph shall contain the date, the name of the Contractor and the title of the view taken.

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d) Updated project schedule showing progress to the end of the week (as percentages completed of the Contractor's activities broken down into significant elements of the works), and the current schedule of activities and the targets for the next week.

e) Identification of areas with foreseeable problems which in the opinion of the contractor may affect the project schedule.

f) Such other information and supporting documentation as the Purchaser may require satisfying himself about the timely manufacture, delivery and erection of equipment as per contract.

The Purchaser shall advise the Contractor about the number of copies of progress reports and, where relevant, photographs he has to submit each week together with the names and addresses of persons to whom they are to be sent. Purchaser will also advise the contractor regarding the format of the Monthly Progress report.

38. FREE ISSUES OF MATERIAL AND /OR EQUIPMENT:

The Purchaser issued Free Issue Material/Equipment to Vendor in order that Vendor may fulfill its obligations under the Agreement, shall remain the property of Purchaser and shall be clearly labelled as such by Vendor until delivery of the completed Goods in accordance with the terms of the Agreement. Risk of loss in respect of all such Free Issue Items shall pass to Vendor upon receipt of such items by Vendor and remain with Vendor until delivery of the completed Goods to Purchaser in accordance with the terms of the Agreement. Vendor shall maintain all such Free Issue Items in good condition and shall use them solely in connection with the requirements of the Agreement. Disposal of surplus items shall be in accordance with written instructions from Purchaser. The vendor shall submit an Indemnity Bond to this effect, as per the format.

39. PROTECTION OF PROPERTY:

The Contractor shall be responsible for any damage resulting from his operation. He shall also be responsible for protection of all persons including members of public; and employees of the PURCHASER & the PURCHASER; employees of the Contractors & Subcontractors; and all public and private property including structures, buildings, other plants and equipment and utilities either above or below the ground.

The Contractor shall ensure provision of necessary safety equipment such as barriers, sign boards, warning lights and alarms, etc to provide adequate protection to persons and property. The Contractor shall be responsible to give reasonable notice to the PURCHASER & the PURCHASER of public or private property and utilities when such property and utilities are likely to get damaged or injured during the performance of his works and shall make all necessary arrangements with such

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PURCHASER, related to removal and/or replacement or protection of such property and utilities.

40. VARIATIONS / AMENDEMENTS:

Any additional work beyond the scope enumerated in the work order above shall be carried out as per the instructions of Engineer-In Charge. The company shall not entertain any claim or increase in the Work Order value due to execution of such additional work if the same is not approved by Engineer in Charge, in written form.

41. ACCEPTANCE

Acceptance of this work order implies and includes acceptance of all terms and conditions enumerated in this work order in the technical specification and drawings made available to you consisting of general conditions, detailed scope of work, detailed technical specification & detailed equipment, drawing. Complete scope of work and the Contractor's and Company's contractual obligation are strictly limited to the terms set out in the work order. No amendments

to the concluded work order shall be binding unless agreed to in writing for such amendment by both the parties.

However, during the course of the execution of the work order, if at any time the Company's representative observe and form an opinion that the work under the work order is not being performed in accordance with the terms of this work order, the company reserves its right to cancel this work order forthwith without assigning any reason and the Company will recover all damages including losses occurred due to loss of time from the Contractor.

We request you to please sign the duplicate copy of this work order as a token of your acceptance and return to us.

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Annexure - I

The Contractor must submit the following to Engineer-In-Charge before commencement of work:

- a) An Electrical license. (If applicable)
- b) PF Code No. and all employees to have PF A/c No. under PF every Act, 1952.
- c) All employees to have a temporary or permanent ESI Card as per ESI Act.
- d) ESI Registration No. e) PAN No.
- f) Work Contract Tax/VAT Registration Number.
- g) Labor License under Contract Labor Act (R & A) Act 1970(All Engineer-in-charge responsible for execution of the job should obtain a copy of Labor License as per guidelines of HR department before start of the work by the contractor.)

The Contractor must follow:

- a) Third party Insurance Policy before start of work.
- b) To follow Minimum Wages Act prevailing in the state.
- c) Salary/ Wages to be distributed in presence of Company's representative not later than 7th of each month.
- d) To maintain Wage- cum - Attendance Register.
- e) To maintain First Aid Box at Site.
- f) Latest P.F. and E.S.I. challans pertaining to the period in which work was undertaken along with a certificate mentioning that P.F. and E.S.I. applicable to all the employees has been deducted and deposited with the Authorities within the time limits specified under the respective Acts.
- g) Workman Compensation Policy. (If applicable)
- h) Labor license before start of work. (If applicable)
- i) Group personnel accident insurance shall have coverage of Rs. 10 Lacs (Table C-Death + Permanent Total Disability + Partial permanent Disability due to external accidents).

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APPENDIX II

(To be executed on a Non-Judicial Stamp Paper of appropriate value)

FORMAT OF ADVANCE BANK GUARANTEE

This Guarantee made at _____ this [____] day of [____] 2016

1. WHEREAS M/s BSES Yamuna Power Limited, a Company incorporated under the provisions of Companies Act, 1956 having its Registered Office at Shaktikiran Building, Karkardooma, Delhi 110032, India hereinafter referred to as the " Owner ", (which expression shall unless repugnant to the context or meaning thereof include its successors, administrators, executors and assigns).

2. AND WHEREAS the Owner has entered into a contract for _____(Please specify the nature of contract here) vide Contract No. _____dated _____(hereinafter referred to as the "Contract") with M/s._____, (hereinafter referred to as "the Suppliers", which expression shall unless repugnant to the context or meaning thereof be deemed to mean and include each of their respective successors and assigns) for providing of the services on the terms and conditions as more particularly detailed therein.

3. AND WHEREAS in conformity with the provisions of clause _____ of conditions of Contract, the Suppliers has agreed to furnish a Bank Guarantee for an amount equivalent to the Advance Payment of Rs..... extended by the Owner to the Supplier for the faithful execution of the Contract.

4. AND WHEREAS the Suppliers have agreed to provide the Owner and the Owner has agreed to accept the Advance Bank Guarantee for _____ percent (____%) of the total Contract Value from [_____] (*pl. specify the name of Bank*) having its head/registered office at [_____] through its branch in _____(*pl. specify the name of Branch through which B.G is issued*) hereinafter referred to as "the Bank",

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(which expression shall unless it be repugnant to the context or meaning thereof be deemed to include its successors and permitted assigns).

5. NOW THEREFORE, in consideration inter alia of the Owner granting the Suppliers the Contract, the Bank hereby unconditionally and irrevocably guarantees and undertakes, on a written demand, to immediately pay to the Owner any amount so demanded (by way of one or more claims) not exceeding in the aggregate [Rs.].....)in words) without any demur, reservation, contest or protest and/or without reference to the Supplier and without the Owner needing to provide or show to the Bank ,grounds or reasons or give any justification for such demand for the sum/s demanded.
6. The decision of the Owner as to whether the Supplier has fulfilled its obligation or not towards set-off of Advance Payment extended by the Owner to the Supplier shall be final and binding on the Bank and the Supplier. The Bank acknowledges that any such demand by the Owner of the amounts payable by the Bank to the Owner shall be final, binding and conclusive evidence in respect of the amounts payable by the Supplier to the Owner. Any such demand made by the Owner on the Bank shall be conclusive and binding, notwithstanding any difference between the Owner and the Supplier or any dispute raised, invoked, threatened or pending before any court, tribunal, arbitrator or any other authority.
7. The Bank also agrees that the Owner at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor without proceeding against the Suppliers notwithstanding any other security or other guarantee that the Owner may have in relation to the Supplier's liabilities.
8. The Bank hereby waives the necessity for the Owner first demanding the aforesaid amounts or any part thereof from the Suppliers before making payment to the Owner and further also waives any right the Bank may have of first requiring the Owner to use its legal remedies against the Suppliers, before presenting any written demand to the Bank for payment under this Guarantee.

9. The Bank's obligations under this Guarantee shall not be reduced by reason of any partial performance of the Contract. The Bank's obligations shall not be reduced by any failure by the Owner to timely pay or perform any of its obligations under the Contract.
10. The Bank further unconditionally and unequivocally agrees with the Owner that the Owner shall be at liberty, without the Bank's consent and without affecting in any manner its rights and the Bank's obligation under this Guarantee, from time to time, to:
- (i) vary and/or modify any of the terms and conditions of the Contract;
 - (ii) forebear or enforce any of the rights exercisable by the Owner against the Suppliers under the terms and conditions of the Contract; or
- and the Bank shall not be relieved from its liability by reason of any such act or omission on the part of the Owner or any indulgence shown by the Owner to the Suppliers or any other reason whatsoever which under the law relating to sureties would, but for this provision, have the effect of relieving the Bank of its obligations under this Guarantee.
11. This Guarantee shall not be discharged by any change in the constitution or composition of the Suppliers, and this Guarantee shall not be affected or discharged by the liquidation, winding-up, bankruptcy, reorganisation, dissolution or insolvency of the Suppliers or any of them or any other circumstances whatsoever.
12. This Guarantee shall be in addition to and not in substitution or in derogation of any other security held by the Owner to secure the obligations of the Suppliers under the Contract.
13. NOTWITHSTANDING anything herein above contained, the liability of the BANK under this Guarantee shall be restricted to _____ (*insert an amount equal to ten percent (10%) of the Contract Value*) and this Guarantee shall be valid and enforceable and expire on _____ (*pl. specify date*) or unless a suit or action to enforce a claim under this Guarantee is filed against the Bank on or before the date of expiry.

14. On termination of this Guarantee, all rights under the said Guarantee shall be forfeited and the Bank shall be relieved and discharged from all liabilities hereunder.
15. The Bank undertakes not to revoke this Guarantee during its validity except with the prior written consent of the Owner and agrees that any change in the constitution of the Bank or the Suppliers shall not discharge our liability hereunder.
16. Owner may assign this Guarantee to any Person or body whether natural, incorporated or otherwise under intimation to the Bank. The Bank shall be discharged of its obligations hereunder by performance in accordance with the terms hereof to such assignee without verifying the validity / legality / enforceability of the assignment.
17. This Guarantee shall be governed by the laws of India. Any suit, action, or other proceeding arising out of, connected with, or related to this Guarantee or the subject matter hereof shall be subject to the exclusive jurisdiction of the courts of **Delhi**, India.

Dated this day of 2016 at

(Signature)

.....

(Name)

.....

(Designation with Bank Stamp)

Attorney as per

Power of Attorney No.....

Date.....

(To be executed on a Non-Judicial Stamp Paper of appropriate value)

FORMAT OF PERFORMANCE BANK GUARANTEE

This Guarantee made at _____ this [____] day of [____] 2016

1. WHEREAS M/s BSES Yamuna Power Limited, a Company incorporated under the provisions of Companies Act, 1956 having its Registered Office at Shaktikiran Building, Karkardooma, Delhi 110032, India hereinafter referred to as the " Owner ", (which expression shall unless repugnant to the context or meaning thereof include its successors, administrators, executors and assigns).
2. AND WHEREAS the Owner has entered into a contract for _____(Please specify the nature of contract here) vide Contract No. _____dated _____(hereinafter referred to as the "Contract") with M/s._____, (hereinafter referred to as "the Supplier", which expression shall unless repugnant to the context or meaning thereof be deemed to mean and include each of their respective successors and assigns) for providing services on the terms and conditions as more particularly detailed therein.
3. AND WHEREAS as per clause ____of conditions of Contract, the Suppliers are obliged to provide to the Owners an unconditional bank guarantee for an amount equivalent to ten percent (10%) of the total Contract Value for the timely completion and faithful and successful execution of the Contract from [_____] *pl. specify the name of Bank*) having its head/registered office at [_____] through its branch in _____(*pl. specify the name of Branch through which B.G is issued*) hereinafter referred to as "the Bank", (which expression shall unless it be repugnant to the context or meaning thereof be deemed to include its successors and permitted assigns).
4. NOW THEREFORE, in consideration inter alia of the Owner granting the Suppliers the Contract, the Bank hereby unconditionally and irrevocably guarantees and undertakes, on a written demand, to immediately pay to the Owner any amount so demanded (by

way of one or more claims) not exceeding in the aggregate [Rs.].....(*in words*) without any demur, reservation, contest or protest and/or without reference to the Supplier and without the Owner needing to provide or show to the Bank ,grounds or reasons or give any justification for such demand for the sum/s demanded.

5. The decision of the Owner to invoke this Guarantee and as to whether the Supplier has not performed its obligations under the Contract shall be binding on the Bank. The Bank acknowledges that any such demand by the Owner of the amounts payable by the Bank to the Owner shall be final, binding and conclusive evidence in respect of the amounts payable by the Supplier to the Owner. Any such demand made by the Owner on the Bank shall be conclusive and binding, notwithstanding any difference between the Owner and the Supplier or any dispute raised, invoked, threatened or pending before any court, tribunal, arbitrator or any other authority.
6. The Bank also agrees that the Owner at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor without proceeding against the Suppliers notwithstanding any other security or other guarantee that the Owner may have in relation to the Supplier's liabilities.
7. The Bank hereby waives the necessity for the Owner first demanding the aforesaid amounts or any part thereof from the Suppliers before making payment to the Owner and further also waives any right the Bank may have of first requiring the Owner to use its legal remedies against the Suppliers, before presenting any written demand to the Bank for payment under this Guarantee.
8. The Bank's obligations under this Guarantee shall not be reduced by reason of any partial performance of the Contract. The Bank's obligations shall not be reduced by any failure by the Owner to timely pay or perform any of its obligations under the Contract.
9. The Bank further unconditionally and unequivocally agrees with the Owner that the Owner shall be at liberty, without the Bank's consent and without affecting in any manner its rights and the Bank's obligation under this Guarantee, from time to time, to:

- (i) vary and/or modify any of the terms and conditions of the Contract;
- (ii) Forebear or enforce any of the rights exercisable by the Owner against the Suppliers under the terms and conditions of the Contract; or
- (iii) Extend and/or postpone the time for performance of the obligations of the Suppliers under the Contract;

and the Bank shall not be relieved from its liability by reason of any such act or omission on the part of the Owner or any indulgence shown by the Owner to the Suppliers or any other reason whatsoever which under the law relating to sureties would, but for this provision, have the effect of relieving the Bank of its obligations under this Guarantee.

- 10. This Guarantee shall be a continuing bank guarantee and shall not be discharged by any change in the constitution or composition of the Suppliers, and this Guarantee shall not be affected or discharged by the liquidation, winding-up, bankruptcy, reorganisation, dissolution or insolvency of the Suppliers or any of them or any other circumstances whatsoever.
- 11. This Guarantee shall be in addition to and not in substitution or in derogation of any other security held by the Owner to secure the performance of the obligations of the Suppliers under the Contract.
- 12. NOTWITHSTANDING anything herein above contained, the liability of the BANK under this Guarantee shall be restricted to _____(*insert an amount equal to ten percent (10%) of the Contract Value*) and this Guarantee shall be valid and enforceable and expire on _____(*pl. specify date*) or unless a suit or action to enforce a claim under this Guarantee is filed against the Bank on or before the date of expiry.
- 13. On termination of this Guarantee, all rights under the said Guarantee shall be forfeited and the Bank shall be relieved and discharged from all liabilities hereunder.

14. The Bank undertakes not to revoke this Guarantee during its validity except with the prior written consent of the Owner and agrees that any change in the constitution of the Bank or the Suppliers shall not discharge our liability hereunder.
15. Owner may assign this Guarantee to any Person or body whether natural, incorporated or otherwise under intimation to the Bank. The Bank shall be discharged of its obligations hereunder by performance in accordance with the terms hereof to such assignee without verifying the validity / legality / enforceability of the assignment.
16. This Guarantee shall be governed by the laws of India. Any suit, action, or other proceeding arising out of, connected with, or related to this Guarantee or the subject matter hereof shall be subject to the exclusive jurisdiction of the courts of **Delhi**, India.

Dated this day of 2016 at

(Signature)

.....

(Name)

.....

(Designation with Bank Stamp)

Attorney as per

Power of Attorney No.....

Date.....

BENEFICIARY'S BANK DETAIL WITH IFSC CODE:

1. Name of the Bank: Axis Bank Limited
2. Branch Name & Full Address: `C-58, Basement & Ground Floor, Preet Vihar, Main Vikas Marg, New Delhi 110092
3. Branch Code: 055
4. Bank Account No: 911020005246567
5. IFSC Code: UTIB0000055

FORMAT OF WARRANTY/GUARANTEE CERTIFICATE

BSES YAMUNA POWER LIMITED Shaktikiran Building, Karkardooma, Delhi -110032.

Ref. Purchase Order No. :

Dear Sir,

We hereby confirm that the.....dispatched to BSES YAMUNA POWER LTD vide invoice no..... DT.....is exactly of the same nature and description as per above mentioned Purchase Order.

We further confirm that we will replace/repair our.....free of cost If found any manufacturing defect during.....months from the date of dispatch of material or.....months from the data of commissioning whichever is earlier.

Vendors Name & Signature

FORMAT OF WARRANTY / DEFECT LIABILITY PERIOD –SERVICE

Performance requirements of the works completed is as per detailed specifications and standards specified and to be adhered to strictly. In-case of deficiency, the same is to be rectified / redone to meet the specifications by the contractor within stipulated schedule or any extension thereof. The Contractor shall be liable to rectify all defects except those arising out of normal wear and tear, in the works done by the Contractor under this contract, or from any act or omission of the contractors for a period of 24 months will depend on individual contract period package to package from the date of Handing over the works to the Employer / Owner.

Vendors Name & Signature

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FORMAT OF NO DEMAND CERTIFICATE

NO DEMAND CERTIFICATE BY CONTRACTOR
(To be issued on letterhead of Contractor)

To ,

BSES YAMUNA POWER LIMITED,
Shaktikiran Building, Karkardooma,
Delhi -110032.

Name of the Project:

Contract No.:

Date of Contract:

Name of the Contractor:

We, M/s _____ (Contractor) do
hereby acknowledge and confirm that we have claimed Rs. _____ (Rs.
_____) towards

full and final settlement of our claims from BSES Yamuna Power Limited, in respect of the aforesaid
WO/PO/Contract No.: #####. Dated. ####. including all amendments, if any, to the said Contract,
to our entire satisfaction and we further confirm that we have no claim whatsoever pending with BSES
Yamuna Power Limited under or in respect of the said Contract.

Notwithstanding any protest, note or objection recorded or raised by us in any correspondence,
documents, measurement books and / or final bills etc.

(a) we confirm that BSES Yamuna Power Limited stands fully discharged of all its obligations,

(b) we shall make no claim of any nature on BSES Yamuna Power Limited or any of its affiliates or
personnel, and

(c) we waive all our rights to lodge any claim or protest in future, in respect of the said Contract.

We have paid in full all applicable duties, levies, taxes and statutory and other amounts payable by us
in connection with the above-mentioned Contract and amounts payable to or in relation to third parties
engaged by us including our contractors, suppliers, employees and labour. No payment in this regard
is pending or unpaid and we have no (and shall have no) claim against BSES Yamuna Power Limited
in this regard.

No refund has been received/ is envisaged to be received or reasonably believed to be receivable on
account of taxes, duties or any other payment made by us in respect of the Contract. In case any
refund corresponding to any amount paid or reimbursed by BSES Yamuna Power Limited is received
in the future, the same will be passed on to BSES Yamuna Power Limited promptly and without any
demand from them in this regard.

We are issuing this "NO DEMAND CERTIFICATE" in favor of BSES Yamuna Power Limited with full
knowledge of its contents and with our free consent without any influence, misrepresentation, coercion
etc.

Date:

Place:

Signature:

Name:

Designation:

(Company Seal)

FORMAT FOR LETTER OF INDEMNITY

Format for Letter of Indemnity

(Notes: Preferably shall be obtained on Stamp paper of appropriate value as applicable at the place of execution, if not, then at least on the letterhead of the Contractor)

Place: _____

Date: _____

To,

BSES Yamuna Power Limited, Shaktikiran Building, Karkardooma, Delhi -110032.

Dear Sirs,

WO/PO/Contract No. _____ Dated _/ _/ _

For _____

Settlement of Dues

In consideration of your awarding the subject Work Order/Purchase Order/Contract to us and in further consideration of your having agreed to pay our final bill towards settlement of the dues in respect of the subject Work Order/Purchase Order/Contract, inter alia, on our assurances and representations that :

(a) We have paid in full all amounts payable by us including but not limited to duties, levies, taxes, cess, octroi, royalties, statutory payments, amounts payable to or in relation to third parties engaged by us including our contractors, suppliers, employees and labour, and

(b) we have fully complied with all requirements under applicable laws in connection with the subject Purchase Order/Work Order/Contract,

We _____,

unconditionally and irrevocably agree and undertake, to pay and/or settle entirely at our own cost and indemnify, defend and hold harmless you, your affiliates and your/your affiliates' personnel, directors and representatives, (hereinafter collectively referred to as "Indemnified Parties") from and against any and all liabilities, judgments, damages, losses, claims, costs and expenses, claimed, suffered or incurred or, likely to be claimed, suffered or incurred at any time by or against the Indemnified Parties or any of them as a result of, or arising out of, or in any way related to any failure or delay in payment of any of the amounts or compliances by us as aforesaid for any reason whatsoever.

Any notice(s) or communication(s) by you shall be sufficient proof that the Indemnified Parties have suffered or incurred loss, damages, liabilities etc. as aforesaid and we shall upon receipt of such notice(s) or communication(s) immediately, without any delay or demur or contest, make payment to you of the entire amount demanded under the said notice(s) or communication(s).

This letter of indemnity shall be in addition to and not in derogation of any other indemnity/ guarantee and/or security which we may have executed in your favor or your rights and entitlements under the contract.

This letter shall be governed by and construed and interpreted to accordance with the laws of India, and shall be subject to the exclusive jurisdiction of the courts of law at Mumbai.

Yours faithfully,

For M/s _____

Authorized

Signatory

PRICE BID FORMATS (SUPPLY & SERVICES)

OF

**DESIGN, ENGINEERING, MANUFACTURING,
SUPPLY, LAYING, JOINTING, TESTING AND
COMMISSIONING OF 33 & 66KV CABLES WITH
REQUIRED ACCESSORIES & DISMANTLING AS PER
THE SCOPE OF WORK, FOR BYPL, DELHI (INDIA)**

ON

TURNKEY BASIS

IN

BSES YAMUNA POWER LTD.

NIT NO CMC/BY/19-20/RB/SV/60 REV 01

Due Date for Submission: 28.01.2020, 15:00 HRS

**BSES YAMUNA POWER LIMITED (BYPL)
SHAKTI KIRAN BUILDING, KARKARDOOMA,
DELHI-110032
CIN: U40109DL2001PLC111525
TEL: 011 3999 7111
WEBSITE: www.bsesdelhi.com**

GRAND SUMMARY OF THE QUOTED PACKAGE(S)

ALL PRICES IN INR (₹)

Package Name/Description	Supply Prices-Landed (A)	Erection, Testing and commissioning prices - Landed (B)
SCHEME NO: EE19SH1029 PROJECT – DELHI METRO PHASE IV (MAUJPUR – MUKANDPUR CORRIDOR OF DMRC) DESIGN, ENGINEERING, MANUFACTURING, SUPPLY, LAYING, JOINTING, TESTING AND COMMISSIONING OF 33 & 66KV CABLES WITH REQUIRED ACCESSORIES & DISMANTLING AS PER THE SCOPE OF WORK, FOR BYPL, DELHI (INDIA)		
Grand Total [A+B]		
Grand Total (In words)		

We declare that the following are our quoted prices in INR for the entire packages.

Date: _____ Bidders Name: _____

Place: _____ Bidders Address: _____

Signature: Designation:

Printed Name: Common Seal:

Note:

- 1) All prices for the packages quoted are inclusive of taxes and duties, GST and freight etc. Bidder shall include & indicate any others taxes under the applicable law(s) for supply and services to be performed in the purchaser's country.
- 2) Bidder shall include & indicate any others taxes under the applicable law(s) for supply and services to be performed in the purchaser's country.
- 3) The bidder shall, at its own, handle all imported equipment's and handle all formalities for custom clearances, port charges, etc if any

PRICE BID (CMC/BY/19-20/RB/SV/60)	Page 2 of 18	33 & 66 KV CABLE WORKS ON TURNKEY BASIS
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- 4) All prices for the packages quoted are against the scope of work under the contract shall be executed strictly as per the NIT conditions and the technical specification.
- 5) Quoted prices shall be as per the Bill of quantities (BOQ) as attached. However Any items/material/machinery, not specifically mentioned In BOQ as well as in the technical specifications but required for successful completeness, Erection, Testing and Commissioning of the package awarded shall be deemed to be in the scope of the bidder.
- 6) Insurance as per the clause defined in SCC and other contract conditions, is included in the quoted prices. However Bidder shall indicate the value of the insurance taken, separately.
- 7) Operation of the Package awarded for the period of Six (6) Months is included and bidders shall quote separately for the same as per the details specified.
- 8) Kindly refer the relevant layout drawing of existing foundations in Annexure of tender document. Site visit is advisable prior to submission of quotation.

PRICE FORMAT – SUPPLY (A) (Kindly refer detailed package wise SCOPE OF SUPPLY attached as Volume II for Indicative Description of Goods/BOM, BOQ)

S. No.	DESCRIPTION OF GOODS	HSN CODE (8 Digit Mandatory)	UoM	QTY (A)	UNIT BASIC PRICE (₹) (B)	UNIT GST & CESS AS APPLICABLE (CGST & SGST/UTGST or IGST) (₹) (C)		UNIT LANDED COST (₹) (D = B+C)	TOTAL LANDED COST (₹) (E = DXA)
						%	AMT		
1	Cable 66 kV 1Cx630 sq mm (3 Runs. for each ckt)		Km	25.2					
2	Cable 66 kV 1Cx1000 sq mm (3 Runs for each ckt)		Km	24					
3	Cable 66 kV 3Cx300 sq mm (2 Runs for each ckt)		Km	4.4					
4	Cable 33 kV 3Cx400 sq mm (2 Runs for each ckt)		Km	3.6					
5	Cable straight through joint kit Suitable for 66 kV 1Cx630 sq mm cable(Make-Raychem/3M)		No's	84					
6	Cable straight through joint kit Suitable for 66 kV 1Cx1000 sq mm cable(Make-Raychem/3M)		No's	42					
7	Cable straight through joint kit Suitable for 66 kV 3Cx300 sq mm cable(Make-Raychem/3M)		No's	48					
8	Cable straight through joint kit Suitable for 33 kV 3Cx400 sq mm cable(Make-Raychem/3M)		No's	44					
9	Cable straight through transition joint kit Suitable for 33 kV 3Cx400 sq mm XLPE cable to 33 KV 3Cx300 sq mm XLPE cable (Make-		No's	2					

PRICE BID
(CMC/BY/19-20/RB/SV/60)

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33 & 66 KV CABLE WORKS ON
TURNKEY BASIS

S. No.	DESCRIPTION OF GOODS	HSN CODE (8 Digit Mandatory)	UoM	QTY (A)	UNIT BASIC PRICE (₹) (B)	UNIT GST & CESS AS APPLICABLE (CGST & SGST/UTGST or IGST) (₹) (C)		UNIT LANDED COST (₹) (D = B+C)	TOTAL LANDED COST (₹) (E = DXA)
	Raychem/3M)								
10	Cable straight through transition joint kit Suitable for 66 kV 1Cx1000 sq mm XLPE cable to 66 KV 1Cx630 sq mm XLPE cable (Make-Raychem/3M)		No's	6					
11	Cable End Termination kit outdoor Suitable for 66 kV 1Cx630 sq mm cable (Make-Raychem/3M)		No's	3					
12	Cable End Termination kit outdoor Suitable for 66 kV 1Cx1000 sq mm cable (Make-Raychem/3M)		No's	6					
13	Cable End Termination kit outdoor Suitable for 66 kV 3Cx300 sq mm cable (Make-Raychem/3M)		No's	4					
14	Cable End Termination kit outdoor Suitable for 33 kV 3Cx400 sq mm cable (Make-Raychem/3M)		No's	6					
15	OFC cable 24 F Single Mode G652 D (2 runs) to be laid with 66 kV 3Cx300 sq mm Wazirabad to Bhagirathi circuit 1 & 2		Km	2.2					
16	40 mm PLB HDPE Duct		Km	2.2					
17	OFC Cable Splice Closure		Nos	14					

S. No.	DESCRIPTION OF GOODS	HSN CODE (8 Digit Mandatory)	UoM	QTY (A)	UNIT BASIC PRICE (₹) (B)	UNIT GST & CESS AS APPLICABLE (CGST & SGST/UTGST or IGST) (₹) (C)		UNIT LANDED COST (₹) (D = B+C)	TOTAL LANDED COST (₹) (E = DXA)
18	Precast RCC (1:2:4) cable cover 600x550x50 mm		No's	2500					
19	HDPE PIPE 200 MM Dia PN6 PE 80		Km	11					
20	HDPE PIPE 200 MM Dia PN4 PE 80		Km	23					
21	HDPE PIPE 225 MM Dia PN6 PE 80 for 66 kV 3Cx300 sq mm cable		Km	4.3					
22	Weather and acid resistant PVC warning tape of 150mm width 300 micron thick Yellow colour with desired Red/Black lettering		Km	11					
23	Route indicating stone at every 50 meter circuit length		No's	72					
24	Joint indicating stones at every cable joint location		No's	36					
25	Galvanized Channel, Angle, Beam and other Structural steel with hardware for Gantry structures including cable support Structure		MT	2					
26	Fine Sand		Cum	243					
27	End Cap for cable 66 kV 1Cx630 sq mm		No's	50					
28	End Cap for cable 66 kV 1Cx1000 sq mm		No's	50					
29	End Cap for cable 66 kV 3Cx300 sq mm		No's	10					
30	End Cap for cable 33 kV 3Cx400 sq mm		No's	10					

PRICE BID
(CMC/BY/19-20/RB/SV/60)

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33 & 66 KV CABLE WORKS ON
TURNKEY BASIS

S. No.	DESCRIPTION OF GOODS	HSN CODE (8 Digit Mandatory)	UoM	QTY (A)	UNIT BASIC PRICE (₹) (B)	UNIT GST & CESS AS APPLICABLE (CGST & SGST/UTGST or IGST) (₹) (C)		UNIT LANDED COST (₹) (D = B+C)	TOTAL LANDED COST (₹) (E = DXA)
31	Cable armour- earth link box single phase without SVL		No's	19					
32	Cable armour- earth link box single phase with SVL		No's	6					
33	Cable cross bonding Link Box - Three Phase with SVL		No's	16					
34	Cable cross bonding Link Box - Three Phase without SVL		No's	2					
35	Copper bonded Earthing electrodes 25 mm 3 meters for earthing		No's	16					
36	RCC Chamber for Three Phase link Box		No's	16					
37	Sheath Bonding Cable XLPE insulated 3.3 kV 1Cx300 Sq mm copper		Meter	200					
38	Trefoil Cleat with hardwares for mounting of single core 66 kV Cables on cable support structure in RCC trench		No's	800					
39	Single cable cleat with hardwares for mounting of Three core 66 & 33 kV Cables on cable support structure in RCC trench		No's	150					
40	HDPE cleat with hardware's suitable for 66 kV & 33 kV cable		No's	19					
41	Support insulators for mounting of cable on support structure		No's	19					
42	Danger Plates		No's	17					

PRICE BID
(CMC/BY/19-20/RB/SV/60)

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33 & 66 KV CABLE WORKS ON
TURNKEY BASIS

S. No.	DESCRIPTION OF GOODS	HSN CODE (8 Digit Mandatory)	UoM	QTY (A)	UNIT BASIC PRICE (₹) (B)	UNIT GST & CESS AS APPLICABLE (CGST & SGST/UTGST or IGST) (₹) (C)		UNIT LANDED COST (₹) (D = B+C)	TOTAL LANDED COST (₹) (E = DXA)
43	Circuit Name Plate		No's	17					
44	Anti Climbing device		No's	1					
45	50X6 Sq mm GI Earthing strip		MT	4					
46	Aluminum Cable Identification tag with nylon string		No's	540					
47	Safety barricading PVC tape		Meter	1					
48	Safety barricading cone		No's	1					
49	Galvanized Nuts and Bolts		Kg	1					
50	Coarse sand for PCC & RCC		Cum	1					
51	Burnt clay Brick - First class		No's	1					
52	Cement Bags 50 kg		No's	1					
53	Reinforcement steel bars		MT	1					
54	Construction Aggregate		Cum	1					
55	RFID based Electronic buried type Cable Route marker for cable joints and turns having facility to feed the joint/turn related information		No's	100					
56	Receiver unit for electronic cable route marker cum		No's	1					

S. No.	DESCRIPTION OF GOODS	HSN CODE (8 Digit Mandatory)	UoM	QTY (A)	UNIT BASIC PRICE (₹) (B)	UNIT GST & CESS AS APPLICABLE (CGST & SGST/UTGST or IGST) (₹) (C)		UNIT LANDED COST (₹) (D = B+C)	TOTAL LANDED COST (₹) (E = DXA)
	cable route tracer suitable with offline as well as online cable route tracing facility.								
GRAND TOTAL LANDED COST									
In words									
Note: All quantities mentioned above are estimated quantities. Actual quantities may vary as per actual site requirement.									

PRICE FORMAT – E/T/C (B) (Kindly refer detailed package wise SCOPE OF WORK attached as Volume II for Indicative Description of Services/BOM, BOQ)

S. No.	DESCRIPTION OF SERVICES	SAC CODE	UoM	QTY (A)	UNIT BASIC PRICE (₹) (B)	UNIT GST & CESS AS APPLICABLE (CGST & SGST/UTGST or IGST) (₹) (C)		UNIT LANDED COST (₹) (D = B+C)	TOTAL LANDED COST (₹) (E = DXA)
						%	AMT		
1	Surveying of cable Route, Detailed Site Plan & Profile using Ground penetration Radar System, Excavation of trial pits as per field requirement, preparation of route drawing with location of joint chambers position and finalizing the cable route in consultation with BSES Representative		Km	11					
2	Dismantling of the existing 66KV D/C OH Line and Towers, (Approx Line length of 2.0KM's) and handing over the dismantled Material to BYPL Stores		Lot	1					
3	Digging of cable trench as per specification and drawings. Rate is inclusive of digging and backfilling for Ordinary Bituminous/C.C.Road (including dewatering if any)		Cum	2809					
4	Digging of cable trench as per specification and drawings. Rate is inclusive of digging and backfilling for Dense Carpeted bituminous Road (including dewatering if any)		Cum	1873					
5	Digging of cable trench as per specification and drawings. Rate is inclusive of digging and backfilling for		Cum	1873					

PRICE BID
(CMC/BY/19-20/RB/SV/60)

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33 & 66 KV CABLE WORKS ON
TURNKEY BASIS

S. No.	DESCRIPTION OF SERVICES	SAC CODE	UoM	QTY (A)	UNIT BASIC PRICE (₹) (B)	UNIT GST & CESS AS APPLICABLE (CGST & SGST/UTGST or IGST) (₹) (C)		UNIT LANDED COST (₹) (D = B+C)	TOTAL LANDED COST (₹) (E = DXA)
	Footpath/tile/Rajasthani Stone/Brick work (including dewatering if any)								
6	Digging of cable trench as per specification and drawings. Rate is inclusive of digging and backfilling for Hard Rocky Soil (including dewatering if any)		Cum	1405					
7	Laying of XLPE cables in the excavated trench		Km	15					
8	Laying of XLPE cable in in Open Excavated Trench HDPE Pipe PN4 PE80		Km	11.4					
9	Laying of cable in trenchless ducts including laying of cable and HDPE pipe using HDD machine including laying of 200 mm dia HDPE pipe PN4 PE 80 Class		Km	11.4					
10	Laying of cable in trenchless ducts including laying of cable and HDPE pipe using HDD machine including laying of 200 mm dia HDPE pipe PN6 PE 80 Class		Km	11					
11	Laying of 66 kV 3Cx300 sq mm cable in trenchless ducts including laying of HDPE pipe using HDD machine; HDPE Pipe Dia - 225 mm PN6 PE 80		Km	4.3					
12	Laying of Cables in RCC trench on cable support structure		Km	4.3					
13	Continuous steel Barricade for all Excavated areas, till the work is completed.		Km	5					

PRICE BID
(CMC/BY/19-20/RB/SV/60)

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33 & 66 KV CABLE WORKS ON
TURNKEY BASIS

S. No.	DESCRIPTION OF SERVICES	SAC CODE	UoM	QTY (A)	UNIT BASIC PRICE (₹) (B)	UNIT GST & CESS AS APPLICABLE (CGST & SGST/UTGST or IGST) (₹) (C)		UNIT LANDED COST (₹) (D = B+C)	TOTAL LANDED COST (₹) (E = DXA)
14	Fixing of Aluminum Cable identification tags with Nylon string at every 30 Mtrs cable length		No's	540					
15	Installation of straight through joints for 66 kv 1Cx630 sq mm cables by jointing kit OEM authorized jointer		No's	84					
16	Installation of straight through joints for 66 kv 1Cx1000 sq mm cables by jointing kit OEM authorized jointer		No's	42					
17	Installation of straight through joints for 66 kv 3Cx300 sq mm cables by jointing kit OEM authorized jointer		No's	48					
18	Installation of straight through joints for 33 kv 3Cx400 sq mm cables by jointing kit OEM authorized jointer		No's	44					
19	Installation of straight through transition joint kit Suitable for 33 kV 3Cx400 sq mm XLPE cable to 33 KV 3Cx300 sq mm XLPE cable (Make- Raychem/3M)		No's	2					
20	Installation of straight through transition joint kit Suitable for 66 kV 1Cx1000 sq mm XLPE cable to 66 KV 1Cx630 sq mm XLPE cable (Make- Raychem/3M)		No's	6					
21	Installation of End Termination for 66 kv 1Cx630 sq mm cables by jointing kit OEM authorized jointer		No's	3					
22	Installation of End Termination for 66 kv 1Cx1000 sq mm cables by jointing kit OEM		No's	6					

PRICE BID
(CMC/BY/19-20/RB/SV/60)

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33 & 66 KV CABLE WORKS ON
TURNKEY BASIS

S. No.	DESCRIPTION OF SERVICES	SAC CODE	UoM	QTY (A)	UNIT BASIC PRICE (₹) (B)	UNIT GST & CESS AS APPLICABLE (CGST & SGST/UTGST or IGST) (₹) (C)	UNIT LANDED COST (₹) (D = B+C)	TOTAL LANDED COST (₹) (E = DXA)
	authorized jointer							
23	Installation of End Termination for 66 kv 3Cx300 sq mm cables by jointing kit OEM authorized jointer		No's	4				
24	Installation of End Termination for 33 kv 3Cx400 sq mm cables by jointing kit OEM authorized jointer		No's	6				
25	Digging of joint pit suitable for 33/66 cable joint box and covering the joint box with sand and providing protection for Ordinary bituminous road/C.C. Road		No's	90				
26	Digging of joint pit suitable for 33/66 cable joint box and covering the joint box with sand and providing protection for Dense carpeted bituminous road.		No's	68				
27	Digging of joint pit suitable for 33/66 cable joint box and covering the joint box with sand and providing protection for Footpath/ tile/ Rajasthani Stone / Brick Works		No's	57				
28	Digging of joint pit suitable for 33/66 cable joint box and covering the joint box with sand and providing protection for Hard Rocky Soil.		No's	11				
29	Spreading of sand forming cushion and cover around the cable		Cum	243				
30	Disposal of debris/surplus malba including Loading /		Cum	267				

PRICE BID
(CMC/BY/19-20/RB/SV/60)

Page **13** of **18**

33 & 66 KV CABLE WORKS ON
TURNKEY BASIS

S. No.	DESCRIPTION OF SERVICES	SAC CODE	UoM	QTY (A)	UNIT BASIC PRICE (₹) (B)	UNIT GST & CESS AS APPLICABLE (CGST & SGST/UTGST or IGST) (₹) (C)	UNIT LANDED COST (₹) (D = B+C)	TOTAL LANDED COST (₹) (E = DXA)
	Unloading							
31	Digging of test pits of required size(not less than 1/2 Meter Wide at site for identification of cable route)		Cum	30				
32	Laying of OFC cable including laying of PLB HDPE duct		Km	2.2				
33	Installation of OFC cable splice close		No's	14				
34	Watch and ward of complete circuit till project handover		Lot	1				
35	Installation of Precast RCC Cable cover		No's	2500				
36	Installation of Route and Joint indicating stone marked with "BYPL 33/66 KV Cable Helpline No-91-11-41247376"		No's	108				
37	Laying of PVC warning tape		Km	11				
38	Fabrication and installation of galvanized Channel, Angle, Beam and other Structural steel including nuts & bolts for all Gantry structures including cable support Structure, drain crossing structure etc.		MT	2				
39	Partial discharge test on complete cable length at site		Lot	1				
40	VLF High voltage test on complete cable length as per relevant IEC/IEEE		Lot	1				
41	Testing of optical fiber cable after installation and jointing		Lot	1				

S. No.	DESCRIPTION OF SERVICES	SAC CODE	UoM	QTY (A)	UNIT BASIC PRICE (₹) (B)	UNIT GST & CESS AS APPLICABLE (CGST & SGST/UTGST or IGST) (₹) (C)		UNIT LANDED COST (₹) (D = B+C)	TOTAL LANDED COST (₹) (E = DXA)
42	Termination of optical fiber cable in already installed fiber optic distribution box		No's	2					
43	Installation of Cable armour- earth link box single phase without SVL including installation of sheath bonding cable & earthing		No's	19					
44	Installation of Cable armour- earth link box single phase with SVL including installation of sheath bonding cable & earthing		No's	6					
45	Installation of Cable cross bonding Link Box - Three Phase with SVL including installation of sheath bonding cable & earthing		No's	16					
46	Installation of Cable cross bonding Link Box - Three Phase without SVL including installation of sheath bonding cable & earthing		No's	2					
47	Installation of RCC Chamber for Three Phase link Box		No's	16					
48	Installation of Trefoil Cleat with hardware for mounting of single core 66 kV Cables on cable support structure in RCC trench		No's	800					
49	Installation of circular cable cleat with hardware for mounting of Three core 66, 33 & 11 kV Cables on cable support structure in RCC trench		No's	150					

S. No.	DESCRIPTION OF SERVICES	SAC CODE	UoM	QTY (A)	UNIT BASIC PRICE (₹) (B)	UNIT GST & CESS AS APPLICABLE (CGST & SGST/UTGST or IGST) (₹) (C)		UNIT LANDED COST (₹) (D = B+C)	TOTAL LANDED COST (₹) (E = DXA)
50	Installation, mounting and fixing of 33/66 kV cable with termination on mounting structure/tower and fixing it with suitable HDPE cleats		No's	19					
51	Installation of support insulators on cable mounting structure with misc. hardware's.		No's	19					
52	Fixing of danger plate on poles including fabrication of clamps etc		No's	17					
53	Fixing of circuit Name plate including fabrication of clamps etc		No's	17					
54	Fixing of anti climbing device on cables mounting structures including fabrication of clamps etc		No's	1					
55	Transportation of empty 33/66 kV cable drums from site to BSES store		No's	93					
56	Laying of GI earth connecting strip of 50x6 sq mm size including required welding, painting on joints etc		MT	4					
57	Submission of actual laid drawing of cable circuits including GPS coordinates of all joint in cables circuits, every 30 meter circuit length, Every turn/curve, Every road crossing (both ends)		Lot	1					
58	Cable Phasing work, Cable Phase Sequence (R,Y,B) Marking, Cable 1&2 Marking, and final connection as per		Lot	1					

PRICE BID
(CMC/BY/19-20/RB/SV/60)

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33 & 66 KV CABLE WORKS ON
TURNKEY BASIS

S. No.	DESCRIPTION OF SERVICES	SAC CODE	UoM	QTY (A)	UNIT BASIC PRICE (₹) (B)	UNIT GST & CESS AS APPLICABLE (CGST & SGST/UTGST or IGST) (₹) (C)	UNIT LANDED COST (₹) (D = B+C)	TOTAL LANDED COST (₹) (E = DXA)
	Phase Sequence.							
59	Masonry Brick work		Cum	1				
60	Providing and laying in position cement concrete 1:1.5:3 (1 cement :1.5 coarse sand : 3 graded stone aggregate) excluding the cost of centering, shuttering, finishing and enforcement		Cum	1				
61	Providing and laying in position cement concrete 1:2:4 (1 cement :2 coarse sand : 4 graded stone aggregate) excluding the cost of centering, shuttering, finishing and enforcement		Cum	1				
62	Providing and laying in position cement concrete 1:4:8 (1 cement :4 coarse sand : 8 graded stone aggregate) excluding the cost of centering, shuttering, finishing and enforcement		Cum	1				
63	Centering, shuttering including shuttering propping etc and removal of shuttering		Cum	1				
64	Fabrication of reinforcement for RCC work including straightening, cutting, bending, placing in position and binding all complete thermo mechanically treated bars.		Cum	1				
65	Installation of Brick as Cable Separator		No's	1				

S. No.	DESCRIPTION OF SERVICES	SAC CODE	UoM	QTY (A)	UNIT BASIC PRICE (₹) (B)	UNIT GST & CESS AS APPLICABLE (CGST & SGST/UTGST or IGST) (₹) (C)	UNIT LANDED COST (₹) (D = B+C)	TOTAL LANDED COST (₹) (E = DXA)
GRAND TOTAL LANDED COST								
In words								
Note: All quantities mentioned above are estimated quantities. Actual quantities may vary as per actual site requirement. All the Testing's shall be witnessed by BYPL. All the Site Test Reports should be submitted, before charging of the Cables.								

VOLUME – II

SCOPE OF TURNKEY EXECUTION

FOR

**DESIGN, ENGINEERING, MANUFACTURING,
SUPPLY, LAYING, JOINTING, TESTING AND
COMMISSIONING OF 33 & 66KV CABLES WITH
REQUIRED ACCESSORIES & DISMANTLING AS PER
THE SCOPE OF WORK, FOR BYPL, DELHI (INDIA)**

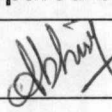
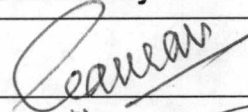
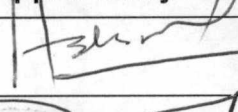
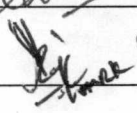
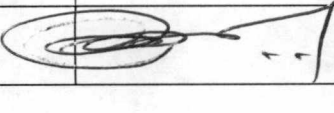
NIT NO CMC/BY/19-20/RB/SV/60 REV 01

Due Date for Submission: 28.01.2020, 15:00 HRS

**BSES YAMUNA POWER LIMITED (BYPL)
SHAKTI KIRAN BUILDING, KARKARDOOMA,
DELHI-110032
CIN: U40109DL2001PLC111525
TEL: 011 3999 7111
WEBSITE: www.bsesdelhi.com**

REVISED SCOPE OF WORK
FOR
SUPPLY, LAYING, JOINTING, TESTING AND COMMISSIONING
OF
66 KV & 33 KV XLPE CABLE
FOR PROJECT – DELHI METRO PHASE IV
(MAUJPUR – MUKANDPUR CORRIDOR OF DMRC)

Against NIT – CMC/BY/19-20/RB/SV/60

Department	Prepared by	Reviewed by	Approved by
CES	 26/02/20		
P&E			

CONTENTS

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1. SCOPE

Scope covers supply, laying, testing and commissioning of following circuits of 33 KV & 66 KV XLPE insulated underground cables:

SI No	Circuit Detail	Cable Type	Each circuit total length (Km)	Each ckt length to be shifted (Km)
1	BYPL Yamuna Vihar to East of Loni Grid Ckt 1 & 2	66 kV 1Cx630	3.3	1.5
2	BYPL Bhagirathi to Ghonda Grid Ckt 1 & 2	66 kV 1Cx1000	2.51	1
3	DTL Wazirabad to Yamuna Vihar Grid Ckt 1 & 2	66 kV 1Cx1000	3.65	2.5
4	DTL Wazirabad to Sonia Vihar Grid Ckt 1 & 2	66 kV 1Cx1000	1.65	0.5
5	DTL Wazirabad to Ghonda Grid Ckt 1 & 2	66 kV 1Cx630	4.37	1.6
6	DTL Wazirabad to Bhagirathi Grid Ckt 1 & 2	66 kV 3Cx300	4	1.1
7	BYPL Yamuna Vihar to Sonia Vihar Grid Ckt 1 & 2 (interconnector)	66 kV 1Cx630	4	1.1
8	BYPL Bhagirathi to Karawal Nagar Grid Ckt 1 & 2	33 kV 3Cx400	3.47	0.3
9	BYPL Bhagirathi to Dwarkapuri Grid Ckt 1	33 kV 3Cx400	5.9	1.2

2. SCOPE OF SUPPLY

S No	Material Description	UoM	Quantity
1	Cable 66 kV 1Cx630 sq mm (3 Runs. for each ckt)	Km	25.2
2	Cable 66 kV 1Cx1000 sq mm (3 Runs for each ckt)	Km	24
3	Cable 66 kV 3Cx300 sq mm (2 Runs for each ckt)	Km	4.4
4	Cable 33 kV 3Cx400 sq mm (2 Runs for each ckt)	Km	3.6
5	Cable straight through joint kit Suitable for 66 kV 1Cx630 sq mm cable(Make- Raychem/3M)	No's	84
6	Cable straight through joint kit Suitable for 66 kV 1Cx1000 sq mm cable(Make- Raychem/3M)	No's	42
7	Cable straight through joint kit Suitable for 66 kV 3Cx300 sq mm cable(Make- Raychem/3M)	No's	48
8	Cable straight through joint kit Suitable for 33 kV 3Cx400 sq mm cable(Make- Raychem/3M)	No's	44
9	Cable straight through transition joint kit Suitable for 33 kV 3Cx400 sq mm XLPE cable to 33 KV 3Cx300 sq mm XLPE cable (Make- Raychem/3M)	No's	2
10	Cable straight through transition joint kit Suitable for 66 kV 1Cx1000 sq mm XLPE cable to 66 KV 1Cx630 sq mm XLPE cable (Make- Raychem/3M)	No's	6
11	Cable End Termination kit outdoor Suitable for 66 kV 1Cx630 sq mm cable (Make- Raychem/3M)	No's	3
12	Cable End Termination kit outdoor Suitable for 66 kV 1Cx1000 sq mm cable (Make- Raychem/3M)	No's	6
13	Cable End Termination kit outdoor Suitable for 66 kV 3Cx300 sq mm cable (Make- Raychem/3M)	No's	4
14	Cable End Termination kit outdoor Suitable for 33 kV 3Cx400 sq mm cable (Make- Raychem/3M)	No's	6
15	OFC cable 24 F Single Mode G652 D (2 runs) to be laid with 66 kV 3Cx300 sq mm Wazirabad to Bhagirathi circuit 1 & 2	Km	2.2
16	40 mm PLB HDPE Duct	Km	2.2
17	OFC Cable Splice Closure	No's	14
18	Precast RCC (1:2:4) cable cover 600x550x50 mm	No's	2500
19	HDPE PIPE 200 MM Dia PN6 PE 80	Km	11
20	HDPE PIPE 200 MM Dia PN4 PE 80	Km	23
21	HDPE PIPE 225 MM Dia PN6 PE 80 for 66 kV 3Cx300 sq mm cable	Km	4.3

SCOPE OF WORK FOR SLTC OF 33 KV & 66 KV XLPE CABLES

S No	Material Description	UoM	Quantity
22	Weather and acid resistant PVC warning tape of 150mm width 300 micron thick Yellow colour with desired Red/Black lettering	Km	11
23	Route indicating stone at every 50 meter circuit length and Joint indicating stones at every cable joint location	No's	108
24	Galvanized Channel, Angle, Beam and other Structural steel with hardwares for Gantry structures including cable support Structure	MT	2
25	Fine Sand	Cum	243
26	End Cap for cable 66 kV 1Cx630 sq mm	No's	50
27	End Cap for cable 66 kV 1Cx1000 sq mm	No's	50
28	End Cap for cable 66 kV 3Cx300 sq mm	No's	10
29	End Cap for cable Cable 33 kV 3Cx400 sq mm	No's	10
30	Cable armour- earth link box single phase without SVL	No's	19
31	Cable armour- earth link box single phase with SVL	No's	6
32	Cable cross bonding Link Box - Three Phase with SVL	No's	16
33	Cable cross bonding Link Box - Three Phase without SVL	No's	2
34	Copper bonded Earthing electrodes 25 mm 3 meters for earthing	No's	16
35	RCC Chamber for Three Phase link Box	No's	16
36	Sheath Bonding Cable XLPE insulated 3.3 kV 1Cx300 Sq mm copper	Meter	200
37	Trefoil Cleat with hardwares for mounting of single core 66 kV Cables on cable support structure in RCC trench	No's	800
38	Single cable cleat with hardwares for mounting of Three core 66 & 33 kV Cables on cable support structure in RCC trench	No's	150
39	HDPE cleat with hardware's suitable for 66 kV & 33 kV cable mounting on cable termination structure	No's	19
40	Support insulators for mounting of cable on support structure	No's	19
41	Danger Plates	No's	17

SCOPE OF WORK FOR SLTC OF 33 KV & 66 KV XLPE CABLES

S No	Material Description	UoM	Quantity
42	Circuit Name Plate	No's	17
43	50X6 Sq mm GI Earthing strip	MT	4
44	Aluminium Cable Identification tag with nylon string	No's	540
45	Safety barricading PVC tape	Meter	1
46	Safety barricading cone	No's	1
47	Galvanized Nuts and Bolts	Kg	1
48	Coarse sand for PCC & RCC	Cum	1
49	Burnt clay Brick - First class	No's	1
50	Cement Bags 50 kg	No's	1
51	Reinforcement steel bars	MT	1
52	Construction Aggregate	Cum	1
53	RFID based Electronic buried type Cable Route marker for cable joints and turns having facility to feed the joint/turn related information	No's	100
54	Receiver unit for electronic cable route marker cum cable route tracer suitable with offline as well as online cable route tracing facility.	No's	1

Note: All quantities mentioned above are estimated quantities. Actual quantities may vary as per actual site requirement.

3. SCOPE OF WORK

S No	Description	UoM	Qty
1	Surveying of cable Route, Detailed Site Plan & Profile using Ground penetration Radar System, Excavation of trial pits as per field requirement, preparation of route drawing with location of joint chambers position and finalizing the cable route in consultation with BSES Representative	Km	11
2	Dismantling of the existing 66KV D/C OH Line and Towers, (Approx Line length of 2.0KM's) and handing over the dismantled Material to BYPL Stores	Lot	1
3	Digging of cable trench as per specification and drawings. Rate is inclusive of digging and backfilling for Ordinary Bituminous/C.C.Road (including dewatering if any)	Cum	2809

SCOPE OF WORK FOR SLTC OF 33 KV & 66 KV XLPE CABLES

S No	Description	UoM	Qty
4	Digging of cable trench as per specification and drawings. Rate is inclusive of digging and backfilling for Dense Carpeted bituminous Road (including dewatering if any)	Cum	1873
5	Digging of cable trench as per specification and drawings. Rate is inclusive of digging and backfilling for Footpath/tile/Rajasthani Stone/Brick work (including dewatering if any)	Cum	1873
6	Digging of cable trench as per specification and drawings. Rate is inclusive of digging and backfilling for Hard Rocky Soil (including dewatering if any)	Cum	1405
7	Laying of XLPE cables in the open excavated trench	Km	15
8	Laying of XLPE cable in open excavated trench in HDPE Pipe PN4 PE80	Km	11.4
9	Laying of cable in trenchless ducts including laying of HDPE pipe using HDD machine; HDPE Pipe Dia - 200 mm PN4 PE 80	Km	11.4
10	Laying of cable in trenchless ducts including laying of HDPE pipe using HDD machine; HDPE Pipe Dia - 200 mm PN6 PE 80	Km	11
11	Laying of 66 kV 3Cx300 sq mm cable in trenchless ducts including laying of HDPE pipe using HDD machine; HDPE Pipe Dia - 225 mm PN6 PE 80	Km	4.3
12	Laying of Cables in RCC trench on cable support structure	Km	4.3
13	Continuous steel Barricade for all Excavated areas, till the work is completed.	Km	5
14	Fixing of Aluminum Cable identification tags with Nylon string at every 30 Mtrs cable length	No's	540
15	Installation of straight through joints for 66 kV 1Cx630 sq mm cables by jointing kit OEM authorized jointer	No's	84
16	Installation of straight through joints for 66 kV 1Cx1000 sq mm cables by jointing kit OEM authorized jointer	No's	42
17	Installation of straight through joints for 66 kv 3Cx300 sq mm cables by jointing kit OEM authorized jointer	No's	48
18	Installation of straight through joints for 33 kv 3Cx400 sq mm cables by jointing kit OEM authorized jointer	No's	44

SCOPE OF WORK FOR SLTC OF 33 KV & 66 KV XLPE CABLES

S No	Description	UoM	Qty
19	Installation of straight through transition joint kit Suitable for 33 kV 3Cx400 sq mm XLPE cable to 33 KV 3Cx300 sq mm XLPE cable (Make-Raychem/3M)	No's	2
20	Installation of straight through transition joint kit Suitable for 66 kV 1Cx1000 sq mm XLPE cable to 66 KV 1Cx630 sq mm XLPE cable (Make-Raychem/3M)	No's	6
21	Installation of End Termination for 66 kv 1Cx630 sq mm cables by jointing kit OEM authorized jointer	No's	3
22	Installation of End Termination for 66 kv 1Cx1000 sq mm cables by jointing kit OEM authorized jointer	No's	6
23	Installation of End Termination for 66 kv 3Cx300 sq mm cables by jointing kit OEM authorized jointer	No's	4
24	Installation of End Termination for 33 kv 3Cx400 sq mm cables by jointing kit OEM authorized jointer	No's	6
25	Digging of joint pit suitable for 33/66 cable joint box and covering the joint box with sand and providing protection for Ordinary bituminous road/C.C. Road	No's	90
26	Digging of joint pit suitable for 33/66 cable joint box and covering the joint box with sand and providing protection for Dense carpeted bituminous road.	No's	68
27	Digging of joint pit suitable for 33/66 cable joint box and covering the joint box with sand and providing protection for Footpath/ tile/ Rajasthani Stone / Brick Works	No's	57
28	Digging of joint pit suitable for 33/66 cable joint box and covering the joint box with sand and providing protection for Hard Rocky Soil.	No's	11
29	Spreading of sand forming cushion and cover around the cable	Cum	243
30	Disposal of debris/surplus malba including Loading / Unloading	Cum	267
31	Digging of test pits of required size(not less than 1/2 Meter Wide at site for identification of cable route)	Cum	30
32	Laying of OFC cable including laying of PLB HDPE duct	Km	2.2
33	Installation of OFC cable splice closure	No's	14
34	Watch and ward of complete circuit till project handover	Lot	1

SCOPE OF WORK FOR SLTC OF 33 KV & 66 KV XLPE CABLES

S No	Description	UoM	Qty
35	Installation of Precast RCC Cable cover	No's	2500
36	Installation of Route and Joint indicating stone marked with "BYPL 33/66 KV Cable Helpline No-91-11-41247376"	No's	108
37	Laying of PVC warning tape	Km	11
38	Fabrication and installation of galvanized Channel, Angle, Beam and other Structural steel including nuts & bolts for all Gantry structures including cable support Structure, drain crossing structure etc.	MT	2
39	Partial discharge test on complete cable length at site	Lot	1
40	VLF High voltage test on complete cable length as per relevant IEC/IEEE	Lot	1
41	Testing of optical fiber cable after installation and jointing	Lot	1
42	Termination of optical fiber cable in already installed fiber optic distribution box	No's	2
43	Installation of Cable armour- earth link box single phase without SVL including installation of sheath bonding cable & earthing	No's	19
44	Installation of Cable armour- earth link box single phase with SVL including installation of sheath bonding cable & earthing	No's	6
45	Installation of Cable cross bonding Link Box - Three Phase with SVL including installation of sheath bonding cable & earthing	No's	16
46	Installation of Cable cross bonding Link Box - Three Phase without SVL including installation of sheath bonding cable & earthing	No's	2
47	Installation of RCC Chamber for Three Phase link Box	No's	16
48	Installation of Trefoil Cleat with hardwares for mounting of single core 66 kV Cables on cable support structure in RCC trench	No's	800
49	Installation of circular cable cleat with hardwares for mounting of Three core 66, 33 & 11 kV Cables on cable support structure in RCC trench	No's	150
50	Installation, mounting and fixing of 33/66 kV cable with termination on mounting structure/tower and fixing it with suitable HDPE cleats	No's	19

SCOPE OF WORK FOR SLTC OF 33 KV & 66 KV XLPE CABLES

S No	Description	UoM	Qty
51	Installation of support insulators on cable mounting structure with misc. hardware's.	No's	19
52	Fixing of danger plate on poles including fabrication of clamps etc	No's	17
53	Fixing of circuit Name plate including fabrication of clamps etc	No's	17
54	Transportation of empty 33/66 kV cable drums from site to BSES store	No's	93
55	Laying of GI earth connecting strip of 50x6 sq mm size including required welding, painting on joints etc	MT	4
56	Submission of actual laid drawing of cable circuits including GPS coordinates of all joint and Turns in cables circuits	Lot	1
57	Cable Phasing work, Cable Phase Sequence (R,Y,B) Marking, Cable 1&2 Marking, and final connection as per Phase Sequence.	Lot	1
58	Masonry Brick work	Cum	1
59	Providing and laying in position cement concrete 1:1.5:3 (1 cement :1.5 coarse sand : 3 graded stone aggregate) excluding the cost of centering, shuttering, finishing and enforcement	Cum	1
60	Providing and laying in position cement concrete 1:2:4 (1 cement :2 coarse sand : 4 graded stone aggregate) excluding the cost of centering, shuttering, finishing and enforcement	Cum	1
61	Providing and laying in position cement concrete 1:4:8 (1 cement :4 coarse sand : 8 graded stone aggregate) excluding the cost of centering, shuttering, finishing and enforcement	Cum	1
62	Centering, shuttering including shuttering propping etc and removal of shuttering	Cum	1
63	Fabrication of reinforcement for RCC work including straightening, cutting, bending, placing in position and binding all complete thermo-mechanically treated bars.	Cum	1
64	Installation of Brick as Cable Separator	No's	1

Note:

All the Testing's shall be witnessed by BYPL. All the Site Test Reports should be submitted, before charging of the Cables.

4. SCOPE DEMARCATION

S. No	Head	BYPL Scope	Contractor's Scope	Remarks
1	Road Cutting Permission and Road Restoration	✓	✗	Statutory fees will be borne by BYPL
2	Permissions from Various External and Internal Agencies Regarding Cable Laying and Commissioning (Traffic Police, GAIL, IGL etc)	✗	✓	Statutory fees will be borne by BYPL
3	Supply, Erection, Testing and commissioning of Equipments related to schemes	✗	✓	As per specifications & Standards
4	Drawing Submissions	✗	✓	NA
5	Engineering Approvals	✓	✗	NA
6	Testing Equipments	✗	✓	NA
7	Lighting Arrangement	✗	✓	NA
8	Construction Power and Construction Water	✗	✓	NA
9	Safety of Manpower (Labour, Engineers, Supervisors etc) and Security of Material, till Handing-over to O&M.	✗	✓	NA
10	Various Tools and Tackles related to Job	✗	✓	NA
11	Transportation of Material and any other tender related work	✗	✓	NA
12	Cleanliness around work premises	✗	✓	NA
13	Security and Safety of material until handing over to O&M.	✗	✓	NA
14	Various Machines, Material, Special Tools & tackles, e.g. Crane, Hydra, JCB, Hammer Cutting Machine etc to complete the Job	✗	✓	NA
15	Maintenance of Equipments Until Handover	✗	✓	NA
16	Loading and Unloading of material	✗	✓	NA
17	Electrical Inspector Clearance	✗	✓	Statutory fees will be borne by BYPL

SCOPE OF WORK FOR SLTC OF 33 KV & 66 KV XLPE CABLES

S. No	Head	BYPL Scope	Contractor's Scope	Remarks
18	Continuous Steel Barricading with Mobile no of Vendor's Engineer Incharge	x	✓	Steel barricade should have small scheme description along with vendor and BYPL name on it
19	Permit to work request to BYPL authority	x	✓	Permit Should be applied to Engineer In-charge prior to work through proper procedure
20	Permit to work issuance from BYPL authority	✓	x	NA
21	Temporary office and Material Store near work premises	x	✓	NA
22	Storage of Material	x	✓	BYPL store will not be used for any kind of material storage and issuance
23	Dismantled material loading, Unloading and transportation to BYPL store	x	✓	Store location will be within BYPL premises
24	Preparation, updation and submission of PERT chart, detailed work Progress Report with Photographs, fortnightly to track activities	x	✓	NA
25	Submission of final drawing showing layout of cable in Google map along with of cable joint locations	x	✓	Approval will be done by BYPL Representative
26	Removal and renaming of existing switchboards' painting as per their route	x	✓	Painting colour and material should be in line with the existing ones for aesthetic look
27	Any other supply item or scope of work missing in given sheet to complete all	x	✓	NA

S. No	Head	BYPL Scope	Contractor's Scope	Remarks
	these schemes/ Work			
28	Any damage to Public Utilities/Properties, Like Gas Pipeline, Water Pipeline, Sewage Pipeline, Telephone/ Fiber optic cables, Power Cables of any other Circuits, Traffic Signal or camera cables, etc Shall be rectified/ replaced.	x	✓	Any Damages to be rectified on priority, in minimum possible Time.

5. DOCUMENTATION

- Document checklist for each stage is given in table below. (Refer equipment specification for details)
- Document check sheet compliance shall be the first sheet for each submission stage i.e. Technical bid, Drawing Approval, Pre Dispatch, Pre closure.
- No submission is acceptable without check list compliance.
- Deficient/ improper document/ drawing submission shall be liable for rejection.
- Order of documents shall be strictly as per the check list.
- Any drawing not included in the below table but necessary for detailed engineering shall be deemed to be included in bidder's scope.

S. No	Detail of Document	Technical Bid	Document Approval	Pre Dispatch	Pre closure
1	Cable GTP in accordance with BSES specification	Yes	Yes	Yes	
2	Soft copy of complete technical bid in pen drive	Yes			
3	Cross sectional drawing of offered cable	Yes	Yes		
4	GTP & component drawing of cable straight through joint	Yes	Yes	Yes	
5	GTP & component drawing of cable End termination kit	Yes	Yes	Yes	
6	CPRI/ERDA type test report of offered cable design	Yes	Yes		
7	CPRI/ERDA type test report of offered straight through Joint kit along with offered make cable	Yes	Yes		

SCOPE OF WORK FOR SLTC OF 33 KV & 66 KV XLPE CABLES

S. No	Detail of Document	Technical Bid	Document Approval	Pre Dispatch	Pre closure
8	CPRI/ERDA type test report of offered end termination kit along with offered make cable	Yes	Yes		
9	Cable Route Layout drawing	Yes	Yes		
10	Installation drawings including cable trench drawing, joint pit, earthing electrodes (GI Pipe and MS rod), Hume Pipe, GI Pipe, HDPE Pipe, Lightning Arrester, Name Plate, Warning Tape, Route Marker, Joint Marker, RCC cover, Danger plate, anti climbing device and other miscellaneous items		Yes		
11	Earthing results of earth pits jointly stamped and signed by BSES representative				Yes
12	Sheath integrity test results for every cable section duly stamped and signed by BSES representative				Yes
13	VLF and Partial discharge test results for every circuit duly stamped and signed by BSES representative				Yes
14	Deviation Sheet	Yes			
15	Actual laid drawing of cable circuits including GPS coordinates of all joint in cables circuits, every 30 meter circuit length, Every turn/curve, Every road crossing (both ends) shall be submitted in hard copy (minimum A3 Size) and AutoCad drawing				Yes
16	Factory Test Reports to be submitted, for the Material supplied (Cables, Cable Jointing Kits etc)			Yes	

VOLUME – III

TECHNICAL SPECIFICATIONS

FOR

**DESIGN, ENGINEERING, MANUFACTURING,
SUPPLY, LAYING, JOINTING, TESTING AND
COMMISSIONING OF 33 & 66KV CABLES WITH
REQUIRED ACCESSORIES & DISMANTLING AS PER
THE SCOPE OF WORK, FOR BYPL, DELHI (INDIA)**

NIT NO CMC/BY/19-20/RB/SV/60 REV 01





Due Date for Submission: 28.01.2020, 15:00 HRS

**BSES YAMUNA POWER LIMITED (BYPL)
SHAKTI KIRAN BUILDING, KARKARDOOMA,
DELHI-110032
CIN: U40109DL2001PLC111525
TEL: 011 3999 7111
WEBSITE: www.bsesdelhi.com**



**Specification
for
H. T. CABLES
(11 & 33 kV : 1-Core / 3-Core)**

**Specification No:
SP- EWHP- 01- R4**

Prepared by		Checked by		Reviewed by		Approved by		Rev.	Date
Name	Sign	Name	Sign	Name	Sign	Name	Sign	3	01.09.07
AP/DRS		DSP		PVC		AM		4	09.03.12

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Revision Record

Note:

Revisions made in R4 are marked by symbol [R4] at the respective text or drawing throughout the Specification.

[R4]

Rev. No.	Revision Date	Item/ clause no:	Page No.	Nature of Change	Approved by
R4	09.03.12	Cl. 1.0.0 ,	5	IS 0462 (Part1)/1983 - added	AM
R4	09.03.12	Cl. 1.0.0 ,	5	IEC 332 - added	AM
R4	09.03.12	Cl. 2.0.0 , GTP 5.0	5	Cable Code - added	AM
R4	09.03.12	Cl. 2.0.0 , GTP 5.0 (Annexure-B)	5	For 33 kV 3-core Cables only armour strips (not armour wires).	AM
R4	09.03.12	Cl. 2.0.0	5	1c x 630 sq. mm. Cables - added.	AM
R4	09.03.12	Cl. 2.1.1	7	Copper conductor - deleted.	AM
R4	09.03.12	Cl. 2.1.1	7	Conductor Al grade H4 - deleted	AM
R4	09.03.12	Cl. 2.1.1, GTP 8.0	7	"Longitudinal Water Blocking Arrangement" within conductor - added	AM
R4	09.03.12	Cl. 2.1.3, GTP-10.0	7	Eccentricity check with regard to Insulation - added	AM
R4	09.03.12	Cl. 2.1.4, GTP-11A.0	8	Ovality check on core (over outer semi-con) - added	AM
R4	09.03.12	Cl. 2.1.4A , GTP 28.0	8	For 11 kV Cables also : "Dry-cure process only" (no moisture cure)	AM
R4	09.03.12	Cl. 2.1.6 , GTP 11C	9	Colour strips to carry manufacturer's name also.	AM
R4	09.03.12	Cl. 2.1.6	9	Copper tape arrangement - added	AM
R4	09.03.12	Cl. 2.1.7	9	Properties of PP filler - added	AM
R4	09.03.12	Cl. 2.1.10	9	Zero negative tolerance for diameter of armour wire - added	AM
R4	09.03.12	Cl. 2.1.12	10	Anti-rodent properties for outer sheath - added	AM
R4	09.03.12	Cl. 2.1.12	10	Ovality check over completed cable - added.	AM
R4	09.03.12	Cl. 2.1.12, GTP 15.0	10	FRLS properties for outer sheath, when required - added	AM
R4	09.03.12	Cl. 2.1.12	10-11	Details of Embossing - revised	AM
R4	09.03.12	Cl. 4.0.0	12	R- Infra QAP detail added	AM
R4	09.03.12	Cl. 4.0.0	12	Strippability Test added in Routine Test and Acceptance Test.	AM
R4	09.03.12	Cl. 4.0.0	12	Minimum lot size of Cables for	AM

				raising Inspection Call - added	
R4	09.03.12	Cl. 4.0.0	13	Water Penetration Test (WPT) - added	AM
R4	09.03.12	Cl. 4.0.0	13	Make & Grade of critical items used during manufacture to be stated in TC - added	AM
R4	09.03.12	Cl. 5.0.0, GTP 18A.0	14	Cross-sectional drawing - added (required details mentioned)	AM
R4	09.03.12	Cl. 7.0.0 , GTP 18.0	15-16	a) Required Packing details mentioned. b) Drum Identification markings - revised c) M. S. Spindle required for drums - added f) Cable drum handling added	AM
R4	09.03.12	Annexure - A	18	a) Document Submission - revised b) Delivery Schedule - added	AM
R4	09.03.12	Annexure-B (GTP)	20	One consolidated GTP format is prepared, instead of earlier separate GTPs for different types of cables.	AM
R4	09.03.12	Annexure-B (GTP)	20	GTP generally revised as per revised clauses.	AM
R4	09.03.12	Annexure-B GTP 8H.0	21	Longitudinal Water blocking arrangement added	AM
R4	09.03.12	Annexure-B GTP 9.0	21	Conductor Screen thickness revised to 0.5 mm.	AM
R4	09.03.12	Annexure-B (GTP) – 11B.0	22	Approval for Pre-slitted w. s. tapes from sub-vendors necessary. - added	AM
R4	09.03.12	Annexure-B GTP – 11D.0	22	Thickness of Copper Tape increased from 0.06 to 0.1 mm	AM
R4	09.03.12	Annexure-B (GTP) - 13.0	23	Inner Sheath – min thickness for 11 kV, 1cx1000 sq.mm. increased from 0.6 to 0.7 mm	AM
R4	09.03.12	Annexure-B (GTP) – 17A.0	24	Overall order tolerance - added	AM
R4	09.03.12	Annexure-C , Cl. 2.1.3 , GTP-31.0	27	R-Infra Approved Sub-Vendors List - added	AM
R4	09.03.12	Annexure-D	29	Service Conditions – added.	AM
R4	09.03.12	Annexure-E	31-32	For Pulling-eye Assembly and Sealing-end Cap, new drawings added.	AM
R4	09.03.12	i) Annexure-F (QAP) ii) Cl. 4.0.0 iii) GTP-30.0	34 to 41	QAP format - added.	AM
R4	09.03.12	Cl. 2.1.3	8	Introduction of “water-tree retardant” property for XLPE insulation	AM
R4	09.03.12	GTP 10.0-G	21		
R4	09.03.12	Annexure-G	42	Introduction of “water-tree retardant” property for XLPE insulation	AM

General Specification

1.0.0 Codes & Standards

The cables shall be designed, manufactured and tested in accordance with the following National Standards and IEC Standards.

National Standards

IS 7098 Part-2	Cross linked polyethylene (XLPE) insulated PVC sheathed cables for working voltages from 3.3 kV up to and including 33 kV.
IS 5831 : 1984	PVC insulation & sheath of electric cables.
IS 10810 : 1984	Methods of test for cables.
IS 8130 : 1984	Conductors for insulated electric cables and flexible cords.
IS 3975 : 1999	Mild steel wires, formed wires and tapes for armouring of cables.
IS 0462 (Part 1) / 1983	Fictitious Calculation Method for determination of dimensions of protective covering of cables

International Standards

IEC 60183	Guide to the selection of high voltage cables
IEC 60228	Conductors of insulated cables. Guide to the dimensional limits of circular conductors.
IEC 60332 - 3	Tests on electric cables under fire conditions. Part 3: Tests on bunched wires or cables.
IEC 60502 - 2	Power cables for rated voltages from 6 kV ($U_m = 7.2$ kV) up to 30 kV ($U_m = 36$ kV)
IEC 60811 Pts 1 through 5	Common test methods for insulating and sheathing materials of electric cables.
IEC 885 Pts 1 through 3	Electric test methods for electric cables.
IEC 28	International Standard of Resistance for Copper
IEC 332	Test on Electric Cables under fire conditions

2.0.0 Cable Construction Features

This Specification generally covers following types / sizes of XLPE H. T. Cables used in R-Infra network in Mumbai Discom area, mostly under-ground (buried, with

chances of flooding by water) or for laying on racks, in ducts, trenches, conduits, and so on.

Note: (Ref.: Table stating Cable sizes given below.)

Cable Code: **[R4]**

As per IS, cable designations comprise of following codes / options, as applicable for this Specification:

(N.A. - Not applicable for Specification)

- (with Copper conductor) (N.A.) **[R4]**

A Aluminium conductor

2X XLPE insulation

W Steel round Wire armour (N.A.)

W W Double steel round Wire armour (N.A.)

Wa Non-magnetic round Wire armour

F Steel formed wire (strip) armour

FF Double steel formed wire (strip) armour (N.A.)

Fa Non-magnetic formed wire (strip) armour (N.A.)

- ("un-armoured" or without armour) (N.A.)

Y PVC outer sheath

Sr. No.	Description	Conductor Material	Cable Code [R4]
1.	11 kV, 3c x 150 sq. mm.	Al	A 2X F Y
2.	11 kV, 3c x 300 sq. mm.	Al	A 2X F Y
3.	33 kV, 3c x 400 sq. mm.	Al	A 2X F Y
4.	33 kV, 1c x 630 sq. mm. [R4]	Al	A 2X Wa Y
5.	11 kV, 1c x 1000 sq. mm.	Al	A 2X Wa Y
6.	33 kV, 1c x 1000 sq. mm	Al	A 2X Wa Y

Description of each item mentioned in the Specification (the text, BOQ, GTP or any site specific requirement) shall be followed, along with IS: 7098 – Part 2.

2.1.1	Conductor	<ul style="list-style-type: none"> a) Electrolytic Grade Stranded Aluminium Conductor [R4] b) Grade: H2 as per IS: 8130 / 1984 (For Al) [R4] c) Stranded, compacted and circular in shape d) Class 2 e) “Longitudinal Water-Blocking Arrangement” (or water-tight construction or water barrier protection) shall be provided within the Conductor. [R4] <ul style="list-style-type: none"> i) As per manufacturer’s procedures, 100 % water-tight conductor shall be achieved. iii) Make & Type of materials to be used (i.e. Water-swellable tapes / yarn / powder, etc.) shall also be stated in the List of Sub-Vendors for pre-order approval. f) All detailed constructional features shall be shown in the cross-sectional drawing.
2.1.2	Conductor Screen	<p>Extruded semi-conducting material. (Also refer Cl. 2.1.3.) (Tapes are not acceptable)</p>
2.1.3	Insulation	<ul style="list-style-type: none"> a) Extruded XLPE (Cross-Linked Poly-Ethylene) Insulation, with water-tree retardant (WTR) property[R4] b) The required compound used shall be from R-Infra-approved sub-vendors and not from any other (refer Annexure – C). [R4] c) Uniform thickness of insulation shall be within the permissible values as per IEC Standards;

		<p>eccentricity check shall be carried out to ensure this. [R4]</p> <p>d) Insulation Color : natural</p>
2.1.4	Insulation Screen	<p>a) Freely-strippable semi-conducting screen, which should not require application of heat for its removal. (Refer Cl. 2.1.3.)</p> <p>b) Text “Do not Heat - Freely Strippable” to be printed on insulation screen (at every 600 mm interval).</p> <p>c) Round shape over the outer semi-con shall be within the permissible limits as per IEC standards; Ovality check shall be carried out to ensure this. [R4]</p> <p>d) Compound used shall be suitable for the operating temperature of the Cable and shall be compatible with the insulation used. [R4]</p>
2.1.4A	XLPE Process	
2.1.4A-1	11 KV	Dry Cure process only. [R4]
2.1.4A-2	33 KV	Dry Cure process only.
2.1.4A-3	Extrusion [R4]	<p>It is desirable that Conductor Screen, Insulation and Insulation Screen shall be extruded simultaneously, in a Single One-Time Process (i.e. as a triple-head extrusion) to ensure homogeneity of layers over the conductor, and absence of voids.</p> <p>However, Tandem Extrusion (1+2) is also acceptable</p>
2.1.4A-4	Make of Compounds for Insulation and Semi-conducting	Any deviation from Approved Makes mentioned in Annexure-C shall not be acceptable, unless the deviation has been specifically approved by R-Infra, prior to sourcing the compounds and taking up manufacturing of cable.
2.1.5	Water-Swellable Tape	<p>a) Semi-Conducting Water-Sellable Tape shall be provided, under the copper tape, on each core.</p>

		b) Nominal thickness : 0.3 mm c) Weight: 118 gm / sq. m apprx. d) Swell height: ≥ 12 mm in 1 min. e) Compatible to strippable / non-strippable semi-con, over which it is applied.
2.1.6	Core Identification	a) For 3-core cables, cores shall be identified by coloured strips (Red, Yellow, Blue), applied helically / longitudinally below the copper tape. The coloured strips shall carry the name of manufacturer permanently printed at close intervals; this is to provide additional identification of manufacturer of the cable. [R4]
2.1.6A	Copper Tape	Copper Tape shall be applied helically over the layer formed after application of insulation screen, water-swellaable tape and identification strip. [R4]
2.1.7	Filler	a) All interstices, including center interstices shall be filled by PP filler. b) PP Filler shall be non-hygroscopic, not having any effect on other compounds used, stable at cable temperatures, etc. [R4] c) PVC filler is not acceptable. d) Filler is not applicable for single-core cables.
2.1.8	Binder Tape	As per manufacturer's standard
2.1.9	Inner Sheath	Extruded Inner Sheath of Black PVC type ST-2 (IS 5831)
2.1.10	Armour	a) For 3-core Cables : Galvanised Steel flat strip armour b) For 1-core Cables : Non-magnetic round wire armour

		<p>(hard-drawn aluminium wire)</p> <p>c) Minimum area of coverage of armouring shall be 90 % (min.). At any time, the gap between any two adjacent armour strips / wires shall not be more than the width of strip / diameter of wire.</p> <p>d) Zero negative tolerance is for :</p> <ul style="list-style-type: none"> Thickness of armour strip Diameter of armour wire [R4]
2.1.11	Binder Tape	Rubberised cotton tape
2.1.12	Outer Sheath	<p>a) Extruded outer sheath of PVC (ST-2 as per IS 5831) with termite-repellant and anti-rodent properties. [R4]</p> <p>(Outer Sheath shall be FRLS-type, if chosen by purchaser.) [R4]</p>
		<p>b) Shape of the cable over the outer sheath shall be circular, when manufactured / completed. Regular Ovality check shall be carried out at factory, to detect any abnormality. Manufacturing quality shall be such that cable will retain its circular shape, even after it is laid at site. [R4]</p>
		<p>c) The Outer Sheath shall be embossed with following minimum text : [R4]</p> <ol style="list-style-type: none"> The voltage designation Type of construction / cable code (e.g. A2XFY) Manufacturer's Name and Trade-mark Number of cores and nominal cross-sectional area of conductor Progressive (sequential) length of cable at every metre, starting from zero for every drum. <p>Colour filled in for the progressive marking,</p>

		<p>shall be with proper contrast in colouring.</p> <p>6. Name of buyer / purchaser, R-Infra (Reliance Infrastructure Ltd.)</p> <p>7. Month & Year of manufacturing</p> <p>8. IS reference, i.e. IS : 7098</p> <p>9. Batch No. / Lot No. (For traceability purpose, in case of any, in case of any manufacturing defect or otherwise arising in the cable in future.)</p> <p>10. Purchase Order Number & date</p> <p>11. Word ' FRLSH ', in case the cable is of FRLSH type. [R4]</p>
2.1.13	Pulling-eye Assembly and Sealing-end Cap (for Cables)	<p>a) A cable pulling-eye assembly Drg. No. MISC/E/4-1131/1698 (see Annexure-E) shall be provided at the loose end (outer end) of the cable on each drum. Sealing material shall be filled in inside the spaces / gaps between the pulling-eye assembly and cable outer sheath. Further, a heat-shrinkable sleeve shall be provided over the pulling-eye assembly and outer sheath of cable.</p> <p>b) Other end (inner end) of the cable shall be sealed as per MISC/E/4-1131/1699 (see Annexure-E.) One PVC cap with Polyurethane compound shall be provided as primary sealing and heat-shrink end-cap shall form a secondary sealing over the PVC cap.</p>
3.0.0	(This number not used.)	
4.0.0	Testing & Inspection	Tests shall be carried out in accordance with IS 7098 (Part-2).
	a) Type Tests	1. Cables must be of type tested quality. Type Test Reports shall be submitted for the type, size and

		<p>rating of cable offered in the bid.</p> <ol style="list-style-type: none"> If the manufacturer's laboratory is accredited by govt. /authorized body, then it shall be acceptable for type testing. Type test on one cable drum of each type/rating, from the first lot, shall be conducted at Govt.- approved / Internationally accredited labs.
	b) R-Infra QAP (Typical) [R4]	In general, all tests mentioned in the R-Infra QAP (Characteristics – Typical) mentioned in Annexure-F shall be included in the Routine Tests, Type Tests and Acceptance Tests stated above.
	c) Routine Tests	<ol style="list-style-type: none"> Measurement of Electrical Resistance HV Test with power frequency AC voltage PD test “Strippability Test” at both the ends of cable for each drum, to check the freely-strippable property of the Insulation Screen (outer semi-con). [R4] <p>Test results from the above tests must appear in the documents forwarded by the vendor for Inspection call / waiver.</p>
	d) Inspection	<ol style="list-style-type: none"> The Buyer reserves the right to witness all tests specified on completed cables. The Buyer reserves the right to inspect cables at Sellers works at any time prior to dispatch, to verify compliance with the specifications. In-process (stage inspection) and final inspection call intimation shall be given sufficiently in advance to the purchaser. Minimum lot size of Cables to be offered for inspection shall be mutually agreed between Purchaser and Vendor, before placing the order. Vendor shall raise inspection call only after a minimum lot size is ready and with due factory routine tests already carried out. [R4]
	e) Acceptance Tests	Acceptance Tests shall be conducted as per Cl. 18.2

		<p>of IS 7098 (Part-2) and the approved Quality Assurance Plan (QAP) for each lot of cables.</p> <p>Following tests shall also be carried out during the Acceptance Tests :</p> <ul style="list-style-type: none"> a) "Wafer Boil Test" for checking integrity of semi-conducting layers. b) "Void-and-contamination Test" for the Insulation c) "Strippability Test" at both the ends of cable for each drum, to check freely-strippable property of the Insulation Screen (outer semi-con). [R4] d) "Water Penetration Test (WPT)", as per applicable IEC standards, to check adequacy of water-blocking arrangement provided inside the conductor. [R4] <p>Number of times WPT is to be carried out, during Acceptance Test, shall be mutually agreed and generally determined as follows :</p> <ul style="list-style-type: none"> a) For the order Qty. < 50 kms : One no. WPT b) For the order Qty. < 50 kms : Two times WPT [R4]
	f) Test Certificates (TC)	<p>Three sets of complete Test Certificates (Routine tests and Acceptance tests) shall be submitted along with the delivery of cables.</p> <p>Soft copy of the TCs shall be separately e-mailed to the Purchaser. [R4]</p> <p>Note : [R4]</p> <p>Make/grades of critical materials (such as, for conductor screen, insulation, insulation screen, etc.), actually used during manufacturing of cables for order-on-hand, shall be clearly stated in the TCs forwarded by the Manufacturer, enabling references in future.</p>
5.0.0	Drawing, Data and Manuals	<ul style="list-style-type: none"> a) Refer Annexure-A regarding Document Submission.

		b) Cross-Sectional Drawing shall show every feature of construction, including the thickness / diameter over every layer. This drawing shall also state the text to be embossed over the outer sheath - i.e. type/size, etc. of the cable, drum no./lot no., sequential marking over every meter, printing text on outer semi-con ("Do Not Heat-Freely Strippable"), font sizes to be used, additional text, if any, etc. Also, drum details, markings to be made on both sides of the drum, and so on. [R4]
5.0.1	Documents to be submitted along with bid	The vendor shall submit : a) Cross-sectional drawing [R4] b) GTP (all data to appear) c) Type Test certificates d) Dimensional drawing for pulling eye e) Fault Level Calculation for armour and copper tape screen f) Complete Cable Catalogue and Manual g) Armour Coverage Calculation
5.0.2	Documents after award of contract	Within 15 days, the seller has to submit four sets of above-mentioned drawings, along with one soft copy for buyer's approval.
5.0.3	Final As-Built Drawings	One soft copy of all documents, including type & routine test certificates.
6.0.0	Drum length & tolerance	Cable length per drum
6.0.1	a) 11 KV, Three core b) 33 KV, Three core c) 11 KV, Single core d) 33 KV, Single core	a) 300 mtr +/- 5 % b) 200 mtr +/- 5 % c) 500 mtr +/- 5 % d) 500 mtr +/- 5 %
6.0.2	Overall tolerance	+/- 2 % for the total cable length for the entire order.

6.0.3	Short length of cables	<p>Manufacturer shall take prior approval from Purchaser for any supply of short length cables.</p> <p>For 33 KV, 3-core/1-core cables, minimum acceptable short length cable can be 150 meter and 250 meter respectively. Similarly, for 11 KV cables, minimum acceptable short length cables can be 250 meter.</p> <p>In any case, manufacturer shall not put two cable pieces of different short lengths in same cable drum.</p>
7.0.0	Packing, Shipping, Handling & Storage	
	a) Packing	<p>[R4]</p> <ol style="list-style-type: none"> Both the ends of the cables shall be properly sealed to prevent any deterioration of the cable, due to ingress of water, etc. Cable inner end (starting end) shall project, outside the completely wound cable, by sufficient length enabling verify cable details, including the initial length marking. Similarly, outer end of the cable shall be saddled / secured to the drum properly to prevent any external damage to the end at any time. Before putting on wooden planks, protective covers (thick plastic sheets, etc.) shall be secured over the wound cable, to avoid any abrasion by wooden planks, over the outer sheath of the cable. After providing the protective covers, the cable drums shall be finally closed by wooden planks (with saddles), without leaving any gaps between the planks; i.e. 100 % covering shall be

		ensured.
	b) Drum Identification Markings:	<p>Direct marking (i.e. text painting through stencils, etc.) shall be done on the drums, instead of attaching labels, which may be misplaced/lost over a period of time. [R4]</p> <ol style="list-style-type: none"> 1. Drum identification number 2. Cable voltage grade 3. Cable code (e.g. A2XFY, etc.) 4. Number of cores and cross sectional area 5. Cable quantity, i.e. cable length (metre) 6. Purchase order number & date 7. SAP item code 8. Total weight of cable and drum (kg) 9. Manufacturer's Name 10. Buyer's name 11. Month & Year of Manufacturing 12. Direction of rotation of drum 13. Cable length final end-markings (i.e., reading at the inner end and reading at the outer end, just before packing, shall be marked on the drum.)
	c) Shipping information	The seller shall give complete shipping information concerning the weight, size of each package
	d) Transit damage	The seller shall be responsible for any transit damage due to improper packing.
	e) Type of Drum	Steel / wooden drums, as per relevant IS / IEC. (Wooden drums shall be with M.S. spindle plate with nut-bolts)
	f) Cable Drum handling	The drums shall be with M.S. spindle plate (with nut-bolts) of adequate size to suit the spindle rods, normally required for handling the drums, according to expected weight of the cable drums. [R4]
8.0.0	Quality Assurance Plan (QAP)	
8.0.1	Vendor's QAP	Manufacturer shall submit QAP in line with R-Infra

		QAP format (Annexure-F) for purchaser's approval. [R4]
8.0.2	Inspection Points	To be mutually identified and agreed upon in QAP.
9.0.0	Progress Reporting	
9.0.1	Outline Document	To be submitted for purchaser's approval for outline of programmes for production, stage-inspection, testing, final inspection, packing, dispatch and documentation.
9.0.2	Detailed Progress Report	To be submitted to Purchaser once a month containing : i) Progress on material procurement ii) Progress on fabrication (as applicable) iii) Progress on assembly (as applicable) iv) Progress on internal stage-inspection v) Reason for any delay in total programme vi) Details of test failures, if any, during manufacturing stages. vii) Progress on final box-up Constraints / Forward Path
10.0.0	Deviation	a) Deviations from this specification are only acceptable, where the Seller has listed in his quotation the requirements he cannot, or does not, wish to comply with, and the Buyer has accepted, in writing, the deviations before the order is placed. b) In the absence of any list of deviation, it will be assumed by the Buyer that the Seller complies fully with this specification.

Annexure – A

Scope, Documentation and Delivery schedule

1. Scope

A.	Scope	Design, manufacture, testing at manufacturer's works before dispatch, packing, delivery, unloading, stacking at stores/site of H.T. Power cables, as per Purchaser's BOQ (Bill of Quantity).
B.	Delivery Schedule	To be filled up on a case-to-case basis.

a) Document Submission

Submission of drawings, calculations, catalogues, manuals, test reports shall be as follows. (Also refer clause 5.0.0 – Drawings, Data and Manuals.)

Legend:

GTP : Guaranteed Technical Particulars
TTR : Type Test Report
RTR : Routine Test Report

[R4]

	Documents Along with offer	After award of contract - for Approval	Final documents (after Approval)
GTP	3 copies	** 1 soft copy	** 1 soft copy + CD
Drawings	3 copies	** 1 soft copy	** 1 soft copy + CD
Calculations	3 copies	** 1 soft copy	** 1 soft copy + CD
Catalogues & Manual	1 copy each		** 1 soft copy + CD
Test Report	1 copy each of TTR and sample RTR		** 1 soft copy + CD

** Soft copy and CD shall contain documents duly approved, signed and scanned.

3. Delivery Schedule [R4]

- a) Delivery period Start Date : from date of LOI / LOA
- b) Delivery period End Date : as agreed with supplier
- c) Material dispatch Clearance : after inspection by purchaser

Annexure - B

GUARANTEED TECHNICAL PARTICULARS (GTP) [R4]

Note: [R4]

- 1) For every type / size of cable, every data shall be mentioned.
- 2) Seller may submit separate GTP for every type / size of cable, as suitable.
- 3) GTP requirements are generally as per IS : 7098 (Part-II).
- 4) GTP shall be read in line with purchaser's Project Site Specific Requirement.

Sr. No.	Description	Buyer's requirement	Unit	Seller's Data
1.0	Purchase Req. No.	-		
2.0	Guarantee Period (Min.)	60 Months (from date of commissioning) / 66 Months (from date of receipt at purchaser's store) whichever is earlier		
3.0	Applicable IS / IEC Standard followed by vendor	IS 7098 Part-2 / IEC 60502-2		
4.0	Make	-		
5.0	Type (as required by purchaser)	[R4]		
	a) 11 kV, 3c x 150 sq. mm.	A2XFY		
	b) 11 kV, 3c x 300 sq. mm.	A2XFY		
	c) 33 kV, 3c x 400 sq. mm.	A2XFY		
	d) 33 kV, 1c x 630 sq. mm.	A2XWaY		
	e) 11 kV, 1c x 1000 sq. mm.	A2XWaY		
	f) 33 kV, 1c x 1000 sq. mm.	A2XWaY		
6.0	Voltage Grade			
	a) 11 kV, 3c or 1c	6.35 / 11	kV	
	b) 33 kV, 3c or 1c	19 / 33	kV	
7.0	Maximum Conductor temperature			
A	Continuous	90	deg. C	
B	Short time	250	deg. C	
8.0	Conductor			
A	Material and Grade	As per Cl. 2.1.1		
B	Size	As shown under 5.0 above		

C	Wires in each conductor	As per Table 2 of IS 8130	Nos.	
D	Conductor Shape	As per Cl. 2.1.1 e		
E	Dia. of wires in each conductor before compaction	Manufacturer Standard	mm	
F	Diameter over conductor		mm	
G	Maximum Conductor resistance at 20 ° C			
	a) 11 kV, 3c x 150 sq. mm.	0.2060	ohm/km	
	b) 11 kV, 3c x 300 sq. mm.	0.1000	ohm/km	
	c) 33 kV, 3c x 400 sq. mm.	0.0778	ohm/km	
	d) 33 kV, 1c x 630 sq. mm.	0.0469	ohm/km	
	e) 11 kV, 1c x 1000 sq. mm.	0.0291	ohm/km	
	f) 33 kV, 1c x 1000 sq. mm.	0.0291	ohm/km	
H	Longitudinal Water Blocking Arrangement within conductor [R4]	Is it provided and shown in the cross-sectional drawing? (Yes / No)		
I	Short circuit current-carrying capacity of conductor		kA for 1 sec.	
9.0	Conductor Screen (inner semi-con)			
A	Material & type	As per Cl. 2.1.2		
B	Thickness (min) [R4]	0.50	mm	
C	Diameter over conductor screen		mm	
D	Make and grade of semi-conducting compound			
10.0	Insulation			
A	Insulation Material	As per Cl. 2.1.3		
B	Nominal thickness			
	a) 11 kV, 3c or 1c	3.6	mm	
	b) 33 kV, 3c or 1c	8.8	mm	
C	Minimum thickness			
	a) 11 kV, 3c or 1c	3.14	mm	
	b) 33 kV, 3c or 1c	7.82	mm	
D	Diameter over Insulation (Approx.)		mm	
E	Make and grade of Insulation compound			
F	Eccentricity [R4]	As per IEC standards	%	
G	Water-tree retardant property	Required [R4]		
11A.	Insulation Screen (outer semi-con)			

a.	i) Thickness of freely strippable Semi conducting screen	0.50	mm	
	ii) Make and grade of semi-conducting compound			
	iii) Printing	As per Cl. No. 2.1.4 (Yes / No)		
	iv) Ovality of the core [R4]	As per IEC Standards	%	
b.	Diameter over Insulation Screen (apprx.)		mm	
11B.	Water-Swellable Tape (if required by Purchaser)			
	a) Thickness b) Weight c) Swell height d) Compatible to strippable / non-strippable semi-con, over which it is applied. e) Make & Grade f) Pre-slitted packed tapes from sub-vendors approved by R-Infra [R4]	a) 0.3 mm b) 118 gm / sq. m c) ≥ 12 mm in 1 min. d) Yes / No e) Pl. state f) Yes / No		
11C.	Cable Core identification a) By coloured strips over cores applied helically / longitudinally b) Manufacturer's name shall be permanently printed on the strips, at close intervals. [R4]			
11D.	Copper Tape			
	i) Dimensions	a) Thickness : 0.1 +/- 5 % b) Width : 50 mm C) Overlap: 20% [R4]	Mm	
	ii) Fault current-carrying capacity of copper tape	Manufacturer's Standard (Calculation sheet shall be attached)	... kA for ... sec.	
11E.	Diameter over laid up core (apprx.)		mm	

12.0	Filler (Material and type)	As per Cl. 2.1.7 (Specify no. & size of filler at center & core interstices)		
	a) 11 kV, 3c x 150 sq. mm.			
	b) 11 kV, 3c x 300 sq. mm.			
	c) 33 kV, 3c x 400 sq. mm.			
	d) 11 kV or 33 kV, 1core	Not applicable		
12A.0	Binder Tape	over laid-up cores		
13.0	Inner Sheath			
A	Material and type	As per Cl. 2.1.9		
B	Minimum thickness			
	a) 11 kV, 3c x 150 sq. mm.	0.6	mm	
	b) 11 kV, 3c x 300 sq. mm.	0.7	mm	
	c) 33 kV, 3c x 400 sq. mm.	0.7	mm	
	d) 33 kV, 1c x 630 sq. mm.	0.6	mm	
	e) 11 kV, 1c x 1000 sq. mm.	0.7 [R4]	mm	
	f) 33 kV, 1c x 1000 sq. mm.	0.7	mm	
C	Approx. dia. over inner sheath		mm	
14.0	Armour	As per Manufacturer's Standard and as per purchaser's site- specific requirements		
A	Material			
	a) 11 kV, 3c	G. I. Strip	No.	
	b) 33 kV, 3c	G. I. Strip [R4]	No.	
	c) 11 kV or 33 kV, 1c	non-magnetic wire armour (Aluminium wire)	No.	
B	Armour – Wires	As per Table 4 of IS 7098 Part-2 (zero negative tolerance for diameter)	mm. no.	
	a) Diameter of wire			
	b) Number of wires (min.)			

C	Armour – GI strips a) Width of strip & Thickness of strip b) Number of strips (min.)	4 x 0.8 (zero negative tolerance for thickness)	mm no.	
D	Approx. Equivalent Area		sq. mm.	
E	Area covered by armour	Min. 90 % Calculation shall be attached.	%	
F	Dia. over armour - apprx.		Mm	
G	Fault current carrying capacity of armour	Calculation sheet shall be attached.	... kA for ... sec.	
15.0	Outer Sheath			
A	Material and type	As per Cl. 2.2.12		
B	Thickness (min.)	** As per Table-5 of IS 7098 Part-2		
	a) 11 kV, 3c x 150 sq. mm.	**	mm	
	b) 11 kV, 3c x 300 sq. mm.	**	mm	
	c) 33 kV, 3c x 400 sq. mm.	**	mm	
	d) 33 kV, 1c x 630 sq. mm.	**	mm	
	e) 11 kV, 1c x 1000 sq. mm.	**	mm	
	f) 33 kV, 1c x 1000 sq. mm.	**	mm	
C	Color	Blue		
D	Embossing (details as per Cl. 2.1.12)	Yes / No		
E	FRLS Properties [R4]	As per customer's requirement		
16.0	Approx. overall diameter		mm	
17.0	Standard drum length with tolerance			
	a) 11 kV, 3c x 150 / 300 sq. mm.	300 +/- 5%	meters	
	b) 33 kV, 3c x 400 sq. mm.	200 +/- 5%	meters	
	c) 33 kV, 1c x 630 sq. mm.	500 +/- 5%	meters	
	d) 11 kV or 33 kV, 1c x 1000 sq. mm.	500 +/- 5%	meters	
17A	Overall order tolerance [R4]	+ / - 2 % for the total cable length for the entire order.		
18.0	Cable Drum			
a.	Type of drum	Steel / Wooden		

		(Specify the relevant IS / IEC followed for drum design)		
b.	Markings on the drum (as per Cl. 7.0.0) [R4]	On both faces		
18A.0	Cross-Sectional Drawing (ref. Cl. 5.0.0) [R4]	Is drawing submitted, showing every feature of constructions? (Yes / No)		
19.0	a. Pulling-eye Assembly (provided at one running end) Refer drawing in Annexure-E [R4]	Is manufacturer's / Sub-vendor's drawing submitted? (Yes / No)		
	b. Sealing-end Cap (provided at the other end) Refer drawing in Annexure-E [R4]	Is manufacturer's / Sub-Vendor's drawing submitted? (Yes / No)		
20.0	Weights			
	a) Net weight of cable (apprx.)		kg / km	
	b) Weight of empty drum		Kg	
	c) Weight of Cable with drum		kg	
21.0	Continuous current rating for standard I. S. condition laid Direct			
	a) In ground 30° C		Amp	
	b) In duct 30° C		Amp	
	c) In air 40° C		Amp	
22.0	(not used)			
23.0	Electrical Parameters at Maximum Operating temperature:			
A	AC Resistance		ohm / km	
B	Reactance at 50 c/s		ohm / km	
C	Impedance		ohm / km	
D	Zero sequence impedance		ohm / km	
E	Positive sequence impedance		ohm / km	
F	Negative sequence impedance		ohm / km	
G	Capacitance		micro-farad / km	

24.0	Recommended minimum bending radius	--- x O. D.	mm	
25.0	De-rating factor for following Ambient Temperatures :	Ground / Air		
	a) At 30° C			
	b) At 35° C			
	c) At 40° C			
	d) At 45° C			
	e) At 50° C			
26.0	Group factor for following numbers of cables laid :	Touching Trefoil		
	a) 3 Nos.			
	b) 4 Nos.			
	c) 5 Nos.			
	d) 6 Nos.			
27.0	Recommended pressure for laying cable using power winch	30 N / mm ²	N / sq. mm.	
28.0	Process of Cross-linking of Polyethylene			
	a) 11 kV, 3c or 1c	Dry Cure process only [R4]		
	b) 33 kV, 3c or 1c	Dry Cure process only		
29.0	Type test (TTR - Type Test Report)	Is copy of latest valid TTR for respective sizes enclosed? (Yes / No)		
30.0	Quality Assurance Plan (QAP) [R4]	Is QAP Format (Annexure-F), duly filled in and enclosed? (Yes / No)		
31.0	List of Sub-Vendors for construction items (Annexure-C) [R4]	Is this list enclosed for R-Infra approval? (Yes / No)		

Annexure - C

List of Sub-Vendors for critical items

[R4]

Vendor to state sub-vendors' names for other items, wherever approved names are not mentioned, for purchaser's approval during pre-order / post-order stages.

Ser. No.	Description of Material	R-Infra Approved @	Sub-Vendors
1.	XLPE Compound	@	Dow Chemicals , U.S.A.
		@	Borealis , Sweden
		@	Hanwha , Seoul , South Korea
2.	Semi-Conducting Compound	@	Dow Chemicals , U.S.A.
		@	Borealis , Sweden
		@	Hanwha , Seoul , South Korea
3.	Conductor Water-Blocking tapes / yarn / powder	@	Lantor
		@	Geca
		@	Freudenberg
		@	Scapa
4.	Water-Swellable Tapes (Pre-slitted)	@	Lantor
		@	Geca
		@	Freudenberg
		@	Scapa
		@	Miracle
		@	Tekstilna (Slovenia)
5.	E.C. Grade Aluminium Rod	@	Bharat Aluminium Co. Ltd. (BALCO)
		@	Hindustan Aluminium Co. Ltd. (HINDALCO)
		@	National Aluminium Co. Ltd. (NALCO)

6.	Aluminium Alloy		
7.	E.C. Grade Copper Rod		
8.	H.T.G.S. Wire		
9.	PVC Compound		
10.	PVC Resin		
11.	Galvanised Steel Wires / Strips		
12.	Copper Tape (for screening)		
13.	P. P. Fillers		

Annexure - D

Service Conditions [R4]

(Atmospheric / Soil conditions at Site)

A. Mumbai		
a)	Average grade atmospheric condition	Heavily polluted, salt-laden, dusty, humid with possibility of condensation
b)	Average grade soil condition	Water-logged
c)	Maximum altitude above sea level	1000 M
d)	Ambient Air temperature	i) Highest : 45 deg C ii) Average : 35 deg C iii) Minimum : 15 deg C
e)	Relative Humidity	100 % Max
f)	Thermal Resistivity of Soil	150 deg. C . cm / W max.
g)	Seismic Zone	3
h)	Rainfall	3000 mm concentrated in four months

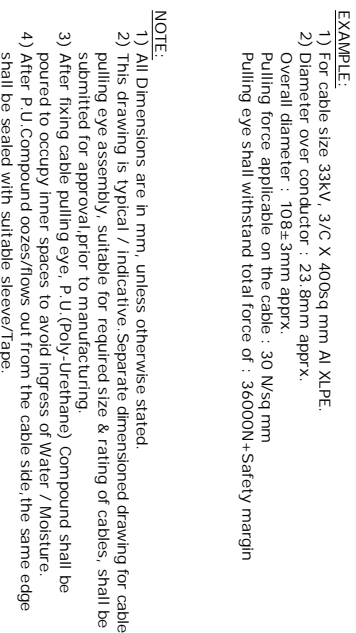
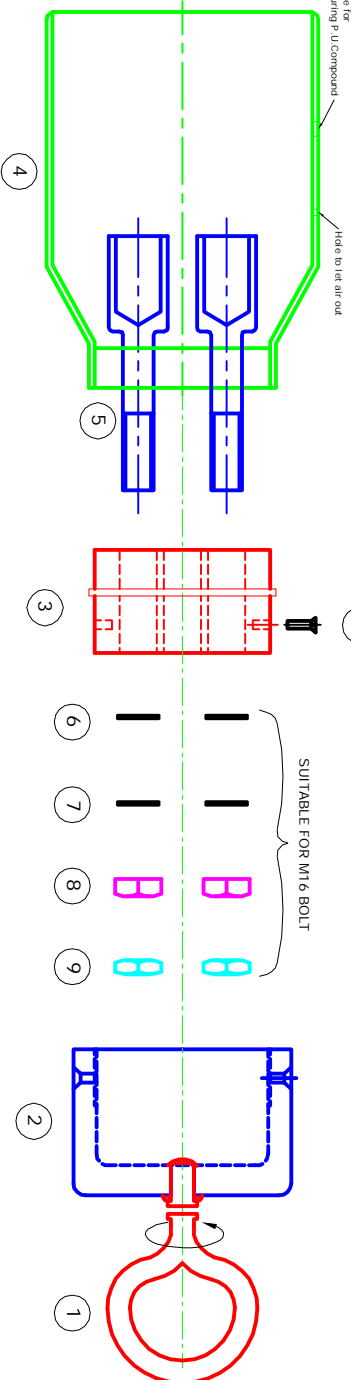
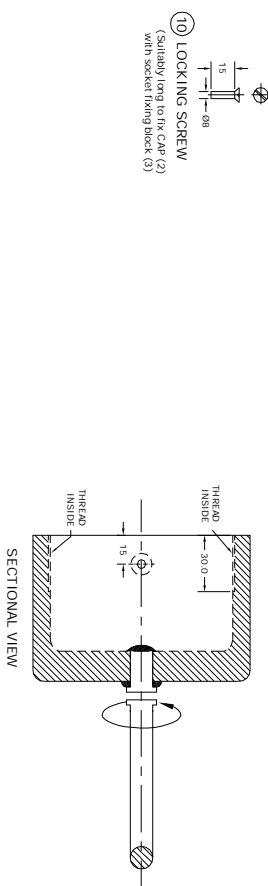
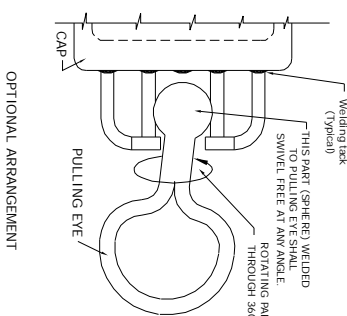
B. Delhi		
a)	Average grade atmospheric condition	Heavily polluted, dry
b)	Average grade soil condition	
c)	Maximum altitude above sea level	1000 M
d)	Air temperature Ambient	i) Highest : 50 deg C ii) Average : 40 deg C iii) Minimum : 0 deg C
e)	Relative Humidity	100 % max
f)	Thermal Resistivity of Soil	150 deg. C . cm / W max.
g)	Seismic Zone	4
h)	Rainfall	750 mm concentrated in four months

Annexure E

- 1. General Arrangement Drawing for
Cable Pulling Eye
[R4]**

- 2. General Arrangement Drawing for
End-sealing Cap
[R4]**

Both the above drawings are given on next pages.

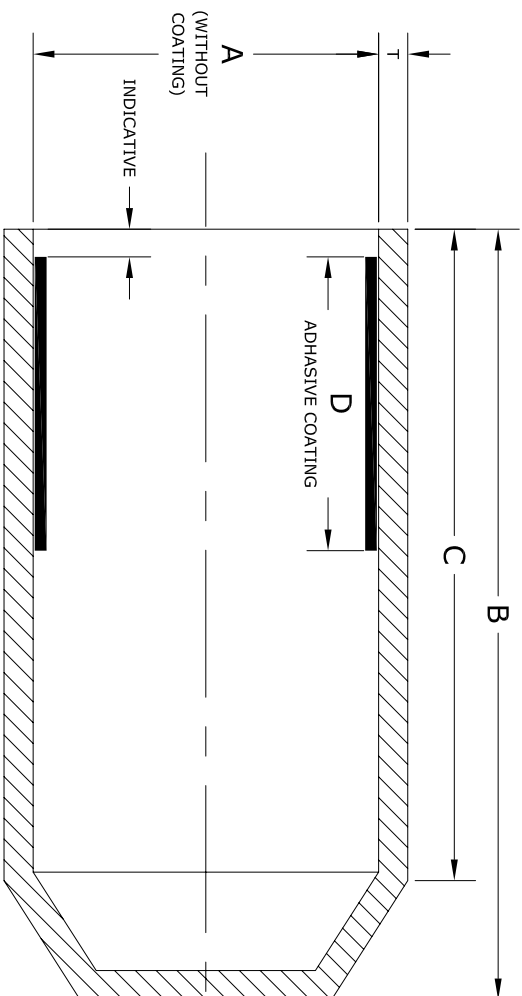


Addl V.P..

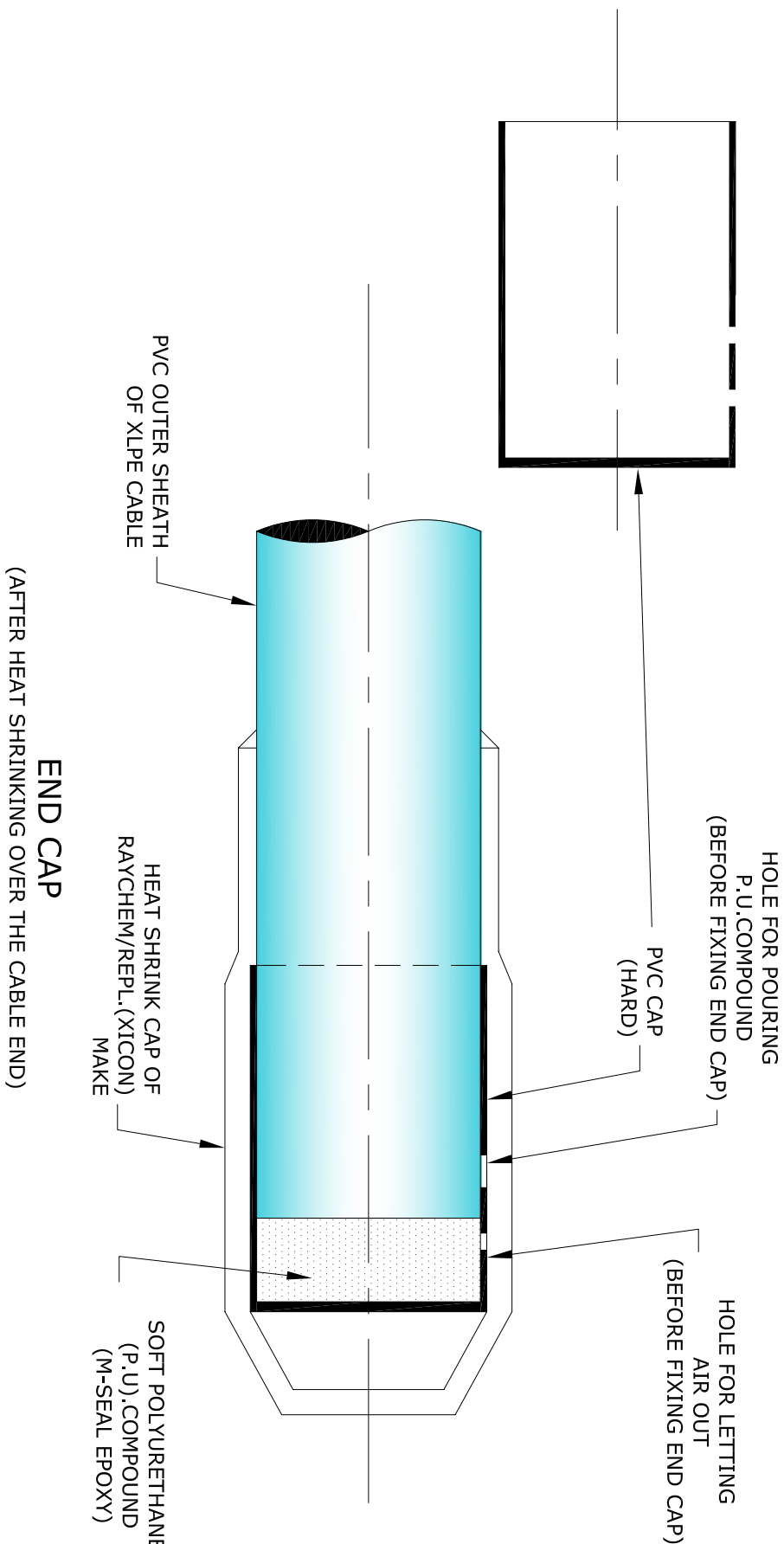
DIMENSIONS

SIZE	A	A	B	C	D	LC %	T
	EXP.(Min.)	REC.(Max)	EXP.(Min.)	EXP.(Min.)	EXP.(Min.)		(WALL REC. $\pm 20\%$)
EC 120/150	75	34	120	105	50	± 10	4.2
EC 240/300	100	62	130	110	70	± 10	3.5
EC 400	145	75	155	120	70	± 10	4.6

EXP - Expanded (as supplied), REC - Recovered freely, LC - Longitudinal Change, T - Wall Thickness, EC - End Cap



END CAP
(AS SUPPLIED)
SECTIONAL VIEW

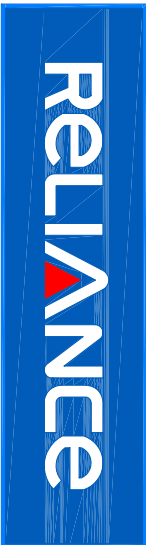


MATERIAL SPECIFICATIONS

	Characteristics	Test Class	Value	Test Method
A	Physical Properties			
1	Specific Gravity	Type	1.05 ± 0.2	ASTM D -1505
2	Water Absorption	Type	1 % (max)	ASTM D-570 / ISO 62
3	Tensile Strength	Routine	10 N /sqmm (min)	ASTM D-412 / ISO 37
4	Ultimate Elongation	Routine	300% (min)	ASTM D-412 / ISO 37
5	Hardness	Type	45 shore D ± 3	ASTM D -2240
6	Thermal Test			
B	Thermal Ageing (120° C for 500 hrs)			
1	Tensile Strength	Type	8 N/sqmm (min)	ASTM D-412 / ISO 37
2	Ultimate Elongation	Type	200% (min)	ASTM D-412 / ISO 37
C	Electrical Properties			
1	Volume Resistivity	Type	10 ¹² ohm-cm. (min)	ASTM D-257 / IEC 93
2	Dielectrical Strength	Type	10 kV/mm. (min)	ASTM D149 / IEC 243
3	Dielectric Constant	Type	5 (max)	ASTM D150 / IEC 250

Note : 1) All dimension in mm

- 2) Colour Black
- 3) Size as mentioned in the table shall be stencilled on respective item

		
DRAWING No. MISC/E/4-1131/1698		
SCALE :NOT TO SCALE	DATE: 09-05-2011	
<p align="center">END SEALING CAP (FOR XLPE CABLE)</p>		
DRAWN BY: BJR	CHECKED BY: AP/DS/PS	APPROVED BY:
REVISIONS		Addl V.P.

Annexure- F

QAP Format
(Quality Assurance Plan)
For H. T. Cables (Typical)
(Page 1 to 10)
[R4]

Typical Characteristics are mentioned in the above QAP format, which is appearing on the next pages.

Vendor shall submit the QAP, duly filled in, in accordance with IS / IEC standards and manufacturer's standards/procedures, for Purchaser's approval, during pre-order / post-order stages.



**QUALITY ASSURANCE PLAN (QAP)
FOR H. T. CABLES
(Typical Format)**

09.03.2012

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Sr. No.	COMPONENT			CHARACTERISTICS & OPERATIONS	UNIT	CLASS	Measuring Equipment / Technique	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT / TEST	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
A.	RAW MATERIALS															
1	Aluminium / Copper Rod	a)		Tensile strength	kg								P	P/V	V/W	
		b)		Resistivity at 20 Deg C	ohm-mm2/km								P	P/V	V/W	
		c)		Diameter	mm								P	P/V	V/W	
		d)		Chemical composition									P	V	V	
		e)		Surface finish	--								P	P	V/W	
		f)		Purity of Aluminium / Copper					One sample per PO				P	P	V/W	
2	PVC Compound	a)		Tensile Strength	N/sq.mm.								P	P/V	V	
		b)		Elongation at break	%								P	P/V	V	
		c)		Thermal stability	min.								P	P/V	V	
		d)		Additional test (for FRLS Sheathing compound only)												
		i)		Oxygen Index test									P	P/V	V	
		ii)		Temperature Index test									P	P/V	V	
		iii)		Smoke generation test									P	P/V	V	
		iv)		Acid gas generation test									P	P/V	V	
3	XLPE Compound	a)		Packing									P	V	V	
		b)		Tensile Strength	N/sq.mm.								P	P/V	V	
		c)		Elongation at break	%								P	P/V	V	
		d)		Hot set test	%								P	P/V	V	
		e)		Volume Resistivity	ohm-cm								P	P/V	V	
		f)		Cure Curve (Max. Torque)	lb-in								-	P	V	
		g)		Density	g/cc								P	P/V	V	
4	Semi-conducting Compound	a)		Packing									P	V	V	
		b)		Volume Resistivity									P	P/V	V	
		c)		Tensile Strength	N/sq.mm.								P	P/V	V	
		d)		Elongation at break	%								P	P/V	V	
		e)		Cure Curve (Max. Torque)	lb-in								-	P	V	
		f)		Density	g/cc								P	P/V	V	
		g)		Firmly bonded over conductor									P	P/V	V	
		h)		Easily strippable over XLPE insulation									P	P/V	V	
5	Copper Tape	a)		Thickness & width	mm x mm								P	P/V	V	
		b)		Tensile Strength	N/sq.mm.								P	P/V	V	
		c)		Elongation at break	%								P	P/V	V	
		d)		Resistivity	ohm-mm2/km								P	P/V	V	



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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
6	Armour wires/strips (Galvanised Steel)	a)		Dimensions	mm x mm								P	P/V	V	
		b)		Surface condition/finish	--								P	P/V	V	
		c)		Tensile Strength	N/sq.mm.								P	P/V	V	
		d)		Elongation at break	%								P	P/V	V	
		e)		Torsion test for round wire									P	P/V	V	
		f)		Wrapping test									P	P/V	V	
		g)		Mass of zinc coating	g/sq.m.								P	P/V	V	
		h)		Uniformity of zinc coating	dips								P	P/V	V	
		i)		Adhesion test									P	P/V	V	
		j)		Resistivity test	ohm-mm2/km								P	P/V	V	
7	Water Swellable Tape (Non-Woven)	a)		Dimensions	mm x mm								P	P/V	V	
		b)		Swelling height	mm								P	P/V	V	
		c)		Resistivity									P	P/V	V	
		d)		Mass	g/sq.m.								P	P/V	V	
8	Steel / Wooden Drum	a)		Dimension	mm						As per IS	-	P	P	V	
		b)		Finish & workman ship	--							-	P	P	V	
9	Cable Pulling Eye	a)		Dimensions & Material	mm							R-Infra approved drawing	-	P	P	V
		b)		Finish & workman ship	--							-	P	P	V	
		c)		Tension test on pulling eye	N/sq.mm.						R-Infra approved drawing	-	P	P	V	
10	Binder Tape			Dimensions & material	mm							-	P	P	V	
11	Poly-propylene Net Filler			Size								-	P	P	V	
12	Heat-shrinkable End Cap	a)		Bore diameter	mm						R-Infra approved drawing	-	-	P	V	
		b)		Length of end cap	mm						R-Infra approved drawing	-	-	P	V	
		c)		hot melt adhesive												
B. IN-PROCESS INSPECTION																
1	Wire Drawing	a)		Diameter	mm								-	P	V/W	
		b)		Surface finish	--								-	P	V/W	
		c)		Tensile test (for Al)	N/sq.mm.					IS: 8130/84	IS: 8130/84		-	P	V/W	
		d)		Elongation test (for Cu)					IS: 8130/84	IS: 8130/84		-	P	V/W		
		e)		Wrapping test (for Al)					IS: 8130/84	IS: 8130/84		-	P	V/W		
		f)		D.C. Resistance at 20 deg C	ohm-cm								-	P	V/W	
2	Stranding	a)		No. of wires/strands	no.								-	P	V	
		b)		Lay length & Lay direction	mm								-	P	V	
		c)		Dia of conductor	mm								-	P	V	
		d)		Surface finish	--								-	P	V	
		e)		Mass of conductor	kg							IS 8130/84	-	P	V	



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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
3	Core Extrusion (CCV) Conductor Screen + Insulation (XLPE with water-tree retardant property) + Insulation Screen	a)	Compound Make/Grade	--							-	-	P	V		
b)		i) Thickness of Conductor Screen ii) Thickness of Insulation iii) Thickness of Insulation Screen	mm					IS 7098 (Part 2) / 85	IS 7098 (Part 2) / 85		-	P	V			
c)		Surface finish	--								-	P	V			
d)		Printing on outer semi-conducting layer						"DO NOT HEAT, FREELY STRIPPABLE"			-	P	V			
e)		Tensile Strength						IS 7098(Part 2)/85	IS 7098(Part 2)/85		-	P	V			
f)		Elongation at break						IS 7098(Part 2)/85	IS 7098(Part 2)/85		-	P	V			
g)		Hot set test	%					IS 7098(Part 2)/85	IS 7098(Part 2)/85		-	P	V			
h)		Eccentricity of insulation	%								-	P	V			
i)		Core diameter and Ovality check on core	mm								-	P	V			
j)		Void & contamination test for insulation (Silicon Oil test)	no.								-	P	V/W			
k)		Condition of Triple Extrude									-	P	V/W			
l)		CCV tube pressure (N2) and temperature	bars & deg. C								-	P	V/W			
m)		Temperature of Extruder (65 mm, 80 mm, 150 mm)	deg C								-	P	V/W			
n)		Haul off / Line Speed	m/min								-	P	V/W			
o)		Dimensions and Condition of dies & nipple	mm								-	P	V/W			
p)		Freely strippable insulation screen (Strippability Test)							IS:7098/3, 93 Cl. No. 20	IS:7098/3, 93 Cl. No. 20	-	P	V/W			
q)	Water boil test for extruded semi-conducting layers							BIS draft Specn	BIS draft Specn	-	P	V/W				
r)	Longitudinal Water-Blocking Test							IEC 60502-2	IEC 60502-2	-	P	V/W				
4	Water Swellable Semi-conducting	a)	Dimensions (thickness x width)	mm x mm							-	P	V			
b)		Tape Application (Overlap)	%							-	P	V				
c)		Lay direction	--													
5	Copper Tape - taping	a)	Diameter under copper tape	mm							-	P	V			
b)		Dimensions (thickness x wid	mm x mm							-	P	V				
c)		Number of tapes								-	P	V				
d)		Tape application (Overlap)	%							-	P	V				
e)		Diameter over copper tape	mm							-	P	V				
6	Laying up	a)	Identification of cores	--							-	P	V			
b)		Direction of lay & core sequence	Measuring tape					IS 7098(Part 2)/85	IS 7098(Part 2)/85		-	P	V			
c)		Lay length	Scale								-	P	V			
d)		Shape of laid up assembly	--								-	P	V			
e)		P. P. Filler size	mm								-	P	V			
f)		Diameter over Lay-up	mm								-	P	V			



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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
7	Inner Sheath	a)		Material & type	--								-	P	V	
		b)		Thickness	mm					IS 7098(Part 2) / 85	IS 7098(Part 2) / 85		-	P	V	
		c)		Surface finish	--								-	P	V	
		d)		Colour of inner sheath									-	P	V	
		e)		Diameter over Inner Sheath	mm								-	P	V	
8	Armouring	a)		Dimension of wires/strips	mm								-	P	V	
		b)		No. of wires/strip	no.								-	P	V	
		c)		Armour coverage	%					IS 7098(Part 2)/85	IS 7098(Part 2)/85		-	P	V	
		d)		Direction of lay						IS 7098(Part 2)/85	IS 7098(Part 2)/85		-	P	V	
		e)		Lay length/Gear setting	mm								-	P	V	
		f)		Surface finish	--								-	P	V	
		g)		Diameter over Armour	mm								-	P	V	
		h)		Rubberised cotton tape over armour												
9	Outer Sheath	a)		Material & type								-	-	P	V	
		b)		Anti termite additives									-	P	V	
		c)		Thickness	mm								-	P	V	
		d)		Overall diameter of the Cable	mm								-	P	V	
		e)		Surface finish & colour of sheath	--								-	P	V	
		f)		Cable length verification									-	P	V	
		g)		Embossing / Printing / Sequential Marking							As per R-Infra's approved GTP/Cross-sectional drawing		-	P	V	
10	Cable Winding over the drum	a)		Cable appearance	--								-	P	V	
		b)		Ovality check over completed cable									-	P	V	
		c)		Drum appearance, including fixing of M. S. Spindle Plates	--								-	P	V	
		d)		Winding	--								-	P	V	
		e)		Packing	--								-	P	V	
		f)		Embossing / Printing	--								-	P	V	
		g)		Surface finish	--								-	P	V	
C. TESTING & INSPECTION																
1.	Type Tests			Type Tests at Vendor's works												
		a)		Tests on conductor					One sample							
			i)	Annealing test for copper						IS 8130/84	IS 8130/84		-	P	V	
			ii)	Tensile test for aluminium	N/mm2					IS 8130/84	IS 8130/84		-	P	V	
			iii)	Wrapping test for aluminium						IS 8130/84	IS 8130/84		-	P	V	
			iv)	Conductor resistance test	ohm/km					IS 8130/84	IS 8130/84		-	P	V/W	



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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
			b)	Tests on armouring wires/strips					One sample							
			i)	Dimensions of wire/strip	mm					IS 3975, IS 10810 Pt. 36			-	P	V/W	
			ii)	Tensile strength & Elongation at break	N/mm2					IS 3975	IS 3975		-	P	V/W	
			iii)	Torsion test for round wire						IS 3975	IS 3975		-	P	V/W	
			iv)	Winding test for strip (Wrapping Test for Al wires/formed wires only)						IS 3975	IS 3975		-	P	V/W	
			v)	Uniformity of zinc coating (for GS)	dips					IS 3975	IS 3975		-	P	V/W	
			vi)	Mass of zinc coating (for GS)	g/mm2					IS 3975	IS 3975		-	P	V/W	
			vii)	Adhesion Test						IS	IS		-	P	V/W	
			viii)	Resistivity of wire/strip	ohm-cm					IS 3975	IS 3975		-	P	V/W	
			c)	Test for thickness of insulation & sheath	mm				One sample	IS 7098(Part 2)/85			-	P	V/W	
			d)	Physical tests on insulation					One sample							
			i)	Tensile strength & Elongation test (before and after ageing)	N/mm2, %					IS 7098(Part 2)/85	IS 7098(Part 2)/85		-	P	V/W	
			ii)	Ageing in air oven						IS 7098(Part 2)/85	IS 7098(Part 2)/85		-	P	V/W	
			iii)	Hot set test	%					IS 7098(Part 2)/85	IS 7098(Part 2)/85		-	P	V/W	
			iv)	Shrinkage test						IS 7098(Part 2)/85	IS 7098(Part 2)/85		-	P	V/W	
			v)	Water absorption test (gravimetric)						IS 7098(Part 2)/85	IS 7098(Part 2)/85		-	P	V/W	
			vi)	Eccentricity test									-	P	V/W	
			e)	Physical tests on outer sheath					One sample							
			i)	Tensile strength & Elongation test at break (before and after ageing)						IS 5831/84	IS 5831/84		-	P	V/W	
			ii)	Ageing in air oven						IS 5831/84	IS 5831/84		-	P	V/W	
			iii)	Shrinkage test	%					IS 5831/84	IS 5831/84		-	P	V/W	
			iv)	Hot deformation test						IS 5831/84	IS 5831/84		-	P	V/W	
			v)	Loss of mass test in air oven						IS 5831/84	IS 5831/84		-	P	V/W	
			vi)	Heat shock test						IS 5831/84	IS 5831/84		-	P	V/W	
			vii)	Thermal stability test	deg C, time					IS 5831/84	IS 5831/84		-	P	V/W	
			viii)	Cold Bend Test						IS 5831/84	IS 5831/84		-	P	V/W	
			ix)	Cold Impact Test						IS 5831/84	IS 5831/84		-	P	V/W	



**QUALITY ASSURANCE PLAN (QAP)
FOR H. T. CABLES
(Typical Format)**

09.03.2012

Legend : SV : Sub-Vendor of Cable Manufacturer, MFR : Cable Manufacturer, R-Infra : Reliance Infra-Structure Ltd., PS : Purchase Specification of Cable Vendor, R-Infra Spec. - R-Infra Specification
P - Perform , V - Verify , W - Witness

Sr. No.	COMPONENT			CHARACTERISTICS & OPERATIONS	UNIT	CLASS	Measuring Equipment / Technique	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT / TEST	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			Remarks					
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17					
		f)		Electrical Tests					One sample												
		i)		Partial discharge test	pC					IS 7098(Part 2)/85	IS 7098(Part 2)/85			-	P	V/W					
		ii)		Bending test							IS 7098(Part 2)/85	IS 7098(Part 2)/85			-	P	V/W				
		iii)		Partial discharge test	pC						IS 7098(Part 2)/85	IS 7098(Part 2)/85			-	P	V/W				
		iv)		Dielectric power factor test (as a function of voltage)							IS 7098(Part 2)/85	IS 7098(Part 2)/85			-	P	V/W				
		v)		Dielectric power factor test (as a function of temperature)							IS 7098(Part 2)/85	IS 7098(Part 2)/85			-	P	V/W				
		vi)		Heating cycle test	deg C, hrs., nos.						IS 7098(Part 2)/85	IS 7098(Part 2)/85			-	P	V/W				
		vii)		Dielectric power factor as a function of voltage							IS 7098(Part 2)/85	IS 7098(Part 2)/85			-	P	V/W				
		viii)		Partial discharge test	pC						IS 7098(Part 2)/85	IS 7098(Part 2)/85			-	P	V/W				
		ix)		Impulse withstand test							IS 7098(Part 2)/85	IS 7098(Part 2)/85			-	P	V/W				
		x)		High voltage test	kV, min.						IS 7098(Part 2)/85	IS 7098(Part 2)/85			-	P	V/W				
		g)			Insulation Resistance test (Volume Resistivity test)	ohm-cm					One sample	IS 7098(Part 2)/85	IS 7098(Part 2)/85			-	P	V/W			
		h)			Flammability Test							One sample	IS 7098(Part 2)/85	IS 7098(Part 2)/85			-	P	V/W		
		i)			Water Penetration Test (WPT) on core (Longitudinal Water-Blocking test)							One sample	IEC 60502-2	IEC 60502-2			-	P	V/W		
		j)			Freely strippable insulation screen (Strippability Test)												-	P	V/W		
		k)			Ovality check on core												-	P	V/W		
		l)			Ovality check on completed Cable												-	P	V/W		
		m)			Check on fixing of M.S. Spindle Plates												-	P	V/W		
		o)				Additional tests on FRLS-type cables only															
		1)				Tests on FRLS outer sheath						One sample									
						i) Oxygen Index test												-	P	V	
						ii) Temperature Index test												-	P	V	
						iii) Acid gas generation test												-	P	V	
						iv) Smoke density test												-	P	V	
				2)						One sample	IS 7098 (Part 2)/85 / IEC 332 (Part 3- Category B)	IS 7098 (Part 2)/85			-	P	V/W				



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Sr. No.	COMPONENT			CHARACTERISTICS & OPERATIONS	UNIT	CLASS	Measuring Equipment / Technique	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT / TEST	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
2.	Routin Tests	a)		High Voltage	kV, min.				100 %	IS 7098(Part 2)/85	IS 7098(Part 2)/85		-	P	V	
		b)		Conductor Resistance	ohm/km				100 %	IS 8130/84	IS 8130/84		-	P	V	
		c)		Partial Discharge	pC				100 %	IS 7098(Part 2)/85	IS 7098(Part 2)/85		-	P	V	
		d)		Freely strippable insulation screen (Strippability Test)									-	P	V	
3.	Acceptance Tests	a)		Annealing test for copper					Appendix A to IS 7098(Part 2)/85	IS 8130/84	IS 8130/84		-	P	V	
		b)		Tensile test for aluminium						IS 8130/84	IS 8130/84		-	P	V	
		c)		Wrapping test for aluminium						IS 8130/84	IS 8130/84		-	P	V	
		d)		Conductor resistance test	ohm/km					IS 8130/84	IS 8130/84		-	P	W	
		e)		Test for thickness of insulation & sheath						IS 7098(Part 2)/85	IS 7098(Part 2)/85		-	P	W	
		f)		Eccentricity test on insulation												
		g)		Hot set test for insulation	%					IS 7098(Part 2)/85	IS 7098(Part 2)/85		-	P	W	
		h)		Tensile strength & Elongation at break of insulation & outer sheath	N/mm2, %				Appendix A to IS 7098(Part 2)/85	IS 7098 (Part 2) / 85 & IS 5831/84 (Type ST2)			-	P	W	
		i)		Partial discharge test	pC					IS 7098(Part 2)/85	IS 7098(Part 2)/85		-	P	W	
		j)		High voltage test	kV, min.					IS 7098(Part 2)/85	IS 7098(Part 2)/85		-	P	W	
		k)		Insulation resistance (Volume resistivity) test	ohm-cm					IS 7098(Part 2)/85	IS 7098(Part 2)/85		-	P	W	
		l)		Tests for dimension and number of armour wires/strips	mm					IS 3975, IS 10810 Pt. 36			-	P	W	
		m) i)		Test for anti-termite property of outer sheath									-	P	W	
		ii)		Test for anti-rodent property of outer sheath									-	P	W	
		n)		Winding of cable on drum To check : i) cable appearance ii) drum appearance iii) cable winding iv) packing v) embossing / printing vi) length verification vii) mass of cable viii) ovality check on completed cable x) Fixing of M. S. Plates					One drum from offered lot				-	P	W	

Annexure- G

Testing and manufacturing process requirements w. r. t. TR- XLPE insulation

All cables made with TR-XLPE Insulation should be tested and/or certified to meet the following performance parameters as per ANSI /ICEA S-94-649 after one year AWTT.

Property	Units	Requirements Values
Min. Avg. Electrical Breakdown Strength(qual. test)	Kv/mm	≥ 25
Impulse Strength	Kv/mm	≥ 83
Water Tree Length	mm	0.25
Max. Bowtie Tree Density	(Number per 16.4 cu. cm)	Maximum 15 (0.12-0.25 mm range)

Manufacturing processes to produce high-quality cables with the following characteristics:

- Cure consistency with hot set/creep less than 100%
- No voids larger than 75 microns per 16.4 cubic cm
- No ambers larger than 250 microns per 16.4 cubic cm
- No contaminants larger than 125 microns and less than 5 between 50-125 microns per cubic 16.4 cubic cm tested.
- Neutral indent on cable is less than 375 microns
- Cable insulation concentricity greater than 90% tested
- No protrusions greater than 75 microns at the conductor shield and 125 microns at the insulation shield

**TECHNICAL SPECIFICATION
FOR
66kV 3Cx300 sq mm CABLE
Specification No. : SP-66kV3C-123-R0**

PREPARED BY	REVIEWED BY	APPROVED BY	REV	00
Ankita Arora	Gaurav Sharma	Ashwani Aggarwal	DATE	July 09, 2018
Ankita	Gaurav	Ashwani	PAGE	1 of 17

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TECHNICAL SPECIFICATION FOR 66kV 3-CORE CABLE**1.0 SCOPE OF SUPPLY**

This specification covers technical requirements of design, manufacture, testing at manufacturer's works, packing, forwarding, supply and unloading at stores/site, performance of 66 kV 3Cx300 sq. mm cable complete with all accessories for trouble free and efficient operations.

2.0 CODES & STANDARDS

Materials and methods used in the manufacturing of Cables shall conform to the latest edition of following –

IS 7098 (Part-3)	Specification for Cross-linked polyethylene insulated PVC sheathed Cables Part: 3 - For working voltages from 66 kV upto and including 220 kV
IS 8130	Specification for Conductor for insulated electric cables & flexible Cords
IS 5831	Specification for PVC insulation and sheath of electric Cables
IS : 3975	Mild steel wires, formed wires and tapes for Armouring of Cables
IS: 5216	Guide for Safety procedures and practices in electric works
IS: 10418	Specification for Drums for Electric Cables
IS: 10810	Methods of test of cables
IEC-60228	Conductor for insulated cables
IEC-60502	Power cables with extruded insulation and their accessories for rated voltages from 1 kV (Um = 1.2 kV) up to 30 kV (Um = 36 kV) - Part 2: Cables for rated voltages from 6 kV (Um = 7,2 kV) up to 30 kV (Um = 36 kV)
IEC-60811	Test methods for insulations and sheaths of electric cables and cords.
IEC 60840	Power cables with extruded insulation and their accessories for rated voltages above 30 kV (Um = 36 kV) up to 150 kV (Um = 170 kV) - Test methods and requirements.

TECHNICAL SPECIFICATION FOR 66kV 3-CORE CABLE

3.0 Cable Design Features

S.NO	DESCRIPTION	REQUIREMENT
3.1	Manufacturing Process	The cable shall be manufactured by “Triple head extrusion process”. The conductor screen, Insulation & Insulation screen shall all be extruded in tandem to ensure homogeneity and reduction of voids in the insulation and the screening system of the cable, whereby enhancing the life of the cable. The cable shall be strictly manufactured by “Dry Cured and Dry- Cooled” process.
3.2	Conductor	Electrolytic grade Aluminum conductor shall H2 grade, class-2 in accordance with IS 8130/IEC 228. The shape of conductor shall be compacted, stranded and circular.
3.3	Longitudinal water sealing of conductor	Shall be achieved by water swelling tapes in the interstices of the conductor. The fiber/tape shall turn into jelly/swell, when in contact with water making the conductor water tight as per IEC 60502-2.
3.4	Semi conducting water blocking tape	Semi-conducting water blocking tapes shall be applied over the conductor and it shall be suitable for continuous operating conductor temperature of 90 deg C.
3.5	Conductor Screen	The conductor screen shall consist of extruded semi conducting XLPE compound which shall be fully compatible with the conductor and extruded insulation. Outer surface of semiconductor screen shall be super smooth, and firmly bonded to the overlaying insulation. The minimum Thickness of conductor screen shall be 0.8 mm.
3.6	Insulation	The extruded XLPE insulation shall Water TREE-RETARDANT and of very high degree of purity with nominal thickness of 11 mm. The minimum thickness at any point shall not be less or more than 10% of the nominal value. Percentage eccentricity of the insulation shall not be more than 10%. The insulation properties shall be stable under Thermal conditions arising out of continuous operation at conductor temperature of 90 deg C rising to 250 Deg C under short circuit conditions.
3.7	Insulation Screen	The insulation screen shall consist of extruded semi conducting compound which shall be fully compatible with extruded insulation. Insulation screen shall be firmly bonded to the insulation. The minimum Thickness of insulation screen shall be 0.8 mm.

TECHNICAL SPECIFICATION FOR 66kV 3-CORE CABLE

3.8	Make of insulation and semi conducting screen	For Insulation: TR-XLPE of Dow/Borealis/Hanwa For Conductor & Insulation Screen: Semiconducting compound of Dow/Borealis/Hanwa Any deviation to above shall not be acceptable
3.9	Core ovality	The ovality of the core shall not be more than 5%.
3.10	Inner Longitudinal water sealing bedding	Semi-conducting water swellable tapes shall be applied over the extruded semi-conducting core screening. Nominal Thickness of the Swellable Tape = 0.3 mm. The swell speed shall be greater than 12mm/minute. Water Swellable Tape overlap: Minimum 10%
3.11	Metallic Screen	The metallic Screen shall consist of a layer of annealed copper tape of minimum 0.1mm thickness and shall be applied over the semi-conducting water-swellable tape Copper tape overlap: Minimum 10%
3.12	Core Identification	Cores shall be identified by colored strips (Red, Yellow, Blue), applied helically over the copper tape. The colored strips shall carry the name of manufacturer permanently printed at close intervals; this is to provide additional identification of manufacturer of the cable.
3.13	Inner Longitudinal water sealing bedding (2 nd Layer)	Semi-conducting water swellable tapes shall be applied over the metallic screen again with a minimum overlap of 10 %. Nominal Thickness of the Swellable Tape = 0.3 mm. The swell speed shall be greater than 12mm/minute.
3.14	Fillers	Balance fillers including center fillers used in 3-Core cables shall be of PP Fillers grade along with sufficient water blocking tape to make it water tight construction.
3.15	Laying up of Cores	All the 3-Core, along with Fillers shall be laid in the suitable right hand lay.
3.16	Inner Sheath	Extruded PE ST7 conforming to requirements of IEC 60502-2 with latest amendments. The minimum thickness of the inner sheath shall be 2 mm. A non-conducting water blocking tape with approx. 10% overlap shall be applied over the inner sheath. Carbon black content shall be 2.5 ±0.5%
3.17	Armour	The armour shall be of galvanized round steel wires of minimum 4 mm dia complying the requirements of IS 3975 with latest amendments. The armour wires shall be applied with minimum 90% coverage. The joints in the armour round wires shall be made by brazing or welding and the surface irregularities shall be removed. A joint in the wire shall be at least 300 mm from the nearest joint in any other armour wire in the completed

TECHNICAL SPECIFICATION FOR 66kV 3-CORE CABLE

		<p>cable.</p> <p>The short circuit capacity of armour shall be 31.5 kA for 1 second. Calculation for same shall be submitted for approval.</p>
3.18	Binder Tape	Rubberized cotton tape shall be wrapped with approx 10% overlap over armour .
3.19	Outer Sheath	<p>The outer sheath shall consist of extruded black coloured HDPE type ST 7 as per IEC 60502-2 with anti-termite protection,</p> <p>The minimum thickness shall be 3mm at any point.</p> <p>Semi conductive layer coating shall be provided over the outer sheath.</p> <p>Carbon black content shall be 2.5 ±0.5%</p>
3.20	Drum Length	<p>300m ± 5% (short lengths not acceptable except the last length and minimum acceptable short length shall be 150m). The overall quantity tolerance shall be as purchase order.</p> <p>In any Purchase Order, only one short length shall be allowed unless approval regarding the same is not taken from CES BYPL in advance. In any case two short lengths shall not be wound in single cable drum.</p>
3.21	Embossing	<p>The extruded outer sheath shall be embossed with meter marking at interval of 1 meter. The outer sheath shall also be embossed with (min.)</p> <ol style="list-style-type: none"> Voltage designation Type of construction/cable code (i.e. A2XCEW2Y) Number of core and nominal cross sectional area Type of cable "Electric Cable" Manufacturers name & trade mark Name of buyer (e.g. BYPL) Month & year of manufacturing Batch no / Lot no. Sequential length marking Purchase order number & date ISI mark <p>Font size of characters shall be 10x5mm</p>
3.22	Joints and Terminations	<p>The Joints and Terminations to be offered with the cable shall be fully type tested as per IS 60840.</p> <p>The Joints and Terminations shall match all technical performance parameters of the specified cable.</p> <p>The Joints and Terminations would be either Heat Shrink or Cold-Shrink.</p>

TECHNICAL SPECIFICATION FOR 66kV 3-CORE CABLE
4.0 Quality Assurance, Inspection & Testing

4.1	Vendor quality plan	To be submitted for purchaser approval
4.2	Inspection points	To be mutually identified & agreed in quality plan
4.3	Type Test	<p>The cable and the associated accessories like Joints and Terminations of same voltage, design and number of cores shall be of Type Tested from CPRI/ERDA as per IEC 60840 /IS7098 (part-3) with latest amendments.</p> <p>Type test report of not more than five (5) years shall be submitted for the same type, size and rating of the cable offered, along with the bid.</p> <p>All type tests shall be carried out in accordance with IEC-60840 / IS 7098 (part-3) and in accordance with the sequence prescribed therein.</p>
4.4	Short Circuit Test of Armour	<p>The bidder shall furnish short circuit test report of 31.5 kA for 1 second from CPRI/ERDA for the same voltage, size and design.</p> <p>This short circuit test shall be preceded and succeeded by high voltage, Partial Discharge, Armour Resistance and Conductor Resistance Test. Test report shall not be more than five (5) years old.</p>
4.5	Routine test	Each drum length of cable shall be subjected to the tests as mentioned in IEC 60840, IS 7098 (Part-3), IEC 60229 and IS 10810
4.6	Acceptance Test	<p>Shall be conducted as per IEC: 60840/ IS: 7098 (part-3) and approved QA plan for each lot of cable.</p> <p>The following tests shall be carried out as special tests</p> <ul style="list-style-type: none"> • Conductor examination as per IEC-60840 for conformance of IEC 60228/IS 8130. • Void and contamination as per IS 7098 (Part-3), • Abrasion resistance as per BS 7835. • Sheath Integrity Test • Carbon black content test in Inner sheath & Outer sheath

	SP-66kV3CC-123-R0
TECHNICAL SPECIFICATION FOR 66kV 3-CORE CABLE	

4.7	Inspection	<p>The buyer reserves the right to inspect cables at the Seller's works at any time prior dispatch, to verify compliance with the specifications.</p> <p>In-process and final inspection call intimation shall be given in 10 days advance to purchaser.</p> <p>In the event of any discrepancy in the test reports i.e test reports not acceptable or any type tests(including special / additional tests, if any) not carried out , same shall be carried out without any cost implication to BSES before dispatch of cable.</p>
4.8	Test Certificates	<p>Three sets of complete test certificates shall be submitted along with the dispatch documents.</p>

5.0 Shipping, Handling and Site Support

5.1	Packing	<p>The cable shall be wound on non-returnable steel drums of suitable size of minimum hub diameter of 15D (where D is the overall diameter of the cable) and packed conforming to international standards. The drum shall be fully enclosed by suitable packing preferably PP sheeting. Cable shall have sea worthy packing in case cables are dispatched by shipping lines.</p>
5.2	Pulling eye & sealing of cable ends	<p>A cable pulling eye shall be provided at "Z" end of cable on each drum. Suitable fillings/putty shall be used for sealing gap between outer sheath and pulling eye. Heat shrinkable sleeves with the pulling eye shall also be provided. The pulling eye shall be directly connected to the conductor and be capable to withstand a tensile load of 30N / sq mm of conductor area. The "A" end of the cable shall be sealed with heat shrinkable cap. Drawing of the pulling eye shall be submitted along with the bid for review.</p>

TECHNICAL SPECIFICATION FOR 66kV 3-CORE CABLE

5.3	Drum Identification Label	The following information shall be marked on the drum: <ol style="list-style-type: none"> Drum identification number Trade name or trade mark; if any Name of manufacturer Name of buyer i.e. BYPL Nominal sectional area of the conductor of the cable Type of cable and voltage for which it is suitable Length of the cable on the drum, with "A" end and "Z" end markings Purchase order number with SAP item code Year and month of manufacturing Direction of rotation of drum (an arrow) Net weight of cable in drum and gross weight of cable with drum Batch no or Lot no.
5.4	Shipping	The seller shall give complete shipping information concerning the gross weight, size of each packing.
5.5	Handling & Storage	Manufacturer instruction shall be followed. Detail handling & storage instruction sheet / manual needs to be furnished before commencement of supply.
5.6	Transit damage	The seller shall be responsible for any transit damage due to improper packing.

6.0 Progress Reporting

6.1	Outline Document	To be submitted for purchaser approval for outline of production, inspection, testing, packing, dispatch, documentation programmer.
6.2	Detailed Progress Report	To be submitted to Purchaser once in a month containing <ol style="list-style-type: none"> Progress on material procurement Progress on internal stage inspection Reason for any delay in total program Details of test failures if any in manufacturing stages Progress on final box up Constraints / forward path

TECHNICAL SPECIFICATION FOR 66kV 3-CORE CABLE
7.0 Deviations

7.1	Deviation	Deviations from this Specification shall be stated in writing with the tender by reference to the Specification clause/GTP/Drawing and a description of the alternative offer. In absence of such a statement, it will be assumed by the Buyer that the Seller complies fully with this specification.
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8.0 Document Submission

Document/Drawing submission shall be as per the matrix given below. All documents/drawings shall be provided in both hard and soft copy with separators for each section. Hard copy shall be provided in box file on A4 size paper. Where document legibility is not possible in A4 size, size of paper shall be appropriately increased. Language of the documents shall be English only. Incomplete bids shall be liable for rejection.

S No.	Detail of Document	Bid	Approval	Pre Dispatch
1	Guaranteed Technical Particulars (GTP)	Required	Required	
2	Deviation Sheet, if any	Required	Required	
3	Detailed cross sectional drawing of cable	Required	Required	
4	Type test reports of offered type and rating of cable and Joints & terminations	Required	Required	
5	Type test report of armour short circuit current carrying capacity as per clause 4.4 of this specification	Required	Required	
6	BIS certificate	Required		
7	Complete cable catalogue	Required		
8	Make of Raw Materials	Required	Required	
9	Cable de-rating factors	Required	Required	
10	Dimensional drawing for pulling eye & End cap		Required	
11	Armour coverage calculation		Required	
12	Manufacturer's quality assurance plan		Required	
13	Inspection test reports, carried out in manufacturer's works			Required
14	Routine Test Certificates			Required
15	Test certificates of all raw materials			Required

TECHNICAL SPECIFICATION FOR 66kV 3-CORE CABLE

Annexure – A: Service Conditions

1.0.0	Delhi Atmospheric conditions	
a)	Average grade atmosphere :	Heavily polluted, dry
b)	Maximum altitude above sea Level	1000 M
c)	Ambient Air temperature	Highest 50 deg C, Average 40 deg C
d)	Minimum ambient air Temperature	Deg C
e)	Relative Humidity	90 % Max
f)	Seismic Zone	4
g)	Rainfall	750 mm concentrated in four months

TECHNICAL SPECIFICATION FOR 66kV 3-CORE CABLE
Annexure – B: Guaranteed Technical Particulars (Data by Supplier)

S. No.	Description	Unit	Data specified by the purchaser	Data to be filled by the manufacturer
1	Name of manufacturer			
2	Country of manufacturer			
3	Type of cable			
4	Standard according to which cable is manufactured			
5	Rated voltage	kV	38/66	
6	Highest system voltage	kV	72.5	
7	System frequency	Hz	50	
8	No. of phases per circuit	Nos	3	
9	System earthing		Solidly Grounded	
10	Rated short time current of conductor	kA		
11	Rated short time current of armour	kA	31.5 for 1 sec	
12	Rated short time current of metal screen	kA		
13	Rated short time current of armour and screen for 1 sec	kA		
14	Impulse withstand voltage 1.2/50 micro sec wave	kVp	325	
15	Power frequency withstand voltage	kV (rms)	95 for 30 minutes	
16	Conductor			
a	Nominal cross sectional area	sqmm	300	
b	Type class of conductor		Compacted Stranded Circular	
c	Material of conductor		Aluminium	
d	Flexibility class of conductor		Class-2	
e	Minimum numbers of strands	Nos		
f	Diameter of strands before compaction (nominal/minimum)	mm/mm		
g	Material of longitudinal water sealing filling of conductor			
17	Details of semi conducting tape over conductor			
18	Conductor Screen			
a	Material and Type			
b	Minimum thickness	mm	0.8	
	Make and grade of semiconducting compound			

TECHNICAL SPECIFICATION FOR 66kV 3-CORE CABLE

19	Insulation			
a	Material of insulation		TR-XLPE	
b	Nominal thickness	mm	11	
c	Make and grade of insulation compound			
d	Maximum dielectric stress at the conductor surface	kV/mm		
20	Insulation Screen			
a	Material and type			
b	Minimum thickness	mm	0.8	
c	Make and grade of semi conducting compound			
21	Inner water swellable semi conducting tape			
a	Nominal thickness	mm	0.3	
b	Minimum swell height in one minute	mm	12mm in one minute	
c	Overlap	%	10 minimum	
22	Min thickness of copper tape	mm	0.1	
a	Width of copper tape	mm		
b	Overlap of copper tape	%	10 minimum	
23	Outer water swellable semiconducting tape			
a	Nominal thickness	mm	0.3	
b	Minimum swell height in one minute	mm	12mm in one minute	
c	Overlap	%	10 minimum	
24	Nominal diameter over laying up of each core	mm		
25	No. and material of fillers	No./material		
26	No. of water blocking tape	No./material		
27	Material of Inner sheath		PE ST7	
28	Method of Extrusion		As per manufacturer	
29	Minimum thickness of Inner sheath	mm	2	
30	Nominal diameter over Inner sheath	mm		
31	Non conducting water blocking tape over Inner sheath			
a	Nominal thickness	Mm	0.3	
b	Minimum swell height in one minute	mm	12mm in one minute	
c	Overlap	%	10 minimum	
32	Armour			
a	Nominal Diameter	mm	4	
b	No. of wires	No's	Vendor to specify	
c	Armour coverage	%	90	
d	Area of armour			

TECHNICAL SPECIFICATION FOR 66kV 3-CORE CABLE

e	Short circuit capacity of armour	kA/1 sec	31.5, Vendor to submit short circuit calculation	
f	Binder tape over armour		RC tape	
33	Outer Sheath			
a	Material and type	HDPE type ST7		
b	Minimum thickness	mm	3	
c	Colour	Black		
34	AC test voltage at works for insulation	kV (rms)	95	
35	DC test voltage for outer sheath	kV (DC)	25	
36	Overall dia of complete cable	mm		
37	Weight per meter of complete cable	Kg/m		
38	Short circuit capacities with maximum conductor temperature of 250 Deg C: (conductor temperature of 90 Deg C at the commencement of short circuit) 0.5 second duration 1 second duration 2 second duration 3 second duration	kA		
39	Minimum radius of bend round: Which cable can be laid - Direct burial in ground - In ducts	mm		
40	Maximum D.C .resistance of conductor per Km at 20 deg	Ohm/Km	0.100	
41	Maximum A.C .resistance of conductor per Km at 90 deg	Ohm		
42	Equivalent star reactance per KM of 3 phase circuit at 50 Hz	Ohm		
43	Maximum electrostatic capacitance per KM of cable	pf		
44	Maximum continuous current carrying capacity per circuit when laid in ground as per the following parameters -Maximum continuous conductor temperature of 90deg C -Maximum conductor temperature during short circuit of 250deg C -Ground temperature of 30deg C -Soil resistivity of 150degC-cm/Watt -Depth of laying of 150cm	Amp		

TECHNICAL SPECIFICATION FOR 66kV 3-CORE CABLE

45	Maximum continuous current carrying: capacity per cable when laid in air with ambient temperature of 40DegC and other parameters	Amp		
46	Rating factors for ambient air temperature attached	Yes/No		
47	Rating factors for ground temperature attached	Yes/No		
48	Rating factors for grouping of cable laid in ground in horizontal formation attached	Yes/No		
49	Rating factors for grouping of cable laid in ground in tri-foil touching formation attached	Yes/No		
50	Rating factors for thermal resistivity of soil attached	Yes/No		
51	Rating factors for depth of laying attached	Yes/No		
52	Max. power factor of charging KVA of: cable when laid direct in the ground at normal voltage frequency at conductor tem at 90Deg .C			
53	Max. dielectric power loss of cable per Km of 3 phase circuit laid direct in ground at normal voltage, frequency and maximum conductor temperature of 90Deg C			
54	Impedance per KM of 3 phase circuit: at 50 C/s and maximum conductor temperature. a) Positive and negative sequence b) Zero sequence	Ohm		
55	Standard drum length of cable	meters	300 ± 5% (short length not acceptable except the last length)	
56	The overall quantity tolerance	%		
57	Cable to be wound on non-returnable steel drum	Yes/No	Yes	
58	Cable pulling Eye to be provided at "Z" end		30 N/sqmm	
59	Tensile load withstand capacity for pulling eye	Kg		
60	Approximate shipping weight for the normal deliver length with the drum size (flange dia. in mm and			

TECHNICAL SPECIFICATION FOR 66kV 3-CORE CABLE

	width in mm)			
61	Drum size (Flange dia x flange width x hub dia)			
62	Embossing details on outer sheath			
63	Sequential marking at every meter		Provided	
64	Process of cross linking of polyethylene			

TECHNICAL SPECIFICATION FOR 66kV 3-CORE CABLE

Annexure –C: Cross Sectional Drawing (Data by Supplier)

Pictorial Label No.	Reference Clause No	Description	Nominal Thickness in mm	Nominal Diameter in mm
1	3.2 & 3.3	Compacted, stranded, circular water blocked aluminium Conductor		
2	3.4	Semi-conducting water blocking tape		
3	3.5	Conductor screen		
4	3.6	TR-XLPE insulation		
5	3.7	Insulation screen		
6	3.10	Semiconducting water blocking Tape		
7	3.11	Metal screening of a copper tape applied in helical form		
8	3.13	Semiconducting water blocking Tape		
9	3.14	PP Fillers		
10	3.14	Water blocking tape		
11	3.16	PE extruded inner sheath		
12	3.16	Non conducting water blocking Tape		
13	3.17	G.S Round Wire Armour		
14	3.18	RC Tape		
15	3.19	HDPE outer sheath		



Specification for HT Cable
(38/66kV : Single Core)

Specification no – SP-EWH2-01-00

Prepared by:	Reviewed	Approved by:	Rev	Date
Tarun Dey	Devendra Sharma	Debabrata Guha	00	5-Jan-10

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1.0.0 Codes & standards

Materials and methods used in the manufacture of Cables shall conform to the latest edition of following –

Indian Standards

IS-8130	Conductor for insulated electric cables & flexible cords
IS-5831	PVC insulation and sheath of electric cables
IS-3975	Mild steel wires strips and tapes for armoring cables
IS-5216	Guide for safety procedures and practices in electrical works
IS-7098 (Part – III)	Cross-linked polyethylene insulated thermoplastic sheathed cables specification.
IS – 10810:1984	Methods of test of cables

IEC Standards

IEC-60811	Common test methods for insulating and sheathing materials of electric cables and optical cables
IEC-60228	Conductor for insulated cables
IEC-60840	Power cable with extruded insulation and their accessories for rated voltage above 30kV up to 150kV- Test methods and requirements

2.0.0 Cable design features

(Refer Annexure – “D”)

2.1.0	Manufacturing process	The cable shall be manufactured by “Tripple head extrusion process”. The conductor screen , Insulation & Insulation screen shall ALL be extruded in SINGLE POINT AT ONE TIME PROCESS to ensure homogeneity and reduction of voids, in the insulation and the screening system of the cable, whereby enhancing the life of the cable. The cable shall be strictly manufactured by “DRY CURED” process.
2.2.0	Conductor	Electrolytic grade aluminium conductor shall consist of flexibility class-2 in accordance with IS 8130/IEC 228. The shape of conductor shall be compacted, stranded, and circular. Milliken type construction will be preferred for cable size of 1000 sqmm or greater.

2.3.0	Longitudinal water sealing of conductor	Shall be achieved by water swelling powder/fibres in the interstices of the conductor. The powder/fibre/yarn shall turns into jelly, when in contact with water
2.4.0	Semi conducting separator tape	Semi-conducting separator tapes shall be applied over the conductor, suitable for continuous operating conductor temperature of 90 deg C.
2.5.0	Conductor screen	The conductor screen shall consist of extruded semi-conducting XLPE which shall be fully compatible with the conductor and extruded insulation. Outer surface of semiconductor screen shall be supper smoothing, cylindrical and firmly bonded to the overlaying insulation.
2.6.0	Insulation	The extruded XLPE insulation shall be of very high degree of purity. The average thickness shall not be less than nominal value as given in annexure C. The minimum thickness at any point shall not be less by more than 10% of the nominal value. Percentage eccentricity of the insulation shall not be more than 10%.
2.7.0	Insulation Screen	The insulation screen shall consist of extruded semi-conducting XLPE which shall be fully compatible with extruded insulation. Insulation screen shall be firmly bonded to the insulation
2.8.0	Make of insulation and semi conducting screen	DOW – TR XLPE or equivalent of Borealis (any deviation to above shall not be acceptable unless and until it has been specially approved by BSES prior to sourcing of compounds and manufacturing of cable.
2.9.0	Core	The ovality of the core shall not be more than 5%.
2.10.0	Inner Longitudinal water sealing bedding	Semi-conducting water swellable tapes shall be applied over the extruded semi-conducting core screening.
2.11.0	Metal screening (if required to meet the short circuit rating)	The metallic screen shall consists of a layer of copper wires, followed by a copper tape applied in helical form
2.12.0	Outer Longitudinal water sealing bedding (when metallic screening is	Semi-conducting water swellable tapes shall be applied over the metallic screening.

	provided)	
2.13.0	Characteristic of water swellable bedding	a) Nominal thickness = 0.3mm b) Swell height shall be ≥ 12 mm in one minute.
2.14.0	Metallic sheath	The metallic sheath shall consist of EITHER lead alloy 'E' seamless sheathing with minimum thickness in accordance with Table-6 of IS 7098 Part – III (1993) OR corrugated aluminium sheathing with minimum thickness of 1.75mm and nominal thickness of 1.8mm, provided with high-viscosity bitumen-based compound coating, in conjunction with textile tape as carrier material for corrosion protection of the outer surface of corrugated aluminium sheathing. Further the corrugations shall be filled with compatible filler material to provide smooth round surface over the aluminium corrugated sheathing, so as to prevent ingress / traveling of water along the corrugations.
2.15.0	Outer Jacket	The outer jacket shall consist of extruded black colored HDPE type ST 7 with anti termite protection. The minimum thickness at any point shall not fall below 85% of the nominal thickness by more than 0.1mm. Nominal thickness shall be 4mm.
2.16.0	Semi conductive layer over the outer jacket	Semi conductive layer shall be either extruded or graphite coating
2.17.0	Cable Rating	The cable size shall be suitable to carry rated load current on 66KV continuously without exceeding the maximum conductor temperature of 90 deg. C.
2.18.0	Drum Length	500 Mtr \pm 5 % (short lengths not acceptable except the last length and minimum acceptable short length shall be 250 mtrs.). The overall quantity tolerance shall be as purchase order. Manufacturer shall not be allowed to put two cable pieces of different short length in same cable drum.
2.19.0	Embossing	The extruded outer sheath shall be embossed with meter marking at interval of 1 metre. The "A" end meter marking and "Z" end meter marking and the drum lengths shall be printed on the drum flange along with

		<p>other markings. The outer sheath shall also be embossed with (min.)</p> <ul style="list-style-type: none"> a) Voltage designation b) Type of construction/cable code (e.g. A2X2Y) c) Number of core and nominal cross sectional area. d) Type of cable "Electric Cable" e) Manufacturers name & trade mark f) Name of buyer (e.g. BSES) g) Month & year of manufacturing h) Batch no / Lot no. i) Sequential length marking.
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3.0 Quality assurance

3.1.0	Vendor quality plan	To be submitted for purchaser approval
3.2.0	Inspection points	To be mutually identified & agreed in quality plan

4.0 Inspection & testing

4.1.0	Routine test	Each drum length of cable shall be subjected to the following tests
		- Measurement of the electrical resistance of the conductor shall be carried out as per the provisions of Clause 10.5 of I.E.C. Publication No.60840 The measurement shall be made on the conductors of each cable length. The D.C. resistance of the conductor at 20 deg. C shall not exceed the maximum value specified in I.E.C. Publication No.60228.
		- High voltage test with power frequency alternating voltage applied between conductor and sheath as per clause 9.3 of IEC-60840
		- Partial discharge test shall be carried out as per clause 9.2 of IEC Publication No.60840.
		- Test on outer jacket as per Clause 3 of IEC 60229
		- Measurement of capacitance as per clause 10.10 of IEC60840
4.2.0	Type test	-The cable shall be of "type tested" quality. Type test report of not

		more than five (5) years shall be submitted for the type, size and rating of the cable offered, along with the bid.
		-If the manufacturer's lab is accredited by govt./authorized body then it shall be acceptable for type testing.
		-All type tests shall be carried out in accordance with Clause 12 of IEC-60840 and in accordance with the sequence prescribed therein.
4.3.0	Acceptance Tests	Shall be conducted as per IEC: 60840 / IS: 7098 (P-3) and approved QA plan for each lot of cable.
4.4.0	Special Tests	The following tests shall be carried out as special tests
		- Conductor examination as per Clause 10.4 of IEC-60840.
		- Measurement of thickness of insulation as per Clause 10.6 of IEC-60840 and Clause 8 of IEC-60811-1-1.
		- Measurement of thickness and overall dimensions as per Clause 8 of IEC-60811-1-1
		- Measurement of thickness of metallic sheath as per Clause 10.7 of IEC-60840
		-Measurement of external diameter as per Clause 8.3 of IEC-60811-1-1
		- Hot set test for XLPE insulation as per Clause 10.9 of IEC-60840
4.5.0	Inspection	-The buyer reserves the right to witness all tests specified on completed cables
		-The buyer reserves the right to inspect cables at the Seller's works at any time prior dispatch, to verify compliance with the specifications.
		-In-process and final inspection call intimation shall be given in advance to purchaser.
4.6.0	Test certificates	Three sets of complete test certificates shall be submitted along with the dispatch documents.

5.0.0 Drawings, Data & manuals

5.1.0	To be submitted	The seller has to submit:
	along with bid	a) Cross sectional drawing of cable.
		b) Completely filled GTP
		c) Type test certificates
		d) Dimensional drawing for pulling eye

		e) Fault level calculation
		f) Complete cable catalogue and manual
5.2.0		Within 15 days, the seller has to submit four sets of above mentioned drawings along with one soft copy for buyer's approval.
5.3.0	Submittals required prior to dispatch	a) Inspection and test reports, carried out in manufacturer's works (R)
		b) Test certificates of all bought out items.
5.4.0	Drawing and document sizes	Standard size paper A0, A1, A2, A3, A4
5.5.0	No. of drags. / Documents required at different stages	As per Annexure - A

6.0.0 Shipping, Handling and Site support

6.1.0	Packing	-The cable shall be wound on non-returnable steel drums of suitable size of minimum hub diameter of 20D (where D is the overall diameter of the cable) and packed conforming to international standards. The drum shall be fully enclosed by continuous metallic cladding. Cable shall have sea worthy packing in case cables are dispatched by shipping lines.
6.2.0	Pulling eye & sealing of Cable ends	-A cable pulling eye shall be provided at "Z" end of cable on each drum. Suitable fillings/putty shall be used for sealing gap between outer sheath and pulling eye. Heat shrinkable sleeves with the pulling eye shall also be provided. The pulling eye shall be directly connected to the conductor and be capable to withstand a tensile load of 30N / sqmm of conductor area. The "A" end of the cable shall be sealed with filling material/putty and heat shrinkable cap.
6.3.0	Drum identification label	The following information shall be marked on the drum:
		- Drum identification number.
		- Trade name or trade mark; if any

		- Name of manufacturer
		- Nominal sectional area of the conductor of the cable
		- Type of cable and voltage for which it is suitable
		- Length of the cable on the drum, with "A" end and "Z" end markings.
		- Purchase order number with SAP item code.
		- Year and month of manufacturing.
		- Direction of rotation of drum (an arrow) and
		- Net weight of cable in drum and gross weight of cable with drum.
		- Batch no or Lot no.
6.4.0	Shipping	The seller shall give complete shipping information concerning the gross weight, size of each packing.
6.5.0	Handling & Storage	Manufacturer instruction shall be followed. Detail handling & storage instruction sheet / manual needs to be furnished before commencement of supply.
6.6.0	Transit damage	The seller shall be responsible for any transit damage due to improper packing.

7.0.0 Progress reporting

7.1.0	Outline Document	To be submitted for purchaser approval for outline of production, inspection, testing, packing, dispatch, documentation programmer.
7.2.0	Detailed Progress report	To be submitted to Purchaser once a month containing a) Progress on material procurement. b) Progress on internal stage inspection c) Reason for any delay in total programme. d) Details of test failures if any in manufacturing stages e) Progress on final box up. f) Constraints / forward path

8.0 Deviations

8.0.0	Deviation from the Specification.	Deviations from this Specification shall be stated in writing with the tender by reference to the Specification clause/GTP/Drawing and a description of the alternative offer. In absence of such a statement, it will be assumed by the Buyer that the Seller complies fully with this specification.
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Annexure - A Scope of supply

1.0 The scope of supply shall include following

1.1 Design, manufacture, testing at manufacturer works before dispatch, packing, delivery including unloading and stacking at site/store of 38/66kV single core cable as per BOQ and submission of all documents.

1.2 BOQ as following -

Sr No	Purchaser Equipment Tag No / SAP code	Material/Equipment description	Location	Unit	Quantity
1			e.g. Delhi	km	e.g. 10
2			e.g. Goa	km	e.g. 10
3					
4					
5					
6					
7					

2.0 Submission of documents

	Along with offer	For Approval after award of contract	Final approval after	Remarks
Detailed dimensional cross-sectional drawing of the cable	3 copies (Typical drgs)	4 copies	6 copies + 1 soft copy in CD	
Type test certificates.	2 copies (Type test and sample Routine Test)		6 copies + 1 soft copy in CD	Type test and sample Routine test reports
Guaranteed technical particulars of each type of cable	3 copies	4 copies	6 copies + 1 soft copy in CD	

Dimensional drawing for pulling eye.	3 copies	4 copies	6 copies + 1 soft copy in CD	
Rating factors	3 copies	4 copies	6 copies + 1 soft copy in CD	
Complete cable catalogue and Manual	1 copy		6 copies + 1 soft copy in CD	
1 Sec rating calculation for metal sheath and copper screen (if applicable)	3 copies (Typical)	4 copies	6 copies + 1 soft copy in CD	

3.0 Delivery schedule

- 3.1 Delivery period start date - from date of LOI
- 3.2 Delivery period end date - as agreed with supplier
- 3.3 Material dispatch clearance - after inspection by purchaser

Annexure – B Service Conditions

1.0.0	Mumbai Atmospheric conditions	
a)	Average grade atmosphere :	Heavily polluted , salt Laden, dusty, humid with possibility of condensation
	Maximum altitude above sea level	1000 M
b)	Ambient Air temperature	Highest 45 deg C, Average 35 deg C
	Minimum ambient air temperature	deg C
c)	Relative Humidity	95 % Max
d)	Thermal Resistivity of Soil	150 Deg.C cm/W
e)	Seismic Zone	3
f)	Rainfall	3000 mm concentrated in four months
2.0.0	Delhi Atmospheric conditions	
a)	Average grade atmosphere :	Heavily polluted, dry
	Maximum altitude above sea level	1000 M
b)	Ambient Air temperature	Highest 50 deg C, Average 40 deg C
	Minimum ambient air temperature	Deg C
c)	Relative Humidity	90 % Max
d)	Thermal Resistivity of Soil	150 Deg.C cm/W
e)	Seismic Zone	4
f)	Rainfall	750 mm concentrated in four months

Annexure – C Guaranteed Technical Particulars (Data by Supplier)

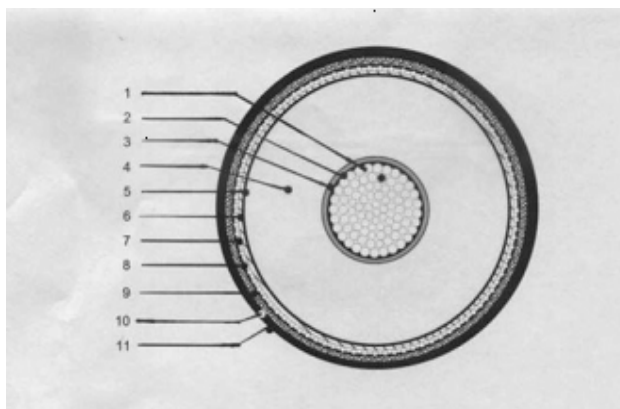
Sr.	Description	Unit	Data specified by the purchaser	Data to be filled by the manufacturer
1	Name of manufacturer			
2	Country of manufacturer			
3	Type of cable			
4	Standard according to which cable is manufactured			
5	Rated voltage	kV	38/66	
6	Highest system voltage	kV	72.5	
7	System frequency	Hz	50	
8	No of phases per circuit	Nos	3	
9	System earthing		Solidly grounded	
10	Rated short time current of conductor	kA		
11	Rated short time current of metal sheath (alone)	kA		
12	Rated short time current of metal screen (if provided)	kA		
13	Rated short time current of metal sheath and screen	kA	19	
14	Duration of short circuit current	Sec	1	
15	Impulse withstand voltage 1.2/50 micro sec wave	kVp	325	
16	Power frequency withstand voltage	kV(rms)	140	
17	Conductor			
a	Nominal cross sectional area	sqmm	1000 / 630	
b	Type class of conductor.		Compacted Stranded Circular	
c	Material of conductor		Aluminum	
d	Flexibility class of conductor		Class -2	
e	Minimum numbers of strands	Nos		
f	Diameter of strands before compaction. (nominal / Minimum)	Mm / mm		
g	Material of longitudinal water sealing filling of conductor			
18	Details of semi conducting tape over the conductor			
19	Conductor Screen			
a	Material and type			
b	Minimum thickness	mm	0.8	
c	Make and grade of semi conducting compound.			

Sr.	Description	Unit	Data specified by the purchaser	Data to be filled by the manufacturer
19	Insulation			
a	Material of Insulation		XLPE	
B	Nominal thickness	Mm	11	
C	Minimum thickness		9.9	
	Make and grade of insulation compound			
	Maximum dielectric stress at the conductor surface	kV/mm		
20	Insulation screen			
a	Material and type			
b	Minimum thickness	mm	0.8	
c	Make and grade of semi conducting compound.			
21	Inner water swellable tape			
a	Nominal thickness	mm	0.3	
a	Minimum swell height in one minute.	mm	12 mm in one minute	
22	Copper wire screening and the copper tape (if required to meet the short circuit rating)			
a	Number of wire	Nos		
B	Diameter of wire	mm		
c	Thickness and width of copper tape	mm / mm		
23	outer water swellable tape (if required)	mm		
a	Nominal thickness	mm	0.3	
b	Minimum swell height in one minute.	mm	12 mm in one minute	
24	Nominal diameter under metal sheath	mm		
25	Material of the metal sheath		Lead alloy E or corrugated aluminium(with corrosion protection & corrugation filling)	
26	Minimum thickness of lead alloy "E" sheath	mm	2.2	
27	Minimum thickness of Corrugated Aluminium sheath	mm	1.75	
28	Nominal radial clearance allowed under metal sheath (in case of corrugated aluminium sheathing)	mm	As per mfg. stnd.	
29	Nominal diameter over metal sheath	mm		
Sr.	Description	Unit	Data specified	Data to be

			by the purchaser	filled by the manufacturer
30	Outer jacket			
a	Material and type		HDPE type ST 7	
b	Minimum thickness	mm	3.3	
c	Nominal thickness	mm	4	
d	Anti termite treated?		Yes / No	
31	Material of semi-conductive coating/extrusion over the outer jacket		Extruded or Graphite coating	
32	AC test voltage at works for insulation.	KV(rms)	90	
33	DC test voltage at works for outer jacket.	KV (DC)	25	
41	Overall dia of completed single core cable	mm		
42	Weight per metre of complete cable	Kg/m		
43	Short circuit capacities with maximum conductor temperature of 250Deg C : (conductor temperature of 90 Deg C at the commencement of short circuit) 0.5 second duration 1 second duration 2 second duration 3 second duration	kA		
44	Minimum radius of bend round : which cable can be laid a) Direct burial in ground b) In ducts	mm		
45	Maximum D.C .resistance of : conductor per KM at 20 deg. C	Ohm/km	0.0469 for 630 sqmm and 0.0291 for 1000 sqmm Cable.	
46	Maximum AC resistance of : conductor per KM at 90 deg. C	Ohm		
47	Equivalent star reactance per KM : of 3 phase circuit at 50 Hz	Ohm		
48	Maximum electrostatic capacitance : Per KM of cable	pf		
Sr.	Description	Unit	Data specified	Data to be

			by the purchaser	filled by the manufacturer
49	<p>Maximum continuous current carrying :</p> <p>Capacity per circuit when laid in ground as per the following parameters (with screens cross bonded)</p> <ul style="list-style-type: none"> -Maximum continuous conductor temperature of 90Deg C -Maximum conductor temperature during short circuit of 250 Deg C -Ground temperature of 30 DegC -Soil resistivity of 150DegC-cm/Watt -Depth of laying of 150cm <p>a. In tri-foil touching formation</p> <p>b. In flat formation with d+70cm</p>	Amp		
50	<p>Maximum continuous current carrying :</p> <p>Capacity per cable when laid in air with ambient temperature of 40DegC and other parameters as per SI no 49 (with screens cross bonded)</p> <p>a. In tri-foil touching formation</p> <p>b. In flat formation with d+70cm</p>	Amp		
51	Rating factors for ambient air temperature attached(Yes/No)			
52	Rating factors for ground temperature attached(Yes/No)			
53	Rating factors for phase spacing in flat formation attached(Yes/No)			
54	Rating factors for grouping of cable laid in ground in horizontal formation attached(Yes/No)			
55	Rating factors for grouping of cable laid in ground in tri-foil touching formation attached(Yes/No)			
56	Rating factors for thermal resistivity of soil attached(Yes/No)			
57	Rating factors for depth of laying attached(Yes/No)			
58	<p>Max. power factor of charging KVA of :</p> <p>cable when laid direct in the ground at normal voltage frequency at conductor temperature at 90Deg .C</p>			
Sr.	Description	Unit	Data specified	Data to be

			by the purchaser	filled by the manufacturer
59	Max. dielectric power loss of cable per : KM of 3 phase circuit laid direct in ground at normal voltage, frequency and maximum conductor temperature of 90 Deg C	Watt/km		
60	Sheath loss of cable per KM of 3 phase : circuit at normal voltage frequency at maximum continuous current rating. a) Laid direct in ground b) Drawn into ducts c) Installed in air	Watt/km		
61	Impedance per KM of 3 phase circuit : at 50 C/s and maximum conductor temperature. a) Positive and negative sequence b) Zero sequence	Ohm		
62	Standard drum length of cable	Metres	500 +/- 5% (short lengths not acceptable except the last length)	
63	The overall quantity tolerance	%		
64	Cable to be wound on non returnable steel drum.	Yes / no	Yes	
65	Normal delivery length	Metres		
66	Cable pulling Eye to be provided at "Z" end			
67	Tensile load withstand capacity for pulling eye		30 N / sqmm	
68	Approximate shipping weight for the normal deliver length with the drum size (flange dia. in mm and width in mm):	kg		
69	Drum size (Flange dia X flange width X hub dia)			
70	Embossing details on outer jacket			
71	Sequential marking at every meter.		Provided	
72	Process of cross linking of polyethylene.			

Annexure –D Cross Sectional Drawing (Data by Supplier)

Pictorial Label No.	Reference Clause No	Description	Nominal Thickness in mm	Nominal Diameter in mm
1	4.2 & 4.3	Compacted, stranded, circular aluminium conductor		
2	4.4	Semi-conducting separator tape		
3	4.5	Conductor screen		
4	4.6	XLPE insulation		
5	4.7	Insulation screen		
6	4.8	Inner longitudinal water sealing bedding		
7	4.9	Metal screening of copper wire followed by a copper tape applied in helical form (if required)		
8	4.10	Outer longitudinal water sealing bedding (if required)		
9	4.11	Metallic sheath (Lead Alloy "E" sheath or corrugated aluminium sheathing with coating and filling)		
10	4.12	HDPE outer jacket		
11	4.13	Semi-conductive extrusion/Graphite coating		

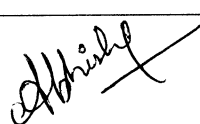
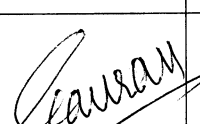
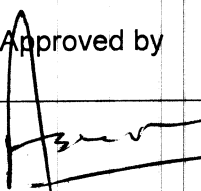
Net weight of cable : kg/m

Name of manufacturer:

Drawing No and date:

TECHNICAL SPECIFICATION FOR CABLE LAYING

**TECHNICAL SPECIFICATION
FOR
LAYING OF
11 KV, 33KV AND 66 KV CABLE**

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AV	GS	AA	Page	1 of 42

TECHNICAL SPECIFICATION FOR CABLE LAYING

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1. REFERENCE STANDARDS

- i) IS 1255: Code of practice for installation and maintenance of power cable up to and including 33kV rating.
- ii) IS 1554: PVC Insulated Electrical Cables upto 11KV
- iii) IS 2274: Code of Practice for electrical wiring installation – system voltage exceeding 650V
- iv) IS 7098 Part II: Cross linked Polyethylene Insulated PVC sheathed cables for working voltages from 3.3KV up to and including 33KV
- v) IS 7098 Part III: Cross linked Polyethylene Insulated PVC sheathed cables for working voltages from 66KV up to and including 220KV
- vi) IS 5820: Specification of precast concrete Cable cover.
- vii) Indian Electricity Rules 1956.

TECHNICAL SPECIFICATION FOR CABLE LAYING**2. CABLE LAYING****2.1. SELECTION OF THE ROUTE**

The cable route selection shall be done by the concerned supervising engineer by first conducting route survey and selecting a route along with contractor keeping followings in mind-

- i) The side of road, which presents the least obstacles and the fewest roadways crossings.
- ii) The future consumers and existing cables in the route may influence the cable route.
- iii) Railway, road crossings, MCD and other government agencies may also influence in selection of cable route.
- iv) Plans for future building projects should be considered.

The route shall be as far as possible away from parallel running gas, water pipes and telephone/telecommunication cables.

2.2. CLEARANCES

The desired minimum clearances are as follows –

- i) Power cable to power cable – A minimum clearance equal to diameter shall be maintained. Trench drawings shall be referred for guidance.
- ii) Power Cable to control cables – 0.2 M
- iii) Power cable to communication cable – 0.3M

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- iv) Power cable to gas/water main – 0.3 M

2.3. DEPTH OF CABLE LAYING

The desired minimum depth of laying from ground surface to the top of cable shall be

- | | | | |
|------|--|---|-------------|
| i) | 650 / 1100V grade XLPE Cable | - | 75 cm |
| ii) | Low voltage and Control Cable | - | 75 cm |
| iii) | 6.35 / 11KV grade XLPE Cable | - | 90 cm |
| iv) | 19 / 33KV grade XLPE Cable | - | 1.05 M |
| v) | 38 / 66KV grade XLPE Cable | - | 1.20 M |
| vi) | Cables at Road crossing | - | 1.0 M (min) |
| vii) | Cables at railways level crossings (measured from bottom of sleepers to the top of Pipe) | - | 1.0 M (min) |

Whenever there is any obstacle at the laying depth, the cable should be lowered/ raised to cross the obstacle. However variation in the depth is to be approved by BSES. The Contractor shall provide the same in deviation report.

2.4. WIDTH OF CABLE TRENCHES

The width and depth of Cable Trenches shall depend upon number of circuits and Voltage Grade. Drawings of this specification are shown in the document itself.

2.5. BENDING RADIUS OF CABLES

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While pulling of the Cable from the drum or during laying following minimum bending radius shall be maintained so that the cable, in particular the insulation does not get damaged.

i) Single Core Cables (PVC & XLPE)

- a) Up to 11KV grade – 15 X D
- b) Above 11KV grade - 20 X D

ii) Multi Core Cables (PVC & XLPE)

- a) Up to 1.1KV grade - 12 X D
- b) Above 1.1KV grade – 15 X D

Where 'D' is overall diameter of the cable

2.6. MAXIMUM PERMISSIBLE TENSILE STRENGTH FOR CABLES**i) For cables pulled with Stocking**

- a) PVC and XLPE SWA Armoured cables $P = 30 \times D$
- b) PVC and XLPE AWA Armoured cables $P = 20 \times D$

Where P= pulling force in Kgm, D= Diameter of Cable in mm

ii) For Cables pulled by Cable eyes

- a) Aluminium conductor – $30 \text{ N/mm}^2 = 3 \text{ Kg/sq. mm}$

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b) Copper conductors - $50\text{N/mm}^2 = 5\text{ Kg/sq. mm}$

Permissible force is calculated by multiplying the above values by cross sectional area (CSA) of conductor of each core and then number of cores.

2.7. METHODS OF LAYING

- i) Cables shall be laid in direct in ground, in trenches excavated therein and shall be protected with covers as given in the drawing. Cables shall also be drawn into pipes of ducts or laid in the formed trenches or troughs or on racks or supported in trays or cleats as required by the site exigencies. Where the cables are laid in the formed trenches, the installation shall include removal and replacement of the trench covers and the provision of temporary protective covers on the trenches where they cross the access ways.
- ii) HDPE (200 mm) pipes shall be used where cable cross roads and railways tracks. Spare ducts for future extensions should be provided. Spare duct should be sealed off. Buried ducts or ducting blocks shall project into footpath or up to the edge of road, where there is no footpath, to permit smooth entry of cable without un-due bending. The diameter of the cable conduit or pipe or duct should be at least 1.5 times the outer diameter of the cable. Angular alignment of the duct across road crossings shall be predetermined to maintain safe bending radius when direction of cable trench changes before or after the road.
- iii) The contractor shall lay cable by horizontal direct drilling (HDD) in main roads and highway with heavy traffic, passage to public

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property where excavation is not possible. Contractor shall take approval for laying of cable by means of HDD wherever required from the supervising engineer. The cable laid by HDD shall be minimized so that it doesn't exceed by 12% of total route length. This is to avoid De-rating of Cables.

- iv) Unless approved by BSES, the contractor shall lay the cables, direct in ground, in single layer. The cables shall be laid with the pre-determined and approved cable route.
- v) Spacing shall be maintained uniformly between the cables all along the length including the bends, as approved by BSES. To maintain the spacing, suitable non-metallic formers shall be placed uniformly with spacing not exceeding 5 meters. Every bend shall have at least one spacer.
- vi) 75 mm of the sand bed shall be placed at the bottom of cable trench.
- vii) After the cables have been laid the trench shall be filled with the sand and shall be well rammed to a level not less than 75 mm above the top of the cables all throughout the route.
- viii) To protect the cables against external mechanical damage, which may be caused by other agencies, the cable shall be protected by suitable cover.(for dimensions of RCC cable cover refer cable laying drawing)

The type of the covers shall be as under

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- a) 1.1KV Cables – Single layer of brick thickness not less than 75 mm (3 inch)
- b) 11KV Cables – sand stone of thickness not less than 75mm (3 inch).
- c) 33KV Cables shall be protected by reinforced concrete cover of width 300 mm as per attached drawing with thickness not less than 50mm.
- d) 66KV Cables shall be protected by reinforced concrete cover as per attached drawing with thickness not less than 50mm.

The RCC cable cover shall be embossed as “BYPL 66/33/11 KV CABLE” whichever is applicable.

- ix) Back fill to be filled up to 75mm and the warning tape shall be installed continuously. The tape shall be yellow in colour with Black / Red lettering of minimum 20mm height. The approved warning message shall be written in English and Hindi/ local language. The minimum thickness and width of the tape should be 300 microns and 150 mm respectively.
- x) The trench shall be filled-up by soft soil (300mm) and Excavated soil as indicated in drawings.

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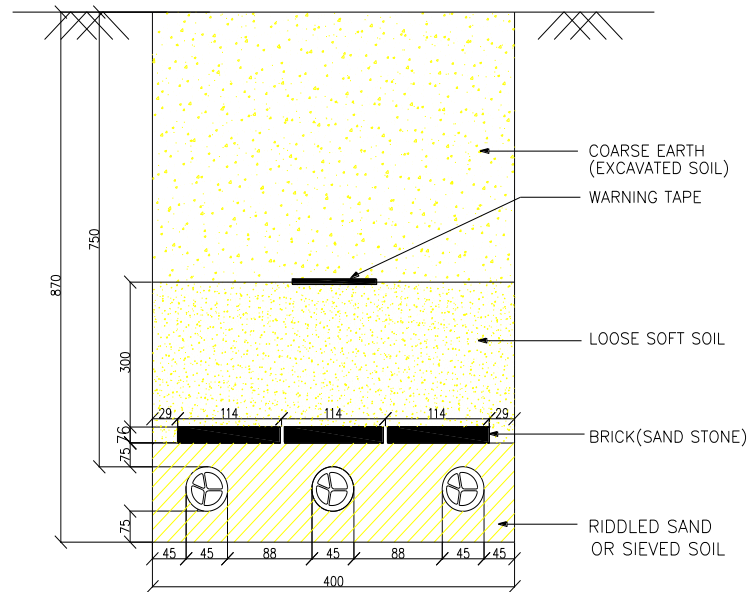


Figure 1.1 – 1.1kV, 150sqmm Buried Cable

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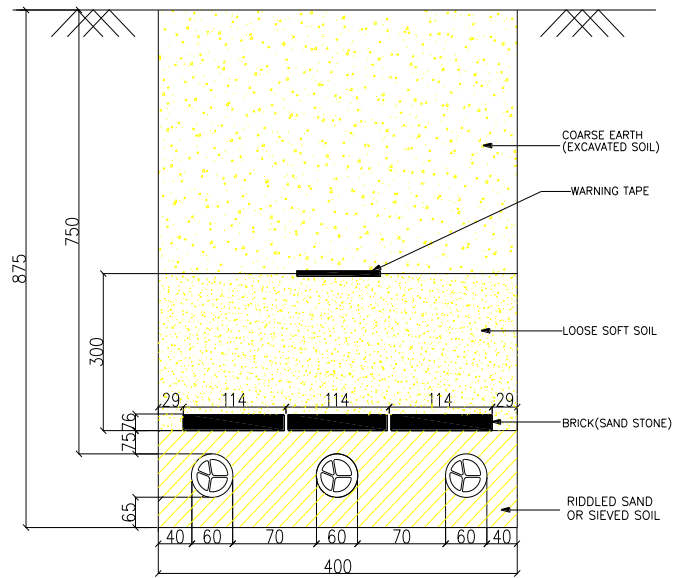


Figure 1.2 – 1.1kV, 300sqmm Buried Cable

TECHNICAL SPECIFICATION FOR CABLE LAYING

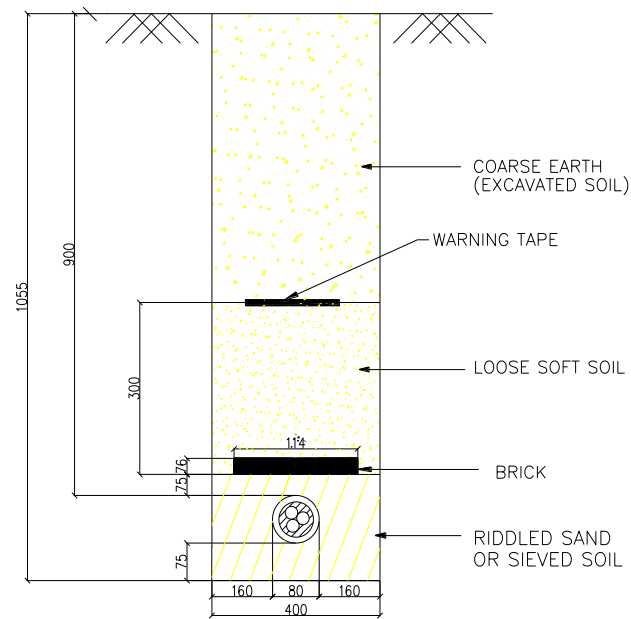


Figure 1.3 – 11kV Buried Cable for Single Circuit

TECHNICAL SPECIFICATION FOR CABLE LAYING

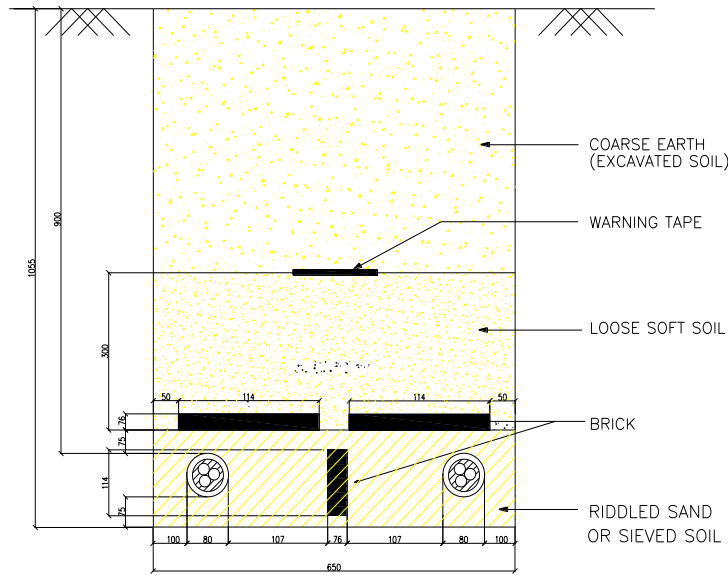


Figure 1.4 – 11kV Buried Cable for Double Circuit

TECHNICAL SPECIFICATION FOR CABLE LAYING

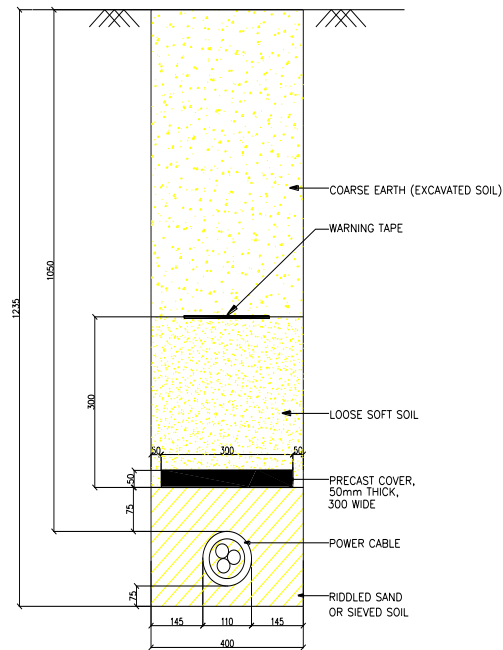


Figure 1.5 – 33kV Buried Cable for Single Circuit

TECHNICAL SPECIFICATION FOR CABLE LAYING

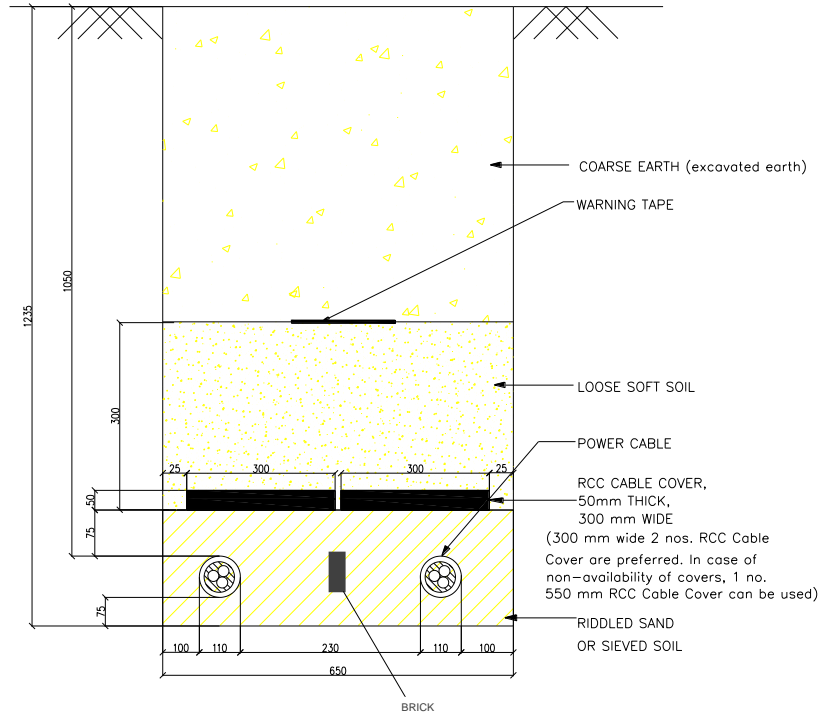


Figure 1.6 – 33kV Buried Cable for Double Circuit

TECHNICAL SPECIFICATION FOR CABLE LAYING

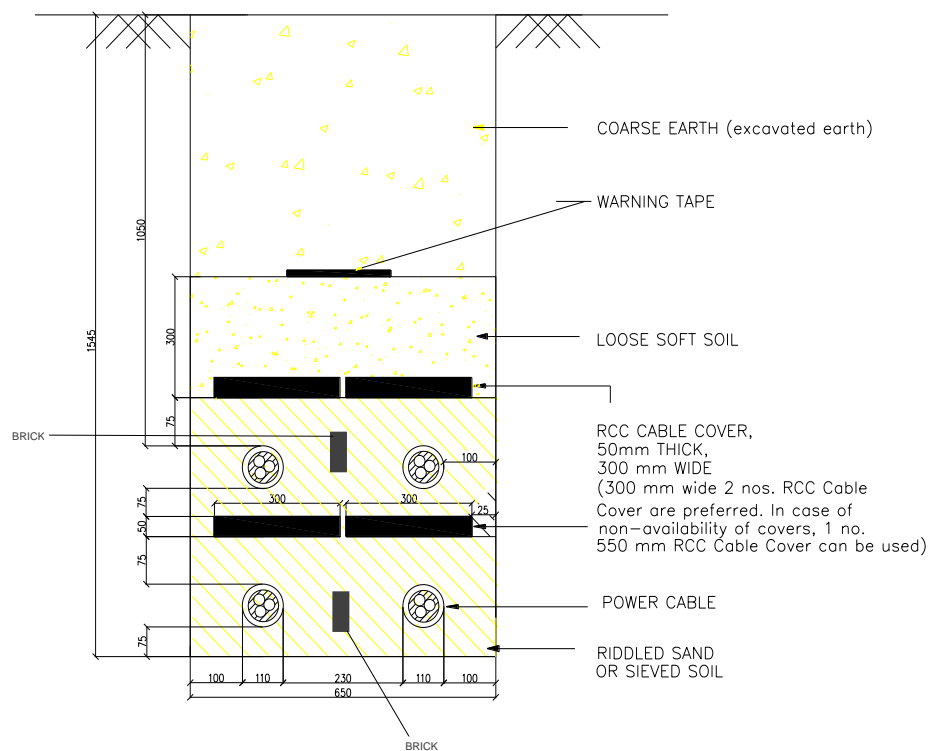


Figure 1.7 – 33kV Buried Cable Option-1 for Four Circuits

TECHNICAL SPECIFICATION FOR CABLE LAYING

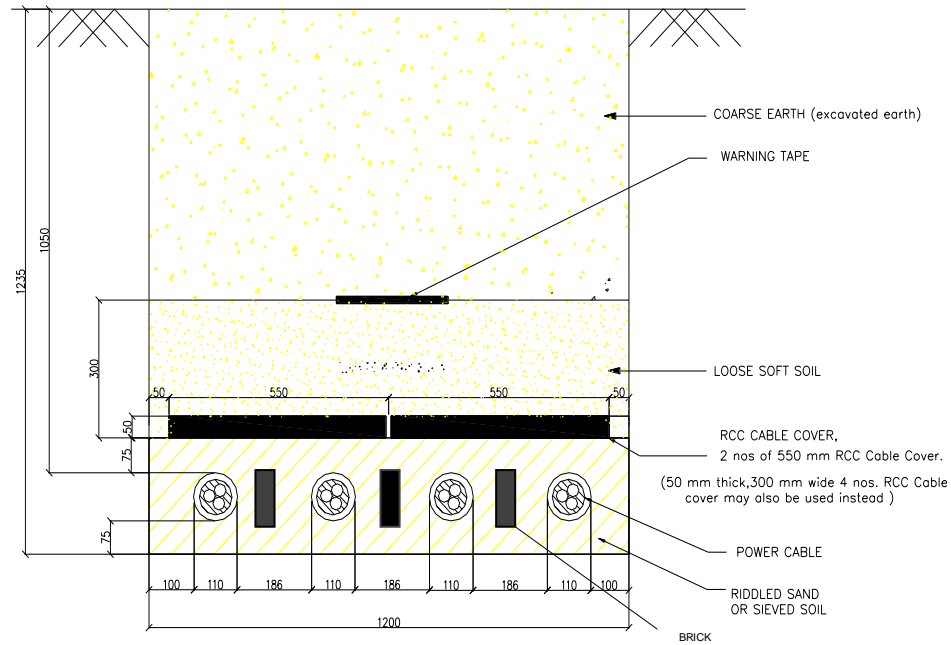


Figure 1.8 – 33kV Buried Cable Option-2 for Four Circuits

TECHNICAL SPECIFICATION FOR CABLE LAYING

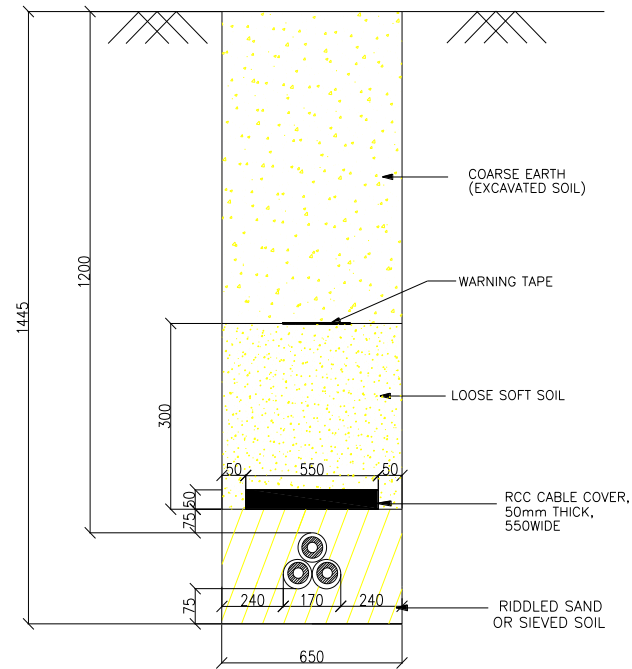


Figure 1.9 – 66kV Buried Cable for Single Circuit

TECHNICAL SPECIFICATION FOR CABLE LAYING

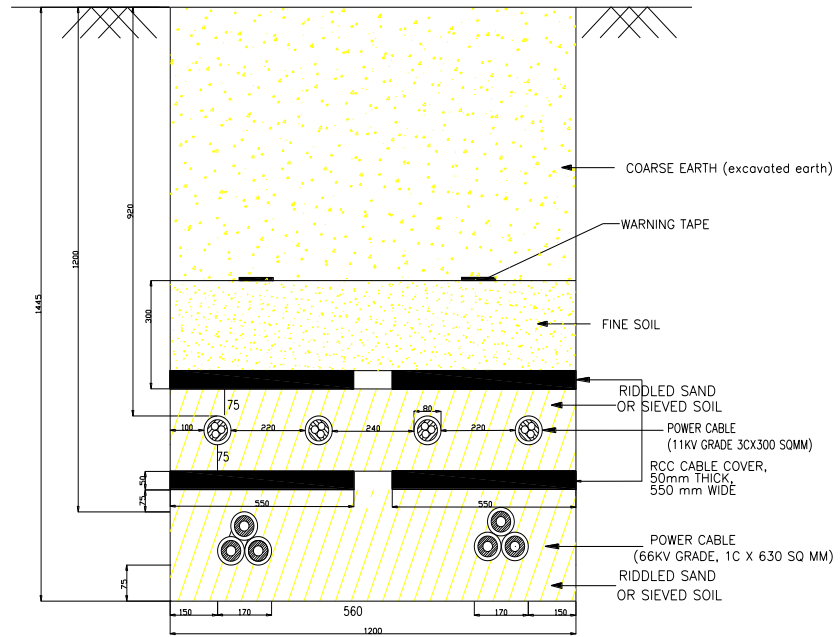


Figure 1.10 – 66kV Double Circuit and 11kV Circuits

TECHNICAL SPECIFICATION FOR CABLE LAYING

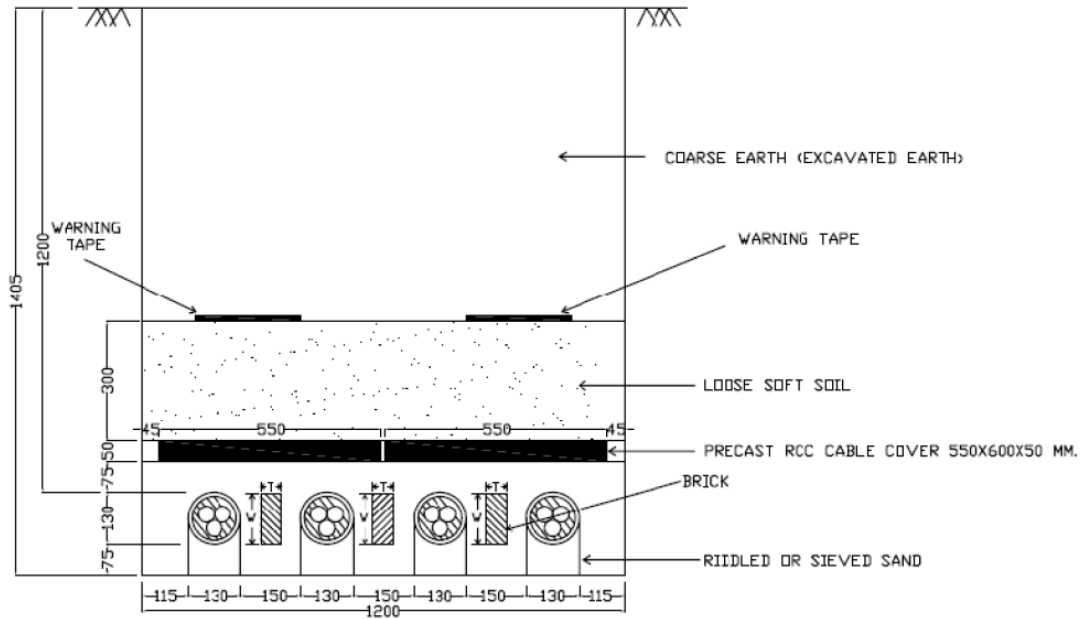


Figure 1.11 – 66kV 3Cx300 sq mm Four No's Cable Runs

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2.8 CABLE OVER BRIDGES

On Bridges the cables are generally supported on HDPE cleats and clamped on steel supports at regular intervals. Approval from appropriate authorities (PWD/railways) as applicable shall be taken by contractor.

2.9 LAYING OF SINGLE CORE CABLES

- a) The single core cables shall be laid in trefoil formation. Single core cables can be laid individually in 200mm HDPE pipe in case of HDD only.
- b) For single core cables laid in trefoil formation, plastic cable ties shall be used at interval of 1.0 (one) meter throughout the cable length to maintain the trefoil arrangement.
- c) To prevent magnetic losses (eddy current and hysteresis losses), the base plate of the panels or the terminal box of the equipments, shall have aluminum plate. Incase the entry into the building is through GI pipe; a “slit” in the GI pipe shall be necessary. Alternatively GI pipes may altogether be avoided and non-metallic pipes such as PVC or HDPE pipe shall be used. Concrete pipes having steel reinforcement (RCC pipe) are not to be used.

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- i) Single point bonded earthing shall be employed to prevent flow of induced circulating current in the armour and screen and consequential de-rating of cables for feeder less than 2.0 KM.
- ii) For feeder length more than 2 KM, cross bonding shall be provided.

2.11 GENERAL GUIDELINES FOR LAYING CABLES

- i) Laying of the cables and handling of the same shall be undertaken, at all times, by adequate staff suitably trained and supplied with all the necessary plant, equipment and tools.
- ii) The contractor shall be responsible for all the route survey, establishment of the position of the joints as per the site requirement and the drum lengths of cables to be laid. While carrying out the route survey the contractor shall take into account the obstacles on the route whether above or below ground. The cable shall be planned to be laid in an orderly formation, free from unnecessary bends and crossings
- iii) The contractor shall submit a drawing for the complete scheme showing the entire route, road crossings, location of joints and also the arrangement of cables to be laid. In case due to site exigencies, cables have to cross over within the trench, the same shall be shown in the drawing. For each and every job, this drawing shall be approved by BSES, prior to commencement of work.

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- iv) Contractor shall arrange for all the material and manpower required for jointing and end termination. The Contractor shall provide pit, carry out excavation for creation of working space required for jointing by the jointer. The contractor shall carry out all civil works, structural work, clamping and earthing, so that the cables and accessories perform satisfactorily during the entire lifetime.
- v) The entry and exit of the cables into the building shall be through RCC or GI pipe except for single core cables, which shall be properly sealed and shall be duly supported as per the method and technique approved by BSES, so that the outer sheath of the cable does not get damaged at the entry and exit points. The sealing should be of adequate length so that it minimizes the risk of spreading of fire or ingress of water.

2.12 HANDLING AND STORAGE OF CABLE DRUMS

- i) The cable drums shall be transported upright, so that the weight is distributed on both the flanges. Under no circumstances the cable drum may be laid on its side. During transportation the drums must be properly secured. The cable drums should never be dropped from Lorry or a trailer, so as to prevent damage to the cable drum and also to the cable. Ramp may be used for unloading. The drums may be rolled over short distance, provided the correct direction of rolling as provided on the drum is observed. Alternatively, a mobile crane should be used for lifting and lowering the drum. A chain-pulley arrangement may also be used to lift the drums and deposit the same on ground if required.

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- ii) In case the drums are to be stored prior to cable laying, they should be arranged in such a way to leave some space between them for air circulation. It is desirable that the drums stand on battens placed directly under the flanges. Overhead covering is not essential except in heavy rainfall areas or during monsoon. Cable should however be protected from direct rays of sun by leaving the battens on or by providing some form of sunshade. In no case the drums shall be stored in a flat position with flanges horizontal.
- iii) For transportation of the cable drums from storage site to work site, the drum should be mounted on a trailer or an open lorry and unloaded by mobile cranes.

2.13 PROCEDURE OF LAYING

- i) The ground over which the drum is positioned at site should be properly consolidated and jacks placed on both sides of the drum to make the pay-off arrangement stable. Suitable arrangement be made to stop the drum rotation, during cable laying preferably by square wooden poles kept temporarily pivoted over cable roller under the flanges which when required can be applied on the flange as a brake by personnel manning the drum.
- ii) The cable should always be paid off from the top of the drum. The drum must be positioned in such a way that the arrow on the drum points opposite to the direction of rotation marked on the drum.

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- iii) It must be ensured that the cable is not dragged over sharp object or on the road surface, so as to avoid damage to the outer sheath of the cable.
- iv) The pulling method to be used shall be approved by BSES. Cable supplier's recommended maximum pulling tension shall not be exceeded.
- v) Rollers shall be placed at intervals and the cable shall be pulled over the rollers. The rollers shall be kept lubricated so that they rotate freely, minimize friction to the cable in motion. Rollers shall be positioned at the bends to minimize sidewall friction. The contractor shall ensure that PVC/HDPE sheath of cable is free from damage due to abrasion.
- vi) The cable should not be pulled out from the drum by lifting of the coil while the drum is lying flat on the flange. This leads to twisting of the armour and cores resulting in permanent damage to the cable.
- vii) To avoid ingress of moisture, it must be observed that the end capping of the cables is not damaged. Cut pieces of the cables must be capped immediately, before laying of the same is taken-up.

2.14 EXCAVATION OF THE TRENCHES

- i) The excavation of the trenches shall be commenced, with proper approvals from various authorities well in time.

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- ii) Before opening of the section of the trench, the contractor shall satisfy himself that the line of the trench is clear of underground obstructions, by taking out trial pits on the line of the trench.
- iii) The exact location of each trench shall be approved on site by BSES. The trenches shall be kept as straight as possible and each trench shall be excavated to approved formation and dimensions. If necessary, the trenches shall be adequate shored by wooden planks and bracing to avoid trench cave-ins which would cause injury to the persons and also damage the cables laid.
- iv) The bottom of each trench shall be firm and of smooth contour. The contractor shall take reasonable precautions to prevent damage to the highway or ground surface from a slip or breaking away of the sides of the trench.
- v) The trench excavation and filling in shall be so executed that all walls, roads, sewers, drains, pipes, cables, structures, places and things shall be reasonably secured against risk of subsidence or injury and shall be carried out to the satisfaction of the authorities concerned. Should, however, a damage to an existing or other services be made, the Contractor will arrange and pay for any necessary repair, to make good the damages.
- vi) Where trenches pass from a footway to a roadway or at other positions where a change of level is necessary, the bottom of the trench shall rise or fall gradually. The rate of rise or fall shall be approved by BSES.

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- vii) Contractor shall ensure that during excavation and until restoration has been completed, for reasonable access of persons and vehicles to property or places adjacent to the route.
- viii) When the excavation of the trenches has been accurately executed, the contractor shall inform BSES for approval. Laying of cables or building of structure shall not be started until the contractor has been advised by BSES to proceed with the work.

2.15 EXCAVATED MATERIAL

- i) The materials excavated from each trench shall be placed so as to prevent nuisance or damage to adjacent ditches, drains fences, gateways and other property or things. Excavated material shall be stacked so as to avoid undue interference with traffic.
- ii) Where, owing to traffic or for reasons of safety or other considerations, this is not permissible, the excavated material shall be removed from the site and returned for refilling the trench on completion of laying; surplus material shall be disposed off by the contractor at his own cost.

2.16 PIPES AND DUCTS

- i) Care shall be taken to make the bend of the pipes or duct lines as easy as practicable and in no case of radius less than 3 meters. Where approved, split pipes may be used on bends, the pipes being fitted round the cable after laying.

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- ii) All road crossings shall be ducted. This applies to present and future roads as indicated on the route plans. The pipes and the ducts shall be laid in an approved manner and shall be surrounded by 150 mm of PCC (1:2:4)
- iii) Ducts under the road shall be provided by the contractor, by non-disruptive method, if road cutting is not permitted by the concerned authorities Cable laying shall be done by Horizontal Direct drilling method (HDD).
- iv) The cables shall be suitably protected at entry and exit from the pipes, so that the outer sheath does not come in contact with the edges of the pipes / ducts. The pipes and ducts shall have slope so that the seepage water can drain through the small opening provided on the lower side of the pipe sealing.
- v) The pipes and ducts shall be secured to the base at both ends and at regular interval, throughout the length, so that at no point the ducts or pipes get suspended over the threaded cable, and damage the same, thus defeating the very purpose of providing the pipe / duct.
- vi) At all road crossings at least one spare duct / pipe shall be provided for future use. The pipe shall be thoroughly cleaned of obstructions. A draw wire or rope shall be left in each pipe to facilitate the drawing in of the cables. The duct end shall be sealed temporarily to prevent the entry of foreign matter. End caps and permanent markers shall be placed flush with footpath / roadways at both the ends. The pipes

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and ducts shall be cleaned again immediately before the cables are drawn in.

- vii) The internal diameter of the pipe / duct should be such that the cables occupy only 40% of the area of the pipe / duct to avoid de-rating.

3. JOINTING OF CABLES

3.1 TYPES OF ACCESSORIES

- i) Straight Through / Transition Joints - These Joints are used for connecting two cables in the run.
- ii) Termination or sealing end – This is generally used to connect a cable to switchgear terminals, H.T. pillars, transformer boxes and OH lines etc. GIS End termination should be used wherever required.

3.2 REQUIREMENTS OF CABLE JOINTS

- i) Resistance of the jointed conductor should be equal to or less than resistance of the conductor of the same length.

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- ii) Connector & lug should have a mechanical strength should be comparable to that of the conductor.
- iii) Thickness of built up insulation should be equal to or more than thickness of insulation of cable.
- iv) The Joint should provide proper mechanical protection to the insulated cores against damage by impact.
- v) The joints should ensure the continuity of metallic sheath or armour.
- vi) Proper stress control shall be provided to eliminate occurrences of high electrical stresses at screen cut points and over crimped connector.
- vii) The Joints shall be provided with an outermost layer resistant to corrosion by chemical effect

For joints of screened cables, following additional features must be considered

- i) Electric stress relief at termination of screen
- ii) Ionization and corona discharge

Besides the above requirement, cable joints should be simple and compact. It should require minimum time for jointing. It should be mechanically strong to

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withstand dynamic stresses due to short circuit current and impacts. The joints should further be resistant to corrosion and other chemical effects.

3.3 PREPARATION BEFORE JOINTING

A proper joint position should be selected for jointing. The joint pit should be of sufficient dimensions as to allow jointers to work. Sides of the pit should be well covered with tarpaulin sheets to prevent loose earth from falling. When jointing cables in water logged ground or under monsoon conditions, sump hole should be excavated at one end of the joint pit in such a position so that the accumulating water can be pumped out or baled out without causing interference to the jointing operation. The jointing as far as possible is to be carried out inside a tent. Before proceeding for jointing, on the existing cable, it is very essential to identify the cable to be jointed. For jointing of high tension cables, the cable should be made dead and earthed before commencement of the jointing. This should be confirmed by spiking method.

Cleanliness is the most important factor in all jointing work. All tools should be clean and dry at the time of the jointing process. Cleanliness while handling the insulation is very important. Any contamination of the insulation by dust or moisture is detrimental to the joint. In case of paper cables, the cable seals should be examined for any damage or puncture. The paper insulation should then be tested for the presence of moisture. This is done by dipping the insulation paper in hot G-38 compound (110 Deg - 120 deg.C). Care should be taken not to touch the paper with hand. Paper should be held with a plier which

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should be slightly warm. If moisture is present in the sample, it will be detected easily by a bubbling or crackling sound. In case of faulty cable, if on test moisture is detected, then further test would have to be carried out to arrest moisture. The cables to be jointed should then be meggered to check the condition of the insulation and a further check of further continuity of cables and tracing out cables to be jointed is necessary. Number on cores represents the phases. But these should never be taken for granted. Crossing of the core should be avoided in a joint.

3.4 PROCESS OF JOINTING

The process of jointing mainly consist of

- i) Connecting conductors together
- ii) Replacing the machine applied insulation
- iii) Providing earth continuity
- iv) Providing mechanical protection

Conductor joints should satisfy the following basic requirements.

- i) Ensure conductivity of the conductor by proper crimping.

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- ii) Leave a reasonably smooth finish and profile on the conductor joint so as to avoid under stress concentration.

4. BACK FILLING TRENCHES AND TEMPORARY REINSTATEMENT

- i) Filling in of trenches shall not be commenced until BSES has inspected and approved the cables and accessories at site. The inspection should be done on daily basis so that the trenches do not remain open unnecessarily, to avoid inconvenience to public.
- ii) Where cables routes are in public highways, footpaths, gardens etc., the method of reinstatement will be subject to approval by MCD. All costs incurred will be at the contractor's expenses.
- iii) The contractor shall be responsible for proper permanent reinstatement of the upper levels, which shall be carried out to the satisfaction of BSES and the MCD authorities concerned.
- iv) Before finally leaving site, permanent reinstatement shall be executed by the contractor to the approval of MCD and the property owners and all costs incurred shall be to the contractor's account.

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5. PERMANENT REINSTATEMENT OF PUBLIC ROAD, FOOT PATH ETC

- i) In public roads and footways the surfaces and foundations shall be temporarily reinstated by the contractor. After settlement, temporary reinstatement material shall be removed as necessary and the permanent reinstatement shall be carried out to the approval of the appropriate highway authority / MCD. Stone and pre-cast concrete paving kerbs and channels shall also be finally reinstated by the contractor.
- ii) Temporary reinstatement shall be maintained by the contractor until commencement of final reinstatement to ensure that the surface is always safe for the passage of pedestrians and vehicular traffic.

6. IDENTIFICATION

All cables shall be identified below the gland at each end, at joint position and at approved positions by means of bands engraved or punched with cable no. feeder name, size of cable, number of cores, phase colour etc. The bands shall be secured fastened in a permanent manner, and shall be made of material able to resist corrosion, dampness and mechanical damage.

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All cables routes shall have markers at suitable location with a gap not exceeding 30 meters. The route markers shall be approved design. Additional markers shall be provided at joint locations with approved markings.

8. CABLE SUPPORTS / CLAMPS

- i) The contractor shall supply and install all the supports, racks, trays, cleats, saddles, clips and other parts required to carry and secure the cables, without risk so that there is no undue mechanical load or stress due to weight of the cable at each end. Cleats, saddles and clips shall be of the design as approved by BSES. No cable shall be laid on the trench floor. They shall be run in a neat and orderly manner and the crossing of cables within the trench shall be avoided as far as possible. Where cable runs unavoidably cross, a suitable supporting arrangement shall be provided to maintain an adequate gap between the cables.
- ii) Every cable shall be supported at a point not more than 500 mm from its termination.

TECHNICAL SPECIFICATION FOR CABLE LAYING**9. INSTALLATION OF CABLES IN TUNNELS / BASEMENT / BELOW THE PANELS**

- i) The design of cable support for cables installed in air in cable tunnels, basements etc. shall consist of vertical steel members spaced at approved interval and secured to the walls, floors and ceilings as necessary by means of bolts either cemented in position or expanded into cored holes. Each vertical support shall have bolted to it a number of steel brackets spaced at the intervals and designed to support and retain trays constructed of galvanized sheet steel of adequate section to carry the weight of the cables, plus space for an additional quantity of future cables at least 25% by weight and dimensions in excess of the cables installed under the contract and an additional load of 100 kg at the extremity without distortion. The trays shall be designed with raised edges to retain the cables and shall incorporate an interlocking feature so as to prevent movement between supports.
- ii) The design and construction of all cable cleating and supporting arrangements shall suit the cable system design. The spacing of cable supports shall be approved by BSES.
- iii) Cable run on trays shall be neatly dressed and where not provided with cleats shall be secured by heavy gauge, type approved metal reinforced, clips or saddles. Not more than six cables shall be embraced by one clip.

TECHNICAL SPECIFICATION FOR CABLE LAYING

- iv) Mild steel of appropriate sections, duly painted in an approved manner, shall be used for fabrication of cable supports. The steel shall be free from blisters, scales, laminations or other defects. Before final painting, the steel sections shall be provided with double coat of red primer.

10. CABLE PROTECTION AT OVERHEAD TOWERS OR POLES

Where the cables terminate on overhead line poles or towers located outside substation compounds the contractor shall provide suitable cable supporting galvanized steel work attached to the pole or tower and comprising backboard, runners, sheet, steel cover of not less than 3.0mm thickness, stays, cable cleats, anti climbing guard and all incidental items to provide secure protection for the cables. Isolators and Lightning arrestor. The erection and steel structure required shall also be in scope of the contractor.

11. SUN SHADES

All cables shall be protected from direct solar radiation by ventilated sun shields as approved by BSES.

12. ROUTE PLAN

- i) Contractor should get updated the GIS map of BSES of route along with joints and other obstructions.
- ii) During the progress of the contract works the contractor shall record on a set of route plans and cross section drawings of an approved

TECHNICAL SPECIFICATION FOR CABLE LAYING

form, these details so that the same can be transferred on the GPS maps. Such particulars will allow an accurate reference to be made in the case of any fault or projected modification. These records shall show, amongst other data, both indoors and outdoors the exact position of every joint, cable end termination and also the particulars of the depth of the trench, the arrangement of the cables, with cable numbers and the position of all obstructions revealed during the course of excavations. These completed records shall be submitted to BSES within 15 days of completion of any particular route/feeder.

13. SITE FACILITIES TO BE MAINTAINED BY THE CONTRACTOR

- i) The contractor shall arrange for all the tools and tackles required for cable laying, jointing testing and commissioning as per this specification.
- ii) The contractor shall arrange illumination and Power supply so that the work can be carried out round the clock.
- iii) The contractor shall maintain functional dewatering pumping facility with suitable power supply so as to protect the cables and the joints from ingress of water due to rain or otherwise
- iv) The contractor shall make arrangement to provide suitable scaffolding arrangement to carry out the termination work
- v) The contractor shall carry out proper barricading of the dug cable route and the joint bays and shall take all necessary precautions to avoid any public hazard.

TECHNICAL SPECIFICATION FOR CABLE LAYING**14. TESTING**

Following tests are to be carried out during and after completion of Cable Laying:

- i) Testing of cable before jointing –Cable shall be tested for Insulation Resistance prior to laying by opening the end and resealing end properly.
- ii) Testing on complete Cable Installation –
 - a. Insulation resistance of each core shall be measured against all the other cores and the metal screen connected to earth.
 - b. The resistance of the conductor shall be measured.
 - c. High voltage – Very Low frequency (VLF) kit shall be used for high voltage testing of complete cables length. Testing voltage and duration shall be as per IEEE 400.2 standards.
 - d. Partial discharge test shall be carried on complete cable length.
 - e. Charging of Cable at No-Load at Nominal working voltage for 24 Hours.
 - f. After laying and before termination of cable a sheath test shall be conducted for 66KV Single core Cable as under:-

At both ends the cable shall be raised from ground. From the end graphite coat over the outer PVC jacket shall be removed with a piece of glass for a length of 300mm. A spiked steel rod with an eye for attaching a wire shall be driven into the ground and connected to a nearby water or hydrant pipe. Insulation resistance of PVC

TECHNICAL SPECIFICATION FOR CABLE LAYING

jacket shall be measured between the aluminum wire armour and the spike with a 500/1000V insulation tester. Measured resistance shall not be less than 2.5 mega ohm / KM. Thereafter 10KV DC shall be applied for one minute in the same way. After the test the armour shall be kept earthed to the steel spike for 15 minutes for discharging residual charge.

- g. Any other testing required to complete the job shall be performed as per IEC standards.

15. BARRICADING AND SAFETY REQUIREMENT

- a. Dimensions of barricading- Height- 2 mtr, Length- 1.5 mtr.
- b. There shall not be any gap in between two barricades.
- c. LED Bacon light shall be placed at 1st and every 4th barricade
- d. Name, painting, color, cleanliness etc. shall be done on regular basis.
- e. Vendor to ensure that traffic management shall not be excuse of work execution. The contactor shall not undertake loading and unloading at carriageways obstructing the free flow of vehicular traffic.
- f. Full height fence, barriers, barricades etc. shall be erected around the site in order to prevent the working area from the risk of accidents due to speedy vehicular movement. In same way barricades shall protect the road users from the danger due to construction equipment and temporary structures.
- g. The structure dimensions of the barricades , material and composition, its color scheme, BSES logo and details shall be in

TECHNICAL SPECIFICATION FOR CABLE LAYING

accordance with specification and drawing laid down in the tender documents.

- h. All the barricades shall be erected as per the design requirements of employer, numbered painted and shall be maintained in good condition. Barricading In-charge shall maintain barricade register at site.
- i. All barricades shall be easily seen in the dark/night time by the road users so that no vehicle hits the barricades. Night vision shall be ensured by affixing retro reflective strips of required size and shape at appropriate angle at bottom and middle portion of the barricades at a minimum gap of 1000 mm. In addition minimum one red light /red blinker and red beacon light shall be placed at the top of each barricade.
- j. No dust deposit is permitted at the front side of barricades.
- k. Cable drum shall be returnable and vendor shall take it back (by buy back process or as per PO agreement) from site at their own risk and cost.
- l. Once cable lying of a drum is completed, within two days, empty drum shall be removed from site.
- m. Trained traffic marshal with all PPE and traffic control light (Red and Green) shall be placed at site for 24x7 hours.
- n. During execution of job, any damage to other agency's properties shall be counted in vendor account and necessary action shall be taken by vendor to immediate recover, repair etc.

TECHNICAL SPECIFICATION FOR CABLE LAYING

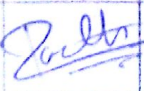
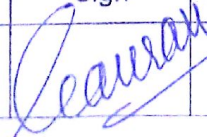
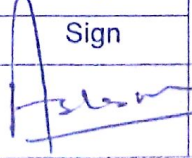
- o. Excess earth shall be removed from site after back filling. Site to be cleared to avoid flowing of dust. Barricades to be removed from site within 24 hrs after completion of job.
- p. During non working hrs vendor to ensure presence of supervisor for controlling any event from locals.
- q. PPEs
 - a. Helmets
 - b. Mask
 - c. Jacket
 - d. Safety Shoes
 - e. First Aid Box etc.

Above mentioned PPEs shall be available at site 24x7. Zero tolerance on absence of PPEs to the working personnel. No excuse shall be acceptable in this regards.

- r. EPR/Scanning shall be done by vendor of whole the route and same shall be submitted to BYPL. This work shall be done by vendor before execution of job.
- s. Lifting of cable drums with hydraulic machine, pulling of cable from top end of drum with pulling machine (hydraulic winch) is mandatory.
- t. Violation on barricading guideline and safety norms, a fine of Rs.5000 /day shall be imposed. BYPL inspector/engineer in-charge shall be empowered to impose the above penalty.
- u. Artwork & Text to be printed on barricading sheet shall be approved by BYPL prior to start of work

**Technical Specification
For Heat Shrinkable And Cold Shrinkable
Straight Through Jointing Kit
(11 KV, 33 KV, 66 KV XLPE Insulated Cables)**

Specification no – SP-HCSTJ-03-R1

Prepared by		Reviewed by		Approved by		Rev	Date
Name	Sign	Name	Sign	Name	Sign		
PG		GS		AA		R0	02/06/2017

**Technical Specification For Heat Shrinkable And Cold Shrinkable Straight Through
Jointing Kit (11 KV, 33 KV, 66 KV XLPE Insulated Cables)****Index**

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**Technical Specification For Heat Shrinkable And Cold Shrinkable Straight Through
Jointing Kit (11 KV, 33 KV, 66 KV XLPE Insulated Cables)**

Record of Revision

Item/Clause No.	Change in Specification	Approved By	Rev

Technical Specification For Heat Shrinkable And Cold Shrinkable Straight Through Jointing Kit (11 KV, 33 KV, 66 KV XLPE Insulated Cables)**1.0.0 Scope of work**

- A. Heat Shrinkable / Cold shrinkable Straight through Joint Kits (hereinafter briefly referred to as “STJ Kits”), suitable for 11 kV, 33 & 66kV XLPE cables, shall be designed, manufactured, tested, packed and delivered by the Vendor, as per Purchaser’s requirements.
- B. During post-installation period, if a joint fails at site, the vendor shall depute a technical team to site for a root-cause analysis of the failure of the joint, in the presence of BSES officials. An Analysis Report shall then be submitted for BSES’s review and approval. If this report concludes the cause of failure as due to a design/manufacturing defect in a component, then vendor shall replace all such components in the entire stock available with BSES.

2.0.0 Codes & standards**2.1.0 National Standards:**

S No.	Standard Number	Title
2.1.1	IS- 13573: 2011	Joints & Terminations of Polymeric Cables for working voltages from 6.6 kV up to and including 33 kV Performance Requirements and Type Tests
2.1.2	IS- 7098: Part 2:1985	Cross-linked Polyethylene (XLPE) Insulated PVC sheathed cables: Part 2 - For working voltages from 3.3 kV up to and including 33 kV
	IS- 7098: Part 3:1993	Cross-linked polyethylene insulated thermoplastic sheathed Cables specification: Part 3 - For working voltages from 66 kV up to and including 220 KV
2.1.3	IS- 10810: 1984	Methods of test for cables

2.1.1 International Standards:

S No.	Standard Number	Title
2.2.1	EA TS - 09-13	Electricity Association - Technical Specification – 09 - 13 Material component for use in Electric Power Cable Termination & Joints for System voltage above 1kV up to 36 kV
2.2.2	IEC - 60183	Guide to the selection of high voltage cables
2.2.3	IEC - 885 Part 1 to 3	Electric test methods for electric cables
2.2.4	IEC - 60502 - 4	Power Cable Accessories for XLPE Cables above 3kV & up to 30 kV Test methods
2.2.5	IEC - 60840	Power cable with extruded insulation and their accessories for rated voltage above 30 kV (Um=36 KV) up to 150 KV (Um=170 KV) - test methods and requirements.

Technical Specification For Heat Shrinkable And Cold Shrinkable Straight Through Jointing Kit (11 KV, 33 KV, 66 KV XLPE Insulated Cables)

3.0.0 Cable Construction

Normal sizes of XLPE cables used in BSES system and the construction features of these cables are indicated below:

11kV, 3-core x 150 sq mm AL
 11kV, 3-core x 300 sq mm AL
 11kV, 1-core x 1000 sq mm AL
 33kV, 3-core x 300 / 400 sq mm AL
 66kV, 1-core x 630 sq mm AL
 66KV, 1 core x 1000 sq mm AL

3.1.0	Conductor	a) Electrolytic Grade Stranded Aluminium Conductor b) Grade: H2 / H4 as per IS: 8130 / 1984 (For Al) c) Stranded, compacted and circular in shape d) Class 2 e) Longitudinal "Water-Blocking Arrangement" (or water-tight construction or water barrier protection)
3.1.1	Conductor Screen	Extruded Semi Conducting material
3.1.2	Insulation	Extruded XLPE Insulation.
3.1.3	Insulation Screen	Freely strippable Semi Conducting (without application of heat) for 66KV firmly bonded.
3.1.4	Water Swell able Tape	Semi-conducting Water Swell able Tape under the copper tape on each core.
3.1.5	Copper Tape	Copper Tape applied helically over the layer formed by application of insulation screen, water swell able tape and identification strip
3.1.6	Filler	All interstices, including center interstices filled by PP filler.
3.1.7	Over all three cores	Binder tape
3.1.8	Inner Sheath	Extruded Inner Sheath of Black PVC type ST-2.
3.1.9	Armour	a) For 3-core Cables : Galvanized Steel flat strip armour b) For 1-core Cables : Non-Magnetic, Hard drawn Aluminium wire (flat/round) c) Corrugated aluminium or lead sheathed for 66KV Cable
3.1.10	Binder Tape	Rubberized cotton tape
3.1.11	Outer Sheath	Extruded outer sheath of PVC (ST-2) for 11 KV and 33 KV and HDPE ST 7 for 66KV with termite- repellent and anti-rodent properties.

Technical Specification For Heat Shrinkable And Cold Shrinkable Straight Through Jointing Kit (11 KV, 33 KV, 66 KV XLPE Insulated Cables)

4.0.0 Straight-Through Joints (STJ)

General Technical Requirements for Straight-Through Joints (STJ) for XLPE cables are as follows:

Scope: Design, manufacture, testing and supply of Straight-Through Joint Kits for 11 KV, 33 KV & 66KV Power Cables.

Functional requirements for Heat Shrinkable / Cold Shrinkable STJ joints are given below:

4.1.0 Heat Shrinkable / Cold Shrinkable STJ joints		
4.1.1	Cable preparation	Cable preparation shall be as per installation instruction sheet. Manufacturer shall provide Installation instruction sheet in every kit
Connector		
4.1.2	Conductor Screen	<p>For 11kV</p> <p>a) Conductors to be jointed by crimping connectors</p> <p>b) Annular CSA (cross-sectional area) of the ferrule shall not be less than CSA of the conductor of the cable. Length of the ferrule shall be sufficient to allow adequate number of crimps, to limit temperature rise at the joint. (Vendor to furnish dimensional drawing for ferrule, indicating crimp marks.)</p> <p>c) For aluminium cable, the crimped ferrule shall be of aluminium</p> <p>d) Refer annexure F for GA drawing of crimping ferrule</p> <p>For 33kV and 66KV</p> <p>a) Shear bolt type mechanical connector</p> <p>b) Approved make:</p> <ul style="list-style-type: none"> • Tyco Electronics (BSM-185/400-U) • Pfisterer (332617010) • Or equivalent make (Manufacturer shall take prior approval from CES) <p>d) Maintain smooth surface over connector after cut the shear head bolt</p> <p>e) Vendor to furnish drawing for the mechanical connector</p>
4.1.3	Void filling and stress relief over crimped connector and cut point of the insulation screen.	By means of High permittivity mastic tapes / Lubricant.
4.1.4	Metal screen continuity	By means of Tinned copper wire mesh, wrap individual core from cu screen with 50 % overlap and continue on other side cu screen. Bind the copper wire mesh on copper screen with copper binding wire
Armour / Earthing Continuity		

Technical Specification For Heat Shrinkable And Cold Shrinkable Straight Through Jointing Kit (11 KV, 33 KV, 66 KV XLPE Insulated Cables)

4.1.5	Armour bond	a) By means of a combination of steel (G.I.) support ring (for 3 - core Cable) or Aluminium support ring (for 1 - core Cable) and two nos. of stainless steel hose clips. b) GI Support Ring shall be 'zinc-sprayed Split Type
4.1.6	Armour continuity	By means of two nos. Of tinned copper braided conductor of 25 sq. mm. for 11 kV 35 sq. mm. for 33kV and 50 sq mm for 66KV.
Accessories		
4.1.7	Suppression of electrical discharges over XLPE insulation	Cleaning solvent /equivalent, for manual application.
4.1.8	Installation Instruction	Shall be provided in English and Hindi and shall be inside every kit.
4.1.9	Sheet paper Tap	Paper tape, required for measurements during jointing, shall be provided inside every kit.
4.1.10	Identification Tag (for traceability)	a) An aluminum pouch with paper tag & sealing arrangement at one end shall be provided. b) This tag is required to be tied over the cable at one side of the joint. c) The paper tag shall give following information 1) Vendor kit designation 2) Division 3) Breakdown ID/Shutdown ID/Scheme No. 4) Cable section 5) Type of joint 6) Size of Joint 7) Make of joint 8) Voltage class 9) Serial no. of kit 10) Vendor lot & batch no 11) Month & year of manufacturing 12) Date of installation 13) Name of joiner 14) Name of vendor supervisor 15) Name of BSES supervisor 16) Remarks
4.1.11	Printing on each Heat/cold shrinkable or Moulded component	Month and year of manufacturing, batch no. /lot no., size, make, type etc.

Technical Specification For Heat Shrinkable And Cold Shrinkable Straight Through Jointing Kit (11 KV, 33 KV, 66 KV XLPE Insulated Cables)

4.2.0 Only for Heat Shrinkable STJ joints

4.2.1	Stress Control System	<p>a) The earthed insulation screen of an XLPE cable is terminated at a suitable distance (minimum 75 mm) from the connector (Ferrule).</p> <p>b) The stress control tube is in electrical contact with insulation screen.</p> <p>c) Impedance of the tube shall be constant up to an operating temperature and shall be within the range 1×10^8 ohm-cm to 8×10^8 ohm-cm.</p> <p>d) The physical and electrical properties shall conform to EA TS 09-13.</p>
4.2.1	Insulation build-up	<p>a) Maximum three layers of insulation tubes shall be used. Total thickness of the insulation being provided in the joint shall not be less than 1.2 times the insulation of the cable being jointed.</p> <p>b) Outer-most tube shall be screened insulating tube (dual wall tube). This tube shall be manufactured by extrusion process.</p> <p>c) Physical and Electrical properties shall conform to EA TS 09-13.</p>
4.2.2	Sealing end of tube	By means of Core end sealing sleeve with red mastic coating. \ Bidder must ensure to provide a solution to prevent water/moisture ingress in the joint.
4.2.3	Mechanical Protection	<p>a) For 3-core cable: By means of a rollable steel mat (with required protective coating against corrosion) (Refer Annex F)</p> <p>b) For 1-core cable:</p> <ol style="list-style-type: none"> Copper wire mesh Adhesive coated medium wall tube One more layer of copper wire mesh Medium wall tube
4.2.4	Corrosion Protection	By means of semi-rigid tubes, internally coated with water blocking sealant. Thick wall Insulating tube

4.3.0 Only for Cold Shrinkable ST joints

Scope:

The term cold shrink applies to materials, which are capable of shrinking without raising the material above the ambient temperature of its immediate surroundings. The material of the rubber insulator used in the Cold Shrink assembly shall be silicone which is factory expanded and placed on a removable core. The removing of the core causes the cold shrink assembly to shrink. The cold shrink assembly shall maintain a compressive force on the cable continuously throughout the life of the product. This pressure will ensure a complete moisture seal.

4.3.1	Stress Control System	By means of one piece body (splice assembly) providing stress control, insulation and screen continuity.
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Technical Specification For Heat Shrinkable And Cold Shrinkable Straight Through Jointing Kit (11 KV, 33 KV, 66 KV XLPE Insulated Cables)

4.3.2	Mechanical Protection	By application of mastic coated vinyl tape and armor cast structural material. The taped armor cast layer may also be sprayed with water to hasten the curing.
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4.4.0	Technical Particulars	Vendor shall submit Guaranteed Technical Particulars (GTP) as per Annexure A.
4.5.0 Testing & Inspection		
4.5.1	Type Tests	a) Straight-Through Joint shall be of type-tested quality. b) In addition to this, vendor will be required to conduct type-testing on heat/cold -shrinkable and moulded components, stress grading mastic, etc., in line with EA TS 09-13 standard, at third party test laboratory once in 6 months on randomly selected sample of each voltage rating without any commercial implication.
4.5.2	Routine & acceptance Tests	I) All the routine and acceptance tests shall be carried out as per EA TS 09-13 guidelines, refer Annexure C. II) H.V. Test shall be carried out on a randomly selected and installed Straight-Through Joint, in the presence of Purchaser's representative, at manufacturer's works. III) The joint shall withstand a test of 4Uo voltage for 4 hours.
4.5.6	Inspection	I) Purchaser reserves the right to inspect /witness all tests on the STJ Kits at Seller's works at any time, prior to dispatch, to verify compliance with the specification. II) In-process and / or final inspection call intimation shall be given in advance to purchaser.
4.5.7	Test Certificates	i) Three sets of complete Test Certificates (Routine & Acceptance tests) shall be submitted along with the delivery of STJ Kits. ii) Bought-out Items: Vendor shall submit Test Certificates, lot/batch number-wise, from their sub- suppliers / principal. TC's should clearly indicate the measured technical parameters, in accordance with sub-supplier's specification. (Also refer Annexure - C)
4.6.0	Documents	"Documents" refer to Documents, Data, Manuals, etc. (Scanned copy of signed documents also shall be part of entire soft file (e-file).

Technical Specification For Heat Shrinkable And Cold Shrinkable Straight Through Jointing Kit (11 KV, 33 KV, 66 KV XLPE Insulated Cables)

4.7.0	Along with the Bid	Vendor shall submit signed 3 sets (plus 1 set of soft copy) of following documents a) GTP (duly filled-in) (as per Annexure — A) b) Cross-sectional drawings for components Assembly. c) Type Test Certificates d) Complete Catalogue and Installation Instructions. e) Any other document.
4.8.0	After Award Contract	Vendor shall submit signed 2 sets (plus 1 set of soft copy) of above-mentioned documents within 15 days, for Purchaser's approval.
4.8.0	"As-Built" documents	Final signed "As-built" documents for the equipment in 3 sets (hard copy), 1 no. soft copy and 1 no. CD. These documents shall include signed Routine & Acceptance Test Certificates also.
4.9.0	Packing, Marking, Shipping, Handling and Storage	a). Every component / kit / box shall be properly sealed/ packed for protection against damage. Stress grading mastic shall be packed in air-tight / air-sealed packing. b). Every kit box shall be wrapped in polythene covers. c. Separate packing (sub-kits) shall be provided, for components (given below) used in crotch area and connector area. These sub-kits, labeled as "CROTCH KIT" and "CONNECTOR KIT", shall be placed inside every kit box. i) Crotch Kit Components --Conductive cable break-out -- Yellow moulded wedge -- Break-out end sealing tube -- Break-out finger sealing tube -- Stress grading mastic ii) Connector Kit : Components -- Ferrule (connector) -- Void Filling mastic (yellow)

Technical Specification For Heat Shrinkable And Cold Shrinkable Straight Through Jointing Kit (11 KV, 33 KV, 66 KV XLPE Insulated Cables)


4.9.1	Identification Label	Markings / Labels shall be on both sides of every packed box. 1) Identification number/type designation (as per manufacturer's standard) 2) Voltage grade, size, description of the Kit (including the voltage grade, size, type of the cables, for which it is to be used) 3) Batch no., lot no., etc. 4) Quantity 5) a) Purchase Order no. & date b) Purchaser's name BSES Yamuna Power Ltd c) BSES's SAP code number 6) Weights (kg) of each Cable Termination Kit and of each box containing kits. 7) Manufacturer's name 8) Month & Year of Manufacturing 9) Date of packing, shelf life (if applicable)
4.9.2	Transit damage	The seller shall be responsible for any transit damage due to improper packing.

5.0.0 Quality Assurance Plan (QAP)

5.1.0	Vendor's Quality Assurance Plan (QAP)	To be submitted for Purchaser's approval.
5.2.0	Sampling Method	Sampling Method for quality checks shall be as per manufacturer's standard practice / ESI guidelines and Purchaser's prior approval shall be taken for the same.
5.3.0	Inspection Hold-Points	To be mutually identified, agreed and approved in Quality Plan.

6.0.0 Deviations

6.1.0	Deviations	a) Deviations from this specification can be acceptable, only where the Seller has listed in his quotation the requirements he cannot, or does not, wish to comply with and which deviations the Buyer has agreed to in writing, before any order is placed. b) In the absence of any list of deviations from the Seller, it will be assumed by the Buyer that the Seller complies with the Specification fully.
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Technical Specification For Heat Shrinkable And Cold Shrinkable Straight Through Jointing Kit (11 KV, 33 KV, 66 KV XLPE Insulated Cables)	

7.0.0 Delivery

7.1.0	Delivery	Dispatch of Material: Vendor shall dispatch the material, only after the Routine Tests /Final Acceptance Tests (FAT) of the material witnessed/waived by the Purchaser, and after receiving written Material Dispatch Clearance Certificate (MDCC) from the Purchaser.
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Technical Specification For Heat Shrinkable And Cold Shrinkable Straight Through Jointing Kit (11 KV, 33 KV, 66 KV XLPE Insulated Cables)**Annexure - A: Guaranteed Technical Particulars (GTP)**

The Vendor is deemed to have examined all parts of the Specification documents and to have been fully informed, as to the nature of work and the conditions related to its performance.

S No.	Description	Purchase requirement	Vendor's data
1	Manufacturer's name		
2	Purchase Order no. & date		
3	Guarantee Period (minimum)	60 Months (from date of commissioning) / 66 Months (from date of receipt at Purchaser's store), whichever is earlier	
4	Applicable IS / IEC Standard followed by Vendor (incl. type test standard)		
5	Voltage Grade (kV)		
5.1	Lightning Impulse Voltage Withstand Test		
5.2	4Uo AC voltage withstand test for 4 hours	Test report submitted	
6	Continuous operating temperature	90 deg. C	
7	Functional Requirements		
7.1	Method of Stress Control and Discharge Suppression		
7.2	Method of Insulation build-up and screening		
7.3	Method of earth bond a) Size and no. of braids b) Size of armour support c) No. of hose clips		
7.4	Method of mechanical protection a) for 3-core Cable b) for 1-core Cable		
7.5	Method of protection against corrosion (type & coating thickness of protective layer on steel mat)		
7.6	Method of conductor continuity a) For crimping connector b) For mechanical connector		

Technical Specification For Heat Shrinkable And Cold Shrinkable Straight Through Jointing Kit (11 KV, 33 KV, 66 KV XLPE Insulated Cables)

8	Description of items in the Kit, which are imported /sourced From Principal /Sub-suppliers		
9	Names of items in the Kit and their respective shelf life (months / years)		
10	Kit Content Table (KCT) enclosed? (Refer Annexure — B)	Yes / No	
11	Drawing for connector (ferrule) enclosed	Yes / No (If yes, mention the document reference)	
12	Is Annexure - D (Technical Deviation Sheet) duly filled-in?		
13	Packing (Qty) i) Packing of every Kit h) Group Packing	1 no -- No. of Kits per Box -- No. of Boxes	
14	Installation Procedure enclosed?	Yes / No (If yes, mention the document reference)	
15	Quality Assurance Programme (QAP for raw materials, in-process inspection, factory testing) is enclosed?	Yes / No	
16	Whether all heat-shrinkable and moulded components of the kit meet the requirements of and have been tested in accordance with EA TS -09-1 3.(for heat-shrinkable joints)	Yes / No (If yes, details of test report no. /Date /name of test laboratory to be mentioned.)	
17	Type Test Reports (TTR) (Relevant test report no. & date, With type, size, other details of each type of Kit.) a) Prepared Joint: CPRI TTR as per BIS / IEC enclosed? b) Loose Components: CPRI TTR as per EA TS 09-13 enclosed?	Yes/No Yes/No	
18	Printing details on each of the Heat- shrinkable and Moulded components	(Mention the text, presently printed on each of the component)	

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Technical Specification For Heat Shrinkable And Cold Shrinkable Straight Through Jointing Kit (11 KV, 33 KV, 66 KV XLPE Insulated Cables)	

Annexure - B: Kit Content Table (KCT)

Vendor shall submit KCT as a consolidated table, consisting of all data, such as:

A. Heading

1. Voltage grade, size, description of the Kit
(Including the voltage grade, size, type of the cables, for which it is to be used)
2. Type designation (as per manufacturer's standard)

B. Details / Parameters (For each component/item of the KCT)

1. Lot no. /Batch no., etc.
2. Item number (manufacturer's standard)
3. Description
 - a) Material, type, make and grade
 - b) Dimensions cross sectional area
 - c) Colour,
 - d) Other description, if any
4. Function of the item
5. Quantity
6. Make/Name/Location of manufacturer/sub-vendor
 - a) Minimum supplied (or in expanded form) diameter
 - b) Maximum freely recovered diameter
7. a) Minimum supplied (or in expanded form) thickness
b) Maximum freely recovered thickness

C. Notes on the KCT

Markings, printings and other details for individual/group of components is to be mentioned on KCT. For example:

- a) Printing of item code, size, batch no., etc.
- b) Printing on components
- c) Other embossing or engraving, if any.

(Note: Vendor may attach an Annexure, for any additional information, if required.)

Technical Specification For Heat Shrinkable And Cold Shrinkable Straight Through Jointing Kit (11 KV, 33 KV, 66 KV XLPE Insulated Cables)**Annexure - C: Routine and Acceptance Test****A. Visual Examination**

Condition of selected items / components, as per sampling method, shall be recorded. Some of the normal check-points can be as follows:

1. Every component shall be verified in quantity and description as per KCT.
2. All items shall be free from any defects, pin holes, cracks, etc.
3. Metallic components to be free from sharp edges.

B. Measurements of Dimensions

(Required / observed dimension — length, diameter, etc.)

1. Supplied dimensions
2. Recovered dimensions

C. Destructive Testing

On various heat-shrinkable / moulded components of ready Kits (items 3 and 4 are applicable only for heat-shrinkable components)

1. Tensile Strength
2. Wall Thickness Ratio
3. Heat Shock
4. Longitudinal Change, after full recovery
5. Ultimate Elongation
6. Low Temperature Flexibility
7. Dielectric Strength
8. Volume Resistivity

Routine Test Reports (RTR) (Typical)

Each RTR shall clearly indicate P.O. no. & date and also BSES's SAP code no. RTR shall record the serial numbers of the kits selected, as per vendor's sampling method. Following details, besides vendor's/manufacturers standard check-points, shall appear in every RTR.

BSES	SP-HCSTJ-03-R1
Technical Specification For Heat Shrinkable And Cold Shrinkable Straight Through Jointing Kit (11 KV, 33 KV, 66 KV XLPE Insulated Cables)	

Annexure - D: Deviation Sheet

Sr No.	Clause No.	Deviation

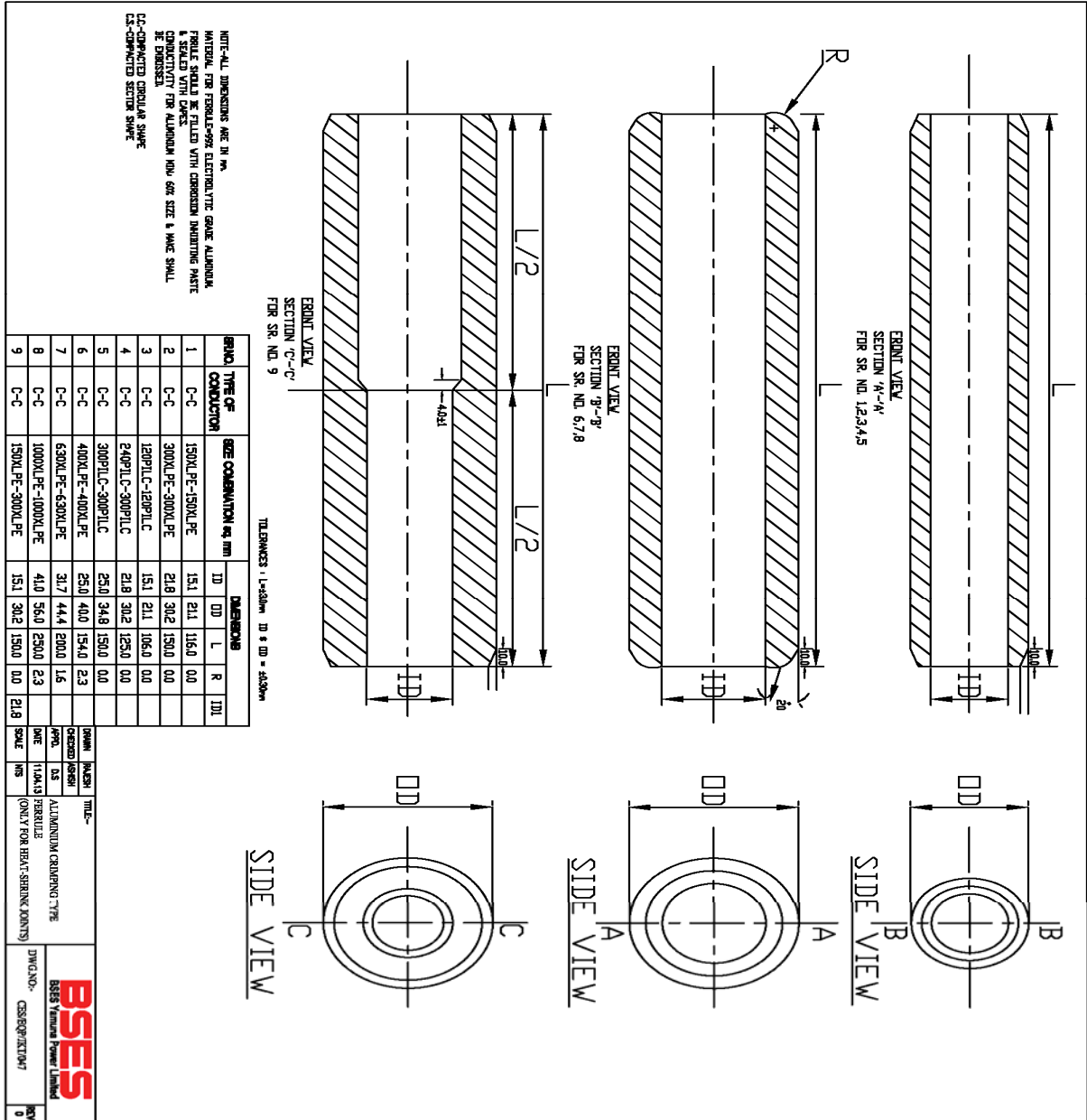
Annexure - E: Service Conditions

(Atmospheric conditions in Delhi)

a)	Average grade Soil Condition	
b)	Maximum altitude above sea level	1000 M
c)	Ambient Air temperature	Highest 50 Deg C, Average 40 Deg C
d)	Minimum ambient air temperature	0 Deg C
e)	Relative Humidity	100 % Max
f)	Thermal Resistivity of Soil	150 Deg C cm/W
g)	Seismic Zone	4
h)	Rainfall	750 mm concentrated in four months

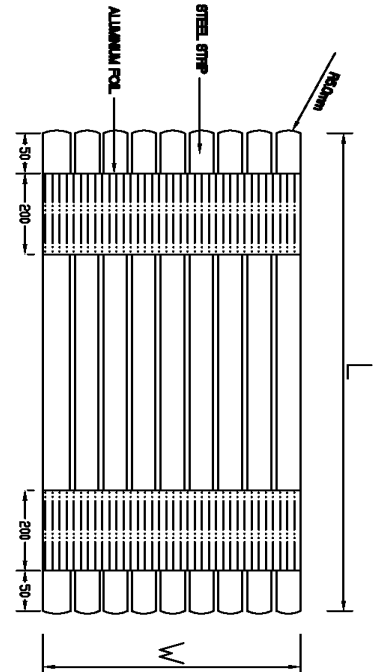
Technical Specification For Heat Shrinkable And Cold Shrinkable Straight Through Jointing Kit (11 KV, 33 KV, 66 KV XLPE Insulated Cables)

Annexure - E: Aluminium crimping-type Ferrule for compacted circular conductor only for Heat Shrink joints

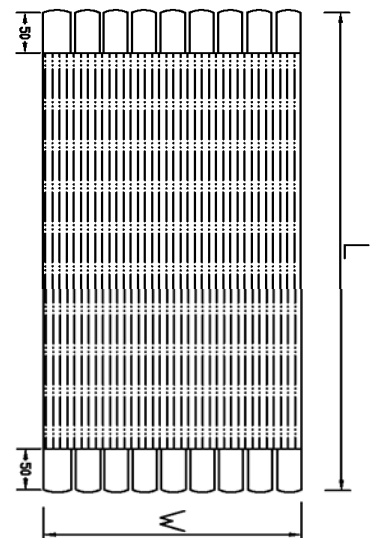


Technical Specification For Heat Shrinkable And Cold Shrinkable Straight Through Jointing Kit (11 KV, 33 KV, 66 KV XLPE Insulated Cables)

Annexure – F: Strip type GI canister (V.B. Can) for joint protection only for Heat Shrink Joint



SIDE-B



SIDE-B

SIDE-A WHICH IS WITH TWO SMALL ALUMINUM FOIL STRIPS. IT SHOULD BE INSTALLED UPWARD. SIDE-B WITH ALMOST COMPLETE ALUMINUM FOIL. IT SHALL BE RESTING OVER THE JOINT.

STILE-B-VI(H ALUMINUM) COMPLETE ALUMINUM FILL. IT SHALL BE RESINING OVER THE JUNT...

NOTE-ALL DIMENSIONS ARE IN MM.

1) MATERIAL-STEEL STRIPS

WIDTH 10mm +0.2mm

GAP BETWEEN STEEL STRIPS-1mm MINIMUM & 2mm MAXIMUM

2) ADHESIVE TAPE-3 PLY LAMINATE MIDDLE ALUMINUM FOIL WITH POLYESTER FILM


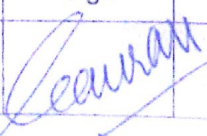
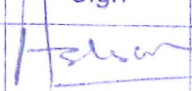
DIMENSIONS FOR 8TP TYPE G1 CANNISTER

SR.NO.	VOLTAGE	JOINT SIZE	NO. OF STRIPS	LENGTH(L)	WIDTH (W)
1	1KV	120PILC-120PILC	40	1450	400
2	1KV	240PILC-240PILC	46	1550	460
3	1KV	120PILC-150XLPE	40	1450	400
4	1KV	240PILC-300XLPE	46	1550	460
5	1KV	120PILC-300XLPE	46	1550	460
6	1KV	70PILC-300XLPE	46	1550	460
7	1KV	150XLPE-150XLPE	34	1260	340
8	1KV	300XLPE-300XLPE	36	1360	360
9	1KV	150XLPE-300XLPE	36	1360	360
10	33KV	300PILC-300PILC	50	1850	500
11	33KV	300PILC-400PILC	50	1850	500

DRAWN	RAMESH	TITLE:-
CHECKED	RAMESH	
APPRO.	AS	STRIP TYPE GI CANISTER V.H.
DATE	11/04/15	(CAN) FOR JNDT PROTECTION
SQALE	N/S	(GENERAL ARRANGEMENT)
		DWG.NO:-
		CIS/RP/JCT/948
		REV 0

**Technical Specification
For Heat Shrinkable and GIS Cable Termination
Kit (For 11 KV, 33 KV & 66 KV Cables)**

Specification no – SP-HSGTK-04-R1

Prepared by		Reviewed by		Approved by		Rev	Date
Name	Sign	Name	Sign	Name	Sign		
AV		GS		AA		R0	02/06/2017

Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 KV, 33 KV, 66 KV Cables)**Index**

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SP-HSGTK-04-R1

Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 KV, 33 KV, 66 KV Cables)

Record of Revision

Item/Clause No.	Change in Specification	Approved By	Rev

Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 KV, 33 KV, 66 KV Cables)**1.0.0 Scope of work**

Heat Shrinkable & GIS Termination Kits, suitable for 11 kV & 33 kV, 66KV XLPE / PILC cables, shall be designed, manufactured, tested, packed and delivered by the Vendor, as per Purchaser's requirements.

2.0.0 Codes & standards

2.1.0 National Standards:

SL	Standard Number	Title
2.1.1	IS - 13573: 2011	Joints & Terminations of Polymeric Cables for working voltages from 6.6 kV up to and including 33 kV Performance Requirements and Type Tests
2.1.2	IS – 7098 Part 2 : 1985	Cross-linked Polyethylene (XLPE) Insulated PVC sheathed cables : Part 2 : For working voltages from 3.3 kV upto and including 33 kV
2.1.3	IS - 692: 1994	Paper insulated lead-sheathed cables (PILC) for rated voltages up to and including 33 kV specification
2.1.3	IS - 10810: 1984	Methods of test for cables

2.1.1 International Standards:

S No.	Standard Number	Title
2.2.1	EA TS - 09 - 13	Electricity Association - Technical Specification -09-13 Material component for use in Electric Power Cable Termination & Joints for System voltage above 1000 V up to 36 kV
2.2.2	IEEE - 48	Standards Test Procedures and requirements for high voltage alternating current cable termination
2.2.3	IEC - 60183	Guide to the selection of high voltage cables
2.2.4	IEC - 885 Part 1-3	Electric test methods for electric cables
2.2.5	IEC - 60840	Power cable with extruded insulation and their accessories for rated voltage above 30 kV (Um=36 KV) up to 150 KV (Um=170 KV) - test methods and requirements.

3.0.0 Cable Construction

Normal sizes of XLPE cables used in BSES system and the construction features of these cables are indicated below:

XLPE type Cables: 3-core x 150, 300 & 400 sq. mm. Al
1-core x 630 or 1000 sq. mm. Al

PILC type Cables: 3-core 240 or 300 sq. mm. Al

Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 KV, 33 KV, 66 KV Cables)

3.1.0	Conductor	For XLPE : a) Electrolytic Grade stranded Aluminium b) Grade: H2/ H4 as per IS: 8130/84 (For Al) c) Shape: Compacted Circular d) Class 2 For PILC : a) 11 kV : sector-shaped b) 33kV: oval-shaped
3.2.0	Conductor Screen	For XLPE : Extruded Semi Conducting material For PILC : 11 kV : no conductor screen 33 kV : carbon paper
3.3.0	Insulation	For XLPE: Extruded XLPE Insulation For PILC: Layers of impregnated papers
3.4.0	Insulation Screen	For XLPE : a) Freely strippable Semi Conducting (without application of heat) for 66KV firmly bonded b) Copper Tape For PILC : a) 11 kV : absent (Belted) b) 33kV: metallised paper tape
3.5.0	Water Swellable Tape	For XLPE: Semi-conducting Water Swellable Tape shall be provided under the copper tape on each core. For PILC : not applicable
3.6.0	Filler	For XLPE: All interstices, including centre interstices filled by PP filler. For PILC : a) 11 kV : Crushed paper filler b) 33kV: Jute twine
3.7.0	Over all three cores	XLPE : Binder tape PILCA : 11 kV : belt paper 33kV: Copper Woven Fabric tape
3.8.0	Inner Sheath	For XLPE: Extruded Inner Sheath of Black PVC type ST-2. For PILC : Lead alloy sheath
3.9.0	Bedding Tape	For XLPE: not applicable For PILC: two layers of paper, followed by compounded (bituminized) cotton tape.
3.10.0	Copper Woven Fabric Tape (CWF tape)	For XLPE : not applicable For PILC : a) 11 kV : absent (Belted cable) b) 33 kV : applicable for screened cable

Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 KV, 33 KV, 66 KV Cables)

3.11.0	Armour	For XLPE : a) Galvanised steel flat strip armour (For 3 core cables) b) Hard drawn Aluminium Wire (For 1 core cables) c) Aluminium or lead sheathed for 66KV cable For PILC : a) 11 kV double steel tape armour
3.12.0	Binder Tape	For XLPE: Rubberised cotton tape
3.13.0	Outer Sheath	For XLPE: Extruded outer sheath of PVC (ST-2) for 11 KV/ 33 KV and HDPE for 66KV Cable with termite- repellent. For PILC : compounded (bituminised) Jute/PVC

4.0.0 Cable Termination Kits

General Technical Requirements for Cable Termination Kits are as follows:

4.1.0	Scope	Design, manufacture, testing and supply of Cable Termination Kits for H. T. Power Cables.				
4.2.0	Functional Requirements					
4.2.1.	Conductor Connection	Voltage Grade	Cable Size	Application	Material of Lug	Connection Method
		11 KV	3Cx 150 & 3Cx 300 sq mm	Indoor	Bi-Metal	Mechanical connector
				Outdoor	Aluminium	Mechanical connector
			1Cx1000 sq mm	Indoor	Aluminium	Crimping
				Outdoor	Aluminium	Crimping
		33 KV	3Cx400 sq mm	Indoor	Bi-Metal	Mechanical connector
				Outdoor	Aluminium	Mechanical connector
		66 KV	1Cx630 & 1Cx1000 sq mm	Indoor	Aluminium	Crimping
				Outdoor	Aluminium	Crimping
		a) For 240 sq. mm. PILC cable and 300 sq. mm. XLPE cable, the lug suitable for 300 sq. mm. XLPE cable shall be used.				
b) For GIS cable termination kits: Conductor connection assembly shall be done by standard method of split, silver-plated copper cone and pressure-fit contact assembly or as per manufacturer's standard.						

Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 KV, 33 KV, 66 KV Cables)

4.2.2	Stress Control System	<p>a) The earthed insulation screen of an XLPE cable is terminated at a suitable distance from the conductor.</p> <p>b) The tube is in electrical contact with insulation screen.</p> <p>c) Impedance of the tube shall be constant upto an operating temperature and shall be within the range 1×10^{08} ohm-cm to 8×10^{08} ohm-cm.</p> <p>d) Minimum length of stress control tube for 11 kV and 33 kV shall be 130 mm and 260 mm respectively.</p> <p>e) The physical and electrical properties shall conform to ESI 09: 13.</p> <p>f) For GIS cable termination kits Stress control shall be done by means of a polymeric stress cone. External profile of the cone shall match inner profile of GIS epoxy bushing. Vendor shall specify the material (EPDM / Silicone) of the cone.</p>
4.2.3	Insulation Protection	<p>a) XLPE insulation shall be protected by means of an outer tube, resistant to tracking and weathering.</p> <p>b) One end of the tube shall be coated internally with red sealant mastic for a length of 50 mm.</p> <p>c) Physical and Electrical properties shall conform to ESI 09: 13.</p>
4.2.3.1	Outer Anti-tracking Tube	Outer length of the tube shall be controlled by providing creepage Extension Shed having the same material composition as the tube. These lengths are given in the table below:

Cable System		Minimum Length of tube (mm)		Creepage Extension Shed (No.) (min)	
Voltage	Cores	Indoor	Outdoor	Indoor	Outdoor
11 kV	3 - core	650	650	Nil	2
	1 - core	340	340	Nil	2
33 kV	3 - core	800	1200	2	5
	1 - core	600	600	2	5

4.2.3.3	Oil Barrier Tube (applicable for PILC cable termination)	<p>a) Transparent tube is used for restoring the insulation provided by belt paper, which is terminated at the crotch.</p> <p>b) 33 kV PILC Termination: The oil barrier tube provides an oil-resistant layer to contain impregnating compound within, thus preventing anti-tracking tube coming in contact with the impregnating compound.</p>
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Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 KV, 33 KV, 66 KV Cables)

4.2.4	Environmental Sealing System	<p>a) Red Sealant Mastic Tape: This tape, used for sealing at ends, shall be synthetic rubber-based and resistant to tracking and weathering. Sufficient quantity of this tape shall be provided.</p> <p>b) Lug-sealing Sleeve: It shall have the same material composition as outer anti-tracking tube. The sleeve shall be fully coated internally with red sealant mastic tape. Length of the sleeve shall be so as to cover half length of the lug barrel and an equal length of track-resistant tube.</p> <p>c) Conductive Break-out: It shall be provided over the crotch for 3-core cables. The break-out base shall overlap PVC outer sheath by a 50 mm. minimum.</p> <p>d) For GIS termination kits : Environmental sealing of cores below the switchgear shall be by means of a trifurcation kit, consisting of heat shrinkable conductive break-out and heat-shrinkable conductive tube of total length of 6 metres supplied in one roll.</p>
4.2.5	Earth Bond System	<p>a) Earth Bond Assembly shall comprise of copper braided conductors as earthing conductors, GI armour support ring (split type) and two stainless steel hose clips.</p> <p>b) For GIS termination kit The earthing arrangement for 3-core cables shall be the same as stated under 'a' above.</p> <p>c) Two nos. copper braided conductors shall be of size: 25 sq. mm. for 11 kV cables, 35 sq. mm. for 33 kV cables and 50 sq mm for 66KV.</p> <p>d) Length of the copper braided conductor shall be 750 mm.</p> <p>e) Each copper braided conductor shall be supplied with copper lug, crimped at one end. Size of lug : 70 sq. mm. for 11 kV and 120 sq. mm. for 33 kV.</p>
4.2.6	Suppression of electrical discharges	<p>Following materials are required for use during cable termination :</p> <p>a) Silicone-based compound Required for filling-in minute services/ surface cracks over XLPE insulation.</p> <p>b) Polymeric mastic Required for application over semiconducting screen, for, eliminating any air-entrapment at any cut point on the surface. It should have sufficient elongation and electrical properties compatible with stress control tube.</p>
4.2.7	Installation. Instruction Sheet	It shall be in English and Hindi language and shall be provided inside every kit.
4.2.8	Identification Tag (for traceability)	<p>a) An aluminum pouch with paper tag & sealing arrangement at one end shall be provided.</p> <p>b) This tag is required to be tied over the cable at one side of the joint.</p> <p>c) The paper tag shall give following information</p> <ol style="list-style-type: none">1) Vendor kit designation2) Division3) Breakdown ID/Shutdown ID/Scheme No.4) Cable section5) Type of joint6) Size of Joint7) Make of joint

Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 KV, 33 KV, 66 KV Cables)

		8) Voltage class 9) Serial no. of kit 10) Vendor lot & batch no 11) Month & year of manufacturing 12) Date of installation 13) Name of jointer 14) Name of vendor supervisor 15) Name of BSES supervisor 16) Remarks
4.2.9	Paper Measuring Tap	Required for use during cable preparation / terminations.
4.3.0	Technical Particulars	Vendor shall submit Guaranteed Technical Particulars (GTP) as per Annexure A.
4.4.0	Type Tests	Termination Kit shall be of type-tested quality.
4.5.0	Testing & Inspection	
	a) Tests	All the routine and acceptance tests shall be carried out as per ESI guidelines. (Also refer Annexure -C)
	b) Inspection	1) Buyer reserves the right to witness all tests specified on individual H. S. components, Moulded components or completed Cable Termination Kit. 2) Buyer reserves the right to inspect Cable Termination Kit at the Seller's works at any time, prior to dispatch, to verify compliance with the specification. 3) In-process and final inspection call intimation shall be given in advance to purchaser.
	c) Test Certificates	Three sets of complete Test Certificates (Routine & Acceptance tests) shall be submitted along with the delivery of Cable Termination Kits.
	d) Type Test	a) End termination kit shall be of type-tested quality. b) In addition to this, vendor will be required to conduct type-testing on heat shrinkable and moulded components, stress grading mastic, etc., in line with EA TS 09-13 standard, at third party test laboratory once in every six months on randomly selected sample of each voltage rating without any commercial implication.
4.6.0	Documents	"Documents" refer to Documents, Data, Manuals, etc. (Scanned copy of signed documents also shall be part of entire soft file (e-file) or CD.)
4.6.1	Along with the Bid	Vendor shall submit signed 3 sets (plus 1 set of soft copy) of following documents: a) GTP (duly filled-in) (as per Annexure - A). b) Cross-sectional drawings for components Assembly c) Type Test Certificates d) Complete Catalogue and Instructions. e) Any other document.
4.6.2	After Award of Contract	Vendor shall submit signed 2 sets (plus 1 set of soft copy) of above mentioned documents within 15 days, for Purchaser's approval.

Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 KV, 33 KV, 66 KV Cables)

4.6.3	"As-Built" documents	Final signed "As-built" documents for the equipment in 3 sets (hard copy), 1 no. soft copy. These documents shall include signed Routine & Acceptance Test Certificates also.
4.7.0	Packing, Marking, Shipping, Handling and Storage	Every component/kit/box shall be properly sealed/ packed for protection against damage.
a)	Identification Label	Markings / Labels shall be on both sides of every packed box. 1) Identification number/type designation (as per manufacturer's standard) 2) Voltage grade, size, description of the Kit (including the voltage grade, size, type of the cables, for which it is to be used) 3) Batch no., lot no., etc. 4) Quantity 5) a) Purchase Order no. & date b) Purchaser's name BSES Yamuna Power Ltd c) BSES's SAP code number 6) Weights (kg) of each Cable Termination Kit and of each box containing kits. 7) Manufacturer's name 8) Month & Year of Manufacturing 9) Date of packing, shelf life (if applicable)
b)	Transit damage	The seller shall be responsible for any transit damage due to improper packing.

5.0.0 Quality Assurance (QA)

5.1.0	Vendor's Quality Plan (QP)	To be submitted for Purchaser's approval.
5.2.0	Sampling Method	Sampling Method for quality checks shall be as per manufacturer's standard practice / ESI guidelines and Purchaser's prior approval shall be taken for the same.
5.3.0	Inspection Hold-Points	To be mutually identified, agreed and approved in Quality Plan.

6.0.0 Deviations

6.1.0.	Deviations	A) Deviations from this specification can· be acceptable, only where the Seller has listed in his quotation the requirements he cannot, or does not, wish to comply with and which deviations the Buyer has agreed to in writing, before any order is placed. B) In the absence of any list of deviations from the Seller, it will be assumed by the Buyer that the Seller complies with the Specification fully.
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Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 KV, 33 KV, 66 KV Cables)**7.0.0 Delivery**

7.1.0.	Delivery	Despatch of Material: Vendor shall despatch the material, only after the Routine Tests/Final Acceptance Tests (FAT) of the material witnessed/waived by the Purchaser, and after receiving written Material Despatch Clearance (MDC) from the Purchaser.
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Annexure – A: Guaranteed Technical Particulars (GTP)

The Seller is deemed to have examined all parts of the Specification documents and to have been fully informed, as to the nature of work and the conditions related to its performance.

S No.	Description	Purchase requirement	Vendor's data
1	Manufacturer's name		
2	Purchase Order no. & date		
3	Guarantee Period (minimum)	60 Months (from date of commissioning) / 66 Months (from date of receipt at Purchaser's store), whichever is earlier	
4	Applicable IS / IEC Standard followed by Vendor (incl. type test standard)		
5	Voltage Grade (kV)		
5.1	Lightning Impulse Voltage Withstand Test		
5.2	4Uo AC voltage withstand test for 4 hours	Test report submitted	
6	Continuous operating temperature	90 deg. C	
7	Functional Requirements		
7.1	Method of Stress Control and Discharge Suppression		
7.2	Method of Insulation build-up and screening		
7.3	Method of earth bond a) Size and no. of braids b) Size of armour support c) No. of hose clips		
7.4	Method of mechanical protection a) for 3-core Cable b) for 1-core Cable		
7.5	Method of protection against corrosion (type & coating thickness of protective layer on		

Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 KV, 33 KV, 66 KV Cables)

	steel mat)		
7.6	Method of conductor continuity a) For crimping connector b) For mechanical connector		
8	Description of items in the Kit, which are imported /sourced From Principal /Sub-suppliers		
9	Names of items in the Kit and their respective shelf life (months / years)		
10	Kit Content Table (KCT) enclosed? (Refer Annexure — B)	Yes / No	
11	Drawing for connector (ferrule) enclosed	Yes / No (If yes, mention the document reference)	
12	Is Annexure - D (Technical Deviation Sheet) duly filled-in?		
13	Packing (Qty) i) Packing of every Kit h) Group Packing	1 no -- No. of Kits per Box -- No. of Boxes	
14	Installation Procedure enclosed?	Yes / No (If yes, mention the document reference)	
15	Quality Assurance Plan (QAP for raw materials, in-process inspection, factory testing) is enclosed?	Yes / No	
16	Whether all heat-shrinkable and moulded components of the kit meet the requirements of and have been tested in accordance with EA TS -09-1 3.(for heat-shrinkable joints)	Yes / No (If yes, details of test report no. /Date /name of test laboratory to be mentioned.)	

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17	Type Test Reports (TTR) (Relevant test report no. & date, With type, size, other details of each type of Kit.)		
	a) Prepared Joint: CPRI TTR as per BIS / IEC enclosed?	Yes/No	
	b) Loose Components: CPRI TTR as per EA TS 09-13 enclosed?	Yes/No	
18	Printing details on each of the Heat- shrinkable and Moulded components	(Mention the text, presently printed on each of the component)	

Annexure – B: Kit Content Table (KCT)

Vendor shall submit KCT as a consolidated table, consisting of all data, such as:

A. Heading

1. Voltage grade, size, description of the Kit
(Including the voltage grade, size, type of the cables, for which it is to be used)
2. Type designation (as per manufacturer's standard)

B. Details / Parameters

(For each component/item of the KCT)

1. Lot no. /Batch no., etc.
2. Item number (manufacturer's standard)
3. Description
 - a) Material, type, make and grade
 - b) Dimensions cross sectional area
 - c) Colour,
 - d) Other description, if any
4. Function of the item
5. Quantity
6. Make/Name/Location of manufacturer/sub-vendor
7. a) Minimum supplied (or in expanded form) diameter
 - b) Maximum freely recovered diameter
8. a) Minimum supplied (or in expanded form) thickness
 - b) Maximum freely recovered thickness

C. Notes on the KCT

Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 KV, 33 KV, 66 KV Cables)

Markings, printings, other details for individual/group of components are to be mentioned on KCT. For example:

- a) Printing of item code, size, batch no., etc.
- b) Printing on components
- c) Other embossing or engraving, if any.

(Note: Vendor may attach an Annexure, for any additional information, if required.)

Annexure – C: Routine and Acceptance Test**A. Visual Examination**

Condition of selected items / components, as per sampling method, shall be recorded. Some of the normal check-points can be as follows:

- 1. Every component shall be verified in quantity and description as per KCT.
- 2. All items shall be free from any defects, pin holes, cracks, etc.
- 3. Metallic components to be free from sharp edges.

B. Measurements of Dimensions

(Required / observed dimension — length, diameter, etc.)

- 1. Supplied dimensions
- 2. Recovered dimensions

C. Destructive Testing

On various heat-shrinkable / moulded components of ready Kits

(Items 3 and 4 are applicable only for heat-shrinkable components)

- 1. Tensile Strength
- 2. Wall Thickness Ratio
- 3. Heat Shock
- 4. Longitudinal Change, after full recovery
- 5. Ultimate Elongation
- 6. Low Temperature Flexibility
- 7. Dielectric Strength
- 8. Volume Resistivity

D. Routine Test Reports (RTR)

(Typical)

BSES	SP-HSGTK-04-R1
Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 KV, 33 KV, 66 KV Cables)	

Each RTR shall clearly indicate P.O. no. & date and also BSES's SAP code no. RTR shall record the serial numbers of the kits selected, as per vendor's sampling method. Following details, besides vendor's/manufacturers standard check-points, shall appear in every RTR.

Annexure – D: Technical Deviation Sheet

Sr No.	Clause No.	Deviation

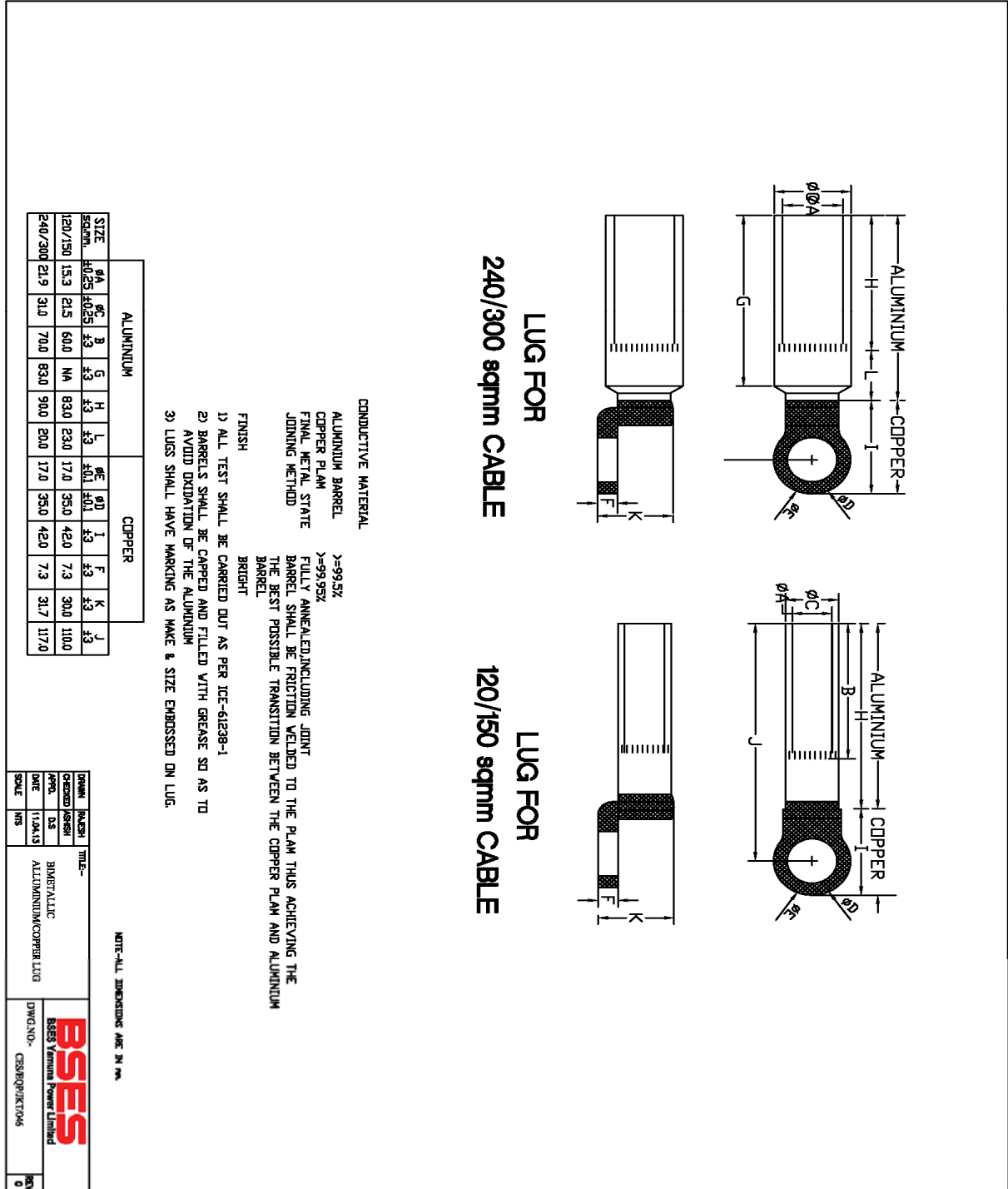
Annexure – E: Service Conditions

(Atmospheric conditions at Site)

1	Delhi	
a)	Average grade Atmospheric Condition:	Heavily Polluted, Dry
b)	Maximum altitude above sea level	1000 M
c)	Ambient Air temperature	Highest 50 deg C, Average 40 deg C
d)	Minimum ambient air temperature	0 deg C
e)	Relative Humidity	90 % Max
f)	Thermal Resistivity of Soil	150 Deg. C cmm
g)	Seismic Zone	4
h)	Rainfall	750 mm concentrated in four months

Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 KV, 33 KV, 66 KV Cables)

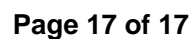
Annexure – F: Bimetallic Aluminium / Copper Lug



NOTE-ALL DIMENSIONS ARE IN mm


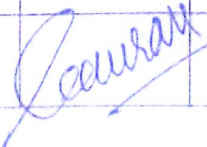
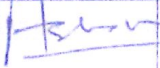
Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 KV, 33 KV, 66 KV Cables)

Annexure – G: Aluminum Lug For XLPE Cable



**Specification for
Heat Shrinkable
Transition Jointing Kit
(For 11 kV & 33 kV Cables)**

Specification no – SP-HSTJK-05-R1

Prepared by		Reviewed by		Approved by		Rev	Date
Name	Sign	Name	Sign	Name	Sign		
PG		GS		AA		R0	02/06/2017

Technical Specification For Heat Shrinkable Transition Jointing Kit (For 11 KV, 33 KV Cables)**Index**

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Technical Specification For Heat Shrinkable Transition Jointing Kit (For 11 KV, 33 KV Cables)

Record of Revision

Item/Clause No.	Change in Specification	Approved By	Rev

Technical Specification For Heat Shrinkable Transition Jointing Kit (For 11 KV, 33 KV Cables)**1.0.0 Scope of work**

- A. Heat Shrinkable Transition Joint Kits (hereinafter briefly referred to as “TRJ Kits”); suitable for 11 kV/33 kV XLPE - PILC cables, shall be designed, manufactured, tested, packed and delivered by the Vendor, as per Purchaser’s requirements.
- B. Supervision during installation of joints at site if mentioned in the order.
- C. During post-installation period, if a joint fails at site, the vendor shall depute a technical team to site for a root-cause analysis of the failure of the joint, in the presence of BSES officials. An Analysis Report shall then be submitted for BSES’s review and approval. If this report concludes the cause of failure as due to a design/manufacturing defect in a component, then vendor shall replace all such components in the entire stock available with BSES.

2.0.0 Codes & standards**2.1.0 National Standards:**

S No.	Standard Number	Title
2.1.1	IS- 13573: 2011	Joints & Terminations of Polymeric Cables for working voltages from 6.6 kV up to and including 33 kV Performance Requirements and Type Tests
2.1.2	IS—7098: Part 2 : 1985	Cross-linked Polyethylene (XLPE) Insulated PVC sheathed cables : Part 2 : For working voltages from 3.3 kV up to and including 33 kV
2.1.3	IS - 692: 1994	Paper insulated lead-sheathed cables (PILC) for rated voltages up to and including 33 kV specification
2.1.4	IS - 10810: 1984	Methods of test for cables

2.2.0 International Standards:

S No.	Standard Number	Title
2.2.1	EA TS - 09-13	Electricity Association - Technical Specification -09-13 Material component for use in Electric Power Cable Termination & Joints for System voltage above 1000 V up to 36 kV
2.2.2	IEEE - 48	Standards Test Procedures and requirements for high voltage alternating current cable termination
2.2.3	IEC - 60183	Guide to the selection of high voltage cables
2.2.4	IEC - 885 Part 1 to 3	Electric test methods for electric cables

Technical Specification For Heat Shrinkable Transition Jointing Kit (For 11 KV, 33 KV Cables)**3.0.0 Cable Construction**

Normal sizes of XLPE cables used in BSES system and the construction features of these cables are indicated below:

XLPE type Cables: 11kV, 3-core x 150 sq mm AL
 11kV, 3-core x 300 sq mm AL
 33kV, 3-core x 400 sq mm AL

A. PILC-Belted cable: (APLySTY)

6.35/11kV (E), 3 core, sector-shaped, Paper insulated, mass impregnated non draining type (PILC), belted, lead alloy 'E' sheathed with bedding over the lead sheath, double G.S. steel tape armoured, overall PVC served with stranded shaped Aluminium conductor (APLySTY) of sizes 120 & 240mm² as detailed in this specification confirming to IS:692.

11kV, 3-core x 120 sq mm AL

11kV, 3-core x 240 sq mm AL

B. PILC- Screened Cable (APLySWY) 19/33kV(E), 12.7/22kV(E) 3 core, 300mm² shaped, Paper insulated, mass impregnated non-draining type (PILC), screened, lead alloy 'E' sheathed with bedding over the lead sheath, round steel wire armoured, overall PVC served with stranded shaped Aluminium conductor (APLySWY) of size 300mm² as detailed in this specification.

22kV, 3-core x 300 sq mm AL

33kV, 3-core x 300 sq mm AL

3.1.0 Cross link polyethylene (XLPE) cable detail:

3.1.1	Conductor	a) Electrolytic Grade stranded Aluminium Conductor b) Grade: H2/ H4 as per IS: 8130/84 (For Al) c) Shape: Compacted Circular d) Class 2 e) Longitudinal "Water-Blocking Arrangement" (or water-tight construction or water barrier protection)
3.1.2	Conductor Screen	Extruded Semi Conducting material
3.1.3	Insulation	Extruded XLPE Insulation, with water-tree retardant property

Technical Specification For Heat Shrinkable Transition Jointing Kit (For 11 KV, 33 KV Cables)

3.1.4	Insulation Screen	Freely strippable Semi Conducting (without application of heat)
3.1.5	Water Swellable Tape	Semi-conducting Water Swellable Tape under the copper tape on each core.
3.1.6	Copper Tap	Copper Tape applied helically over the layer formed by application of insulation screen, water-swellable tape and identification strip
3.1.7	Filler	All interstices, including center interstices filled by PP filler.
3.1.8	Over all three cores	Binder tape
3.1.9	Inner Sheath	Extruded Inner Sheath of Black PVC type ST-2.
3.1.10	Armour	a) Galvanised Steel round Wires/ Galvanised steel flat strip armour (For 3 core cables) b) Hard drawn Aluminium Wire (For 1 core cables)
3.1.11	Binder Tape	Rubberised cotton tape
3.1.12	Outer Sheath	Extruded outer sheath of PVC (ST-2) with termite- repellent and anti rodent properties.

3.2.0 Paper insulated lead sheathed (PILC-Belted and Screened) cable detail:

3.2.1	Conductor	a) Electrolytic Grade stranded Aluminium b) Grade: H2/ H4 as per IS: 8130/84 (For Al) c) Stranded, compacted and sector in shape d) Class 2 e) Free from sharp corners or projection
3.2.2	Insulation	a) Kraft paper impregnated with non-draining Compound. b) Applied helically with controlled lay and tension c) Uniform in texture free from impurities and defects
3.2.3	Identification of cable cores	a) The cable cores shall have the identified numbers (1, 2 & 3) corresponding to R, Y & B phases respectively b) The printing shall be preferably in a white in a dark background.
3.2.4	Belt Paper	Additional (belt) paper insulation layer
3.2.5	Filler	Crushed paper to fill the gaps between cores

Technical Specification For Heat Shrinkable Transition Jointing Kit (For 11 KV, 33 KV Cables)

3.2.6	Metallic screen	a) Lead Alloy "E sheath a) Sheath shall be extruded directly on the cable in the form of a seamless tube. b) It shall be reasonably close-fitting, impervious to moisture and free from pin-holes, joints, mended
3.2.7	Bedding	Bedding shall be of lapped type and shall consists of two layers of impregnated paper tapes applied over coating of waterproof compound over lead alloy sheath without overlap but breaking joints, covered with a layer of compound and followed by two layers of Hussein tapes.
3.2.8	Armour	Galvanized Steel (flat/round)strip armour
3.2.9	Outer Sheath	Extruded outer sheath of PVC (ST-2) with termite repellent and anti-rodent properties.

3.3.0 Paper insulated lead sheathed (only Screened) cable detail

	Conductor Screening	Two layers of semi conducting carbon paper tape applied helically d conductor
	Insulation Screening	Each individual core shall be provided with metallic screening over the insulation,

4.0.0 Transition Joints (TRJ)

General Technical Requirements for Transition Joints (TRJ) for XLPE-PILC Cables are as follows:

Scope: Design, manufacture, testing and supply of Transition Joint Kits for 11 KV & 33 KV Power Cables.

Functional requirements for Heat Shrinkable TRJ joints are given below:

4.1.1	Cable preparation	a) Cable preparation shall be as per installation instruction sheet. b) Manufacturer must be provided Installation instruction sheet in every kit.
Connector		

Technical Specification For Heat Shrinkable Transition Jointing Kit (For 11 KV, 33 KV Cables)

4.1.2	Conductor Connection	<p>For 11kV</p> <p>a) Conductors to be jointed by crimping connectors</p> <p>b) Annular CSA (cross-sectional area) of the ferrule shall not be less than CSA of the conductor of the cable. Length of the ferrule shall be sufficient to allow adequate number of crimps, to limit temperature rise at the joint. (Vendor to furnish dimensional drawing for ferrule, indicating crimp marks.)</p> <p>c) For aluminum cable, the crimped ferrule shall be of aluminum</p> <p>d) Refer annexure F for GA drawing for crimping ferrule</p> <p>For 33kV a) Shear bolt type mechanical connector b) Approved make: Tyco Electronics (BSM-185/400-U) Pfisterer (332617010) Or equivalent make (Manufacturer shall take prior approval from CES)</p> <p>c) Maintain smooth surface over connector after cut the shear head bolt</p> <p>d) Vendor to furnish drawing for the mechanical connector</p>
4.1.3	Screening of belted PILC cable	<p>a) Transparent tube over each core providing oil barrier and for restoring belt paper Insulation.</p> <p>b) Semi conductive tube over each core providing a screen over each core (similar to semicon screen of XLPE cable)</p> <p>c) Yellow mastic fill-up air voids at the crutch.</p> <p>d) A semi conductive breakout, which has been packed with insulating mastic prevent trap of air.</p> <p>e) The fingers overlap the semi conductive tube and establish continuity of lead sheath up to end of the semi conductive tube.</p>
4.1.4	Void filling and stress relief over crimped connector and cut point of the insulation screen.	By means of High permittivity mastic tapes / Lubricant.
4.1.5	Metal screen continuity	<p>a) By means of Tinned copper wire mesh, wrap individual core from cu screen with 50 % overlap and continue on other side metal sheath (lead Sheath)</p> <p>b) Cu wire mesh connect both the side by solder tack</p>
4.1.6	Stress Control System	<p>a) The earthed insulation screen of an XLPE cable is terminated at a suitable distance (minimum 75 mm) from the connector (Ferrule).</p> <p>b) The stress control tube is in electrical contact with insulation screen.</p> <p>c) Impedance of the tube shall be constant up to an operating temperature and shall be within the range 1×10^8 ohm-cm to 8×10^8 ohm-cm.</p> <p>d) The physical and electrical properties shall conform to EA TS 09-13.</p>

Technical Specification For Heat Shrinkable Transition Jointing Kit (For 11 KV, 33 KV Cables)

4.1.7	Insulation build-up	a) Maximum three layers of insulation tubes shall be used. Total thickness of the insulation being provided in the joint shall not be less than 1.2 times the insulation of the cable being jointed. b) Outer-most tube shall be screened insulating tube (dual wall tube). This tube shall be manufactured by extrusion process. c) Physical and Electrical properties shall conform to EA TS 09-13.
4.1.8	Core end sealing	By means of Core end sealing sleeve with coating
4.1.9	Mechanical Protection	By means of a rollable steel mat (with required protective coating against corrosion) Refer drawing
4.1.10	Corrosion Protection	By means of semi-rigid tubes, internally coated with water blocking sealant. Thick wall Insulating tube
Armour / Earthing Continuity		
4.1.11	Armour bond	1) For XLPE cable: a) By means of a combination of steel (G.I.) support ring and two nos. of stainless steel hose clips. b) GI Support Ring shall be 'zinc-sprayed Split Type' 2) For PILC cable: Two No's Solder rod and flux to plumb the earthing braid to lead sheath
4.1.12	Armour continuity	By means of two nos. of tinned copper braided conductor of 25 sq. mm. for 11 kV and 35 sq. mm. for 22 or 33kV.
Accessories		
4.1.13	Vinyl tape	Oil sealing for PILC cable
4.1.14	Suppression of electrical discharges over XLPE insulation	Cleaning solvent /equivalent, for manual application.
4.1.15	Installation Instruction Sheet	Shall be provided in English and Hindi and shall be inside every kit.
4.1.16	Paper Tape	Paper tape, required for measurements during jointing, shall be provided inside every kit.

Technical Specification For Heat Shrinkable Transition Jointing Kit (For 11 KV, 33 KV Cables)

4.1.17	Identification Tag (for traceability)	a) An aluminum pouch with paper tag & sealing arrangement at one end shall be provided. b) This tag is required to be tied over the cable at one side of the joint. c) The paper tag shall give following information 1) Vendor kit designation 2) Division 3) Breakdown ID/Shutdown ID/Scheme No. 4) Cable section 5) Type of joint 6) Size of Joint 7) Make of joint 8) Voltage class 9) Serial no. of kit 10) Vendor lot & batch no 11) Month & year of manufacturing 12) Date of installation 13) Name of jointer 14) Name of vendor supervisor 15) Name of BSES supervisor 16) Remarks
4.1.18	Printing on each Heat/cold shrinkable or Moulded component	Month and year of manufacturing, batch no. /lot no., size, make, type etc.
4.1.19	Technical Particulars	Vendor shall submit Guaranteed Technical Particulars (GTP) as per Annexure A.

5.0.0 Inspection and Testing:

5.1.1	Type Tests	a) Transition Joint shall be of type-tested quality. b) In addition to this, vendor will be required to conduct type-testing on heat shrinkable and moulded components, stress grading mastic, etc., in line with EA TS 09-13 standard, at third party test laboratory once in every six months on randomly selected sample of each voltage rating without any commercial implication.
5.1.2	Routine & acceptance Tests	I) All the routine and acceptance tests shall be carried out as per EA TS 09-13 guidelines, refer Annexure C II) H. V. Test shall be carried out on a randomly selected and installed Transition Joint, in the presence of Purchaser's representative, at manufacturer's works. III) The joint shall withstand a test of 4Uo voltage for 4 hours.

Technical Specification For Heat Shrinkable Transition Jointing Kit (For 11 KV, 33 KV Cables)


5.1.3	b) Inspection	I) Purchaser reserves the right to inspect /witness all tests on the TRJ Kits at Seller's works at any time, prior to dispatch, to verify compliance with the specification. II) In-process and / or final inspection call intimation shall be given in advance to purchaser.
5.1.4	c) Test Certificates	i) Three sets of complete Test Certificates (Routine & Acceptance tests) shall be submitted along with the delivery of TRJ Kits. ii) Bought-out Items: Vendor shall submit Test Certificates, lot/batch number-wise, from their sub-suppliers / principal. TC's should clearly indicate the measured technical parameters, in accordance with sub-supplier's specification. (Also refer Annexure — C)
5.1.5	Documents	"Documents" refer to Documents, Data, Manuals, etc. (Scanned copy of signed documents also shall be part of entire soft file (e-file))
5.1.6	Along with the Bid	Vendor shall submit signed 3 sets (plus 1 set of soft copy) of following documents a) GTP (duly filled-in) (as per Annexure — A) b) Cross-sectional drawings for components! Assembly c) Type Test Certificates d) Complete Catalogue and Installation Instructions. e) Any other document.
5.1.7	After Award of Contract	Vendor shall submit signed 2 sets (plus 1 set of soft copy) of above-mentioned documents within 15 days, for Purchaser's approval.
5.1.8	"As-Built" documents	Final signed "As-built" documents for the equipment in 3 sets (hard copy), 1 no. soft copy. These documents shall include signed Routine & Acceptance Test Certificates also.

Technical Specification For Heat Shrinkable Transition Jointing Kit (For 11 KV, 33 KV Cables)

5.1.9	Packing, Marking, Shipping, Handling and Storage	<p>a) Every component / kit / box shall be properly sealed / packed for protection against damage. Stress grading mastic shall be packed in air-tight / air-sealed packing.</p> <p>b) All tubings should be nested as per application sequence and packed in separate polythene bags.</p> <p>c) Separate packings (sub-kits) shall be provided, for components (given below) used in crotch area and connector area. These sub-kits, labeled as "CROTCH KIT" and "CONNECTOR KIT", shall be placed inside every kit box.</p> <p>i) Crotch Kit Components</p> <ul style="list-style-type: none">-- Semi conducting break-out (PILC side)-- Insulating cable break-out (XLPE side)-- Yellow moulded wedge-- Break-out end sealing tube-- Break-out finger sealing tube-- Stress grading mastic-- Vinyl mastic tape <p>ii) Connector Kit : Components</p> <ul style="list-style-type: none">-- Ferrule (connector)-- Void Filling mastic (yellow)
5.1.10	a) Identification Label	<p>Markings / Labels shall be on both sides of every packed box.</p> <ol style="list-style-type: none">1) Identification number/type designation (as per manufacturer's standard)2) Voltage grade, size, description of the Kit (including the voltage grade, size, type of the cables, for which it is to be used)3) Batch no., lot no., etc.4) Quantity5) a) Purchase Order no. & date b) Purchaser's name c) R-INFRA's SAP code number 6) Weight (kg) of each Cable Termination Kit and of each box containing kits.7) Manufacturer's name8) Month & Year of Manufacturing9) Date of packing, shelf life (if applicable)
5.1.11	b) Transit damage	The seller shall be responsible for any transit damage due to improper packing.

6.0.0 Quality Assurance (QA)

6.1.1	Vendor's Quality Plan (QP)	To be submitted for Purchaser's approval.
6.1.2	Sampling Method	Sampling Method for quality checks shall be as per manufacturer's standard practice / ESI guidelines and Purchaser's prior approval shall be taken for the same.
6.1.3	Inspection Hold-Points	To be mutually identified, agreed and approved in Quality Plan.

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7.0.0 Deviations

7.1.0	Deviations	<p>a) Deviations from this specification can be acceptable, only where the Seller has listed in his quotation the requirements he cannot, or does not, wish to comply with and which deviations the Buyer has agreed to in writing, before any order is placed.</p> <p>b) In the absence of any list of deviations from the Seller, it will be assumed by the Buyer that the Seller complies with the Specification fully.</p>
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8.0.0 Delivery

8.1.0.	Delivery	Despatch of Material: Vendor shall despatch the material, only after the Routine Tests/Final Acceptance Tests (FAT) of the material witnessed/waived by the Purchaser, and after receiving written Material Despatch Clearance (MDC) from the Purchaser.
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Technical Specification For Heat Shrinkable Transition Jointing Kit (For 11 KV, 33 KV Cables)**Annexure - A: Guaranteed Technical Particulars (GTP)**

The Seller is deemed to have examined all parts of the Specification documents and to have been fully informed, as to the nature of work and the conditions related to its performance.

SL	Description	Purchase requirement	Vendor's data
1.0	Manufacturer's name		
2.0	Purchase Order no. & date		
3.0	Guarantee Period (minimum)	60 Months (from date of commissioning) / 66 Months (from date of receipt at Purchaser's store), whichever is earlier	
4.0	Applicable IS / IEC Standard followed by Vendor (incl. type test standard)		
5.0	Voltage Grade (kV)		
5.1	Lightning Impulse Voltage Withstand Test		
5.2	4Uo AC voltage withstand test for 4 hours	To be conducted on Installed joint at works	
6.0	Continuous operating temperature	90 deg. C	
7.0	Functional Requirements		
7.1	Method of Stress Control and Discharge Suppression		
7.2	Method of Insulation build-up and screening		
7.3	Method of earth bond a) Size and no. of braids b) Size of armour support c) No. of hose clips		
7.4	Method of mechanical protection a) for 3-core Cable b) for 1-core Cable		
7.5	Method of protection against corrosion (type & coating thickness of protective layer on steel mat)		
7.6	Method of conductor continuity a) For crimping connector b) For mechanical connector		
8.0	Description of items in the Kit, which are imported /sourced From Principal /Sub-suppliers		
9.0	Names of items in the Kit and their respective shelf life		

Technical Specification For Heat Shrinkable Transition Jointing Kit (For 11 KV, 33 KV Cables)

	(months I years)		
10.0	Kit Content Table (KCT) enclosed? (Refer Annexure — B)	Yes / No	
11.0	Drawing for connector (ferrule) enclosed	Yes / No (If yes, mention the document reference)	
12.0	Is Annexure — D (Technical Deviation Sheet) duly filled-in ?		
13.0	Packing (Qty) i) Packing of every Kit h) Group Packing	1 no. --No. of Kits per Box --No. of Boxes Yes / No (If yes, mention the document reference)	
14.0	Installation Procedure enclosed?		
15.0	Quality Assurance Programme (QAP for raw materials, in-process inspection, factory testing) is enclosed?	Yes / No	
16.0	Whether all heat-shrinkable and moulded components of the kit meet the requirements of and have been tested in accordance with EA TS -09-1 3. (for heat-shrinkable joints)	Yes / No (If yes, details of test report no./Date /name of test laboratory to be mentioned.)	
17.0	Type Test Reports (TTR) (Relevant test report no. & date, With type, size, other details of each type of Kit.) a) Prepared Joint: CPRI TTR as per BIS / IEC enclosed? b) Loose Components: CPRI TTR as per EA TS 09-13 enclosed?	Yes/No Yes/No	
18.0	Printing details on each of the Heat-shrinkable and Moulded components	(Mention the text, presently printed on each of the component)	

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Annexure – B: Kit Content Table (KCT)

Vendor shall submit KCT as a consolidated table, consisting of all data, such as:

A. Heading

1. Voltage grade, size, description of the Kit
(Including the voltage grade, size, type of the cables, for which it is to be used)
2. Type designation (as per manufacturer's standard)

B. Details / Parameters

(For each component/item of the KCT)


1. Lot no. /Batch no., etc.
2. Item number (manufacturer's standard)
3. Description
 - a) Material, type, make and grade
 - b) Dimensions cross sectional area
 - c) Colour,
 - d) Other description, if any
4. Function of the item
5. Quantity
6. Make/Name/Location of manufacturer/sub-vendor
7. a) Minimum supplied (or in expanded form) diameter
 - b) Maximum freely recovered diameter
8. a) Minimum supplied (or in expanded form) thickness
 - b) Maximum freely recovered thickness

C. Notes on the KCT

Markings, printings, other details for individual/group of components are to be mentioned on KCT. For example:

- a) Printing of item code, size, batch no., etc.
- b) Printing on components
- c) Other embossing or engraving, if any.

(Note: Vendor may attach an Annexure, for any additional information, if required.)

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Annexure – C: Routine and Acceptance Test

A. Visual Examination

Condition of selected items / components, as per sampling method, shall be recorded.

Some of the normal check-points can be as follows:

1. Every component shall be verified in quantity and description as per KCT.
2. All items shall be free from any defects, pin holes, cracks, etc.
3. Metallic components to be free from sharp edges.

B. Measurements of Dimensions

(Required / observed dimension — length, diameter, etc.)

1. Supplied dimensions
2. Recovered dimensions

C. Destructive Testing

On various heat-shrinkable / moulded components of ready Kits

(Items 3 and 4 are applicable only for heat-shrinkable components)

1. Tensile Strength
2. Wall Thickness Ratio
3. Heat Shock
4. Longitudinal Change, after full recovery
5. Ultimate Elongation
6. Low Temperature Flexibility
7. Dielectric Strength
8. Volume Resistivity

Routine Test Reports (RTR)

(Typical)

Each RTR shall clearly indicate P.O. no. & date and also BSES's SAP code no. RTR shall record the serial numbers of the kits selected, as per vendor's sampling method. Following details, besides vendor's/manufacturers standard check-points, shall appear in every RTR.

BSES	SP-HSTJK-05-R1
Technical Specification For Heat Shrinkable Transition Jointing Kit (For 11 KV, 33 KV Cables)	

Annexure - D: Deviation Sheet

Sr No.	Clause No.	Deviation

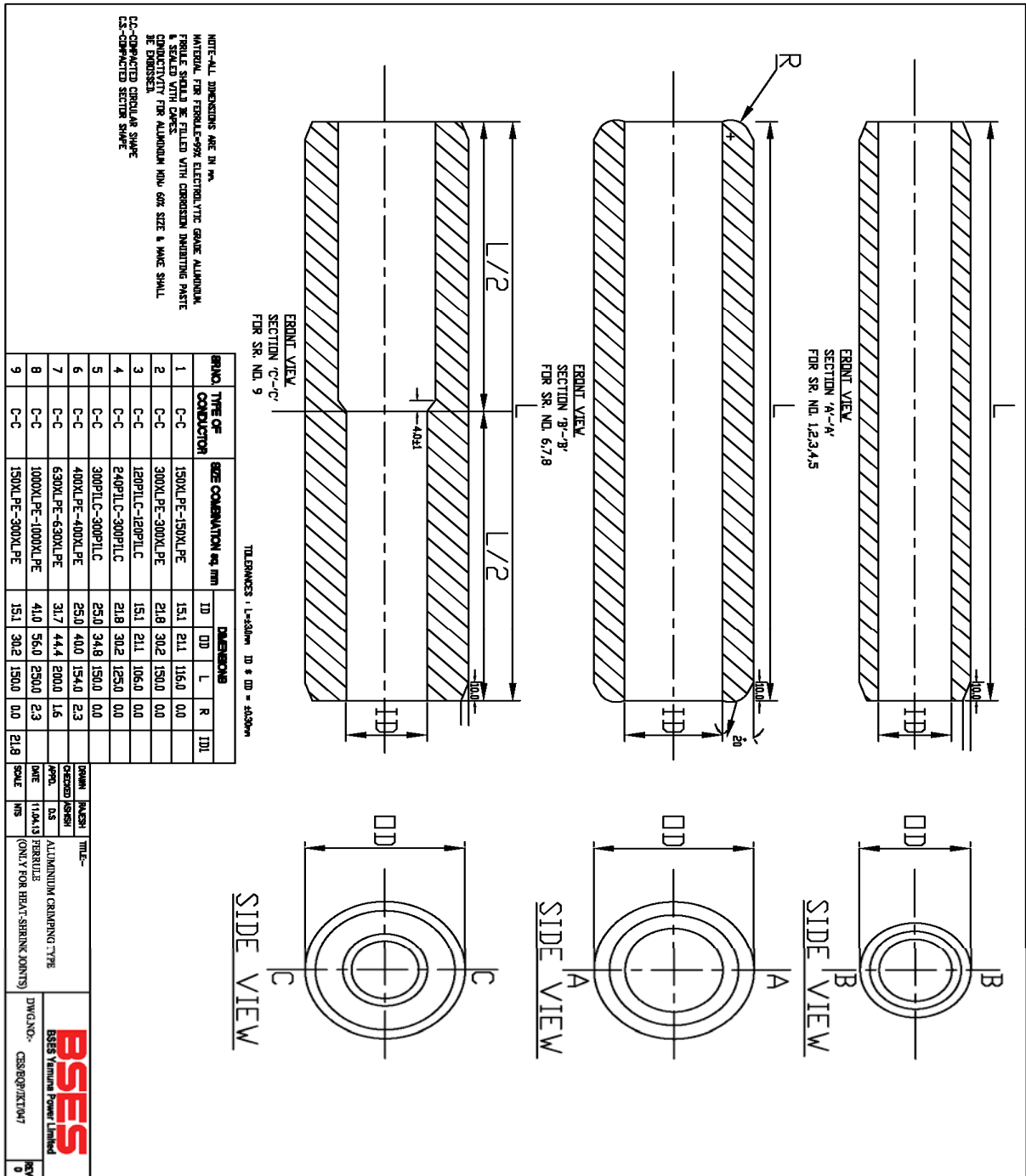
Annexure – E: Service Conditions

(Atmospheric conditions at Site)

1	Delhi	
a)	Average grade Soil Condition:	Highly Polluted, Dry
b)	Maximum altitude above sea level	1000 M
c)	Ambient Air temperature	Highest 50 deg C, Average 40 deg C
d)	Minimum ambient air temperature	0 deg C
e)	Relative Humidity	90 % Max
f)	Thermal Resistivity of Soil	150 Deg. C cm/W
g)	Seismic Zone	4
h)	Rainfall	750 mm concentrated in four months

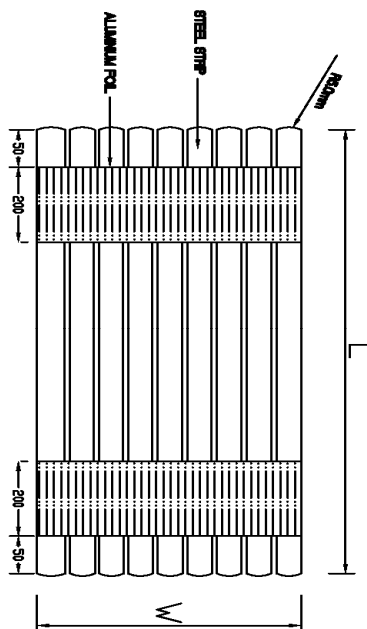
Technical Specification For Heat Shrinkable Transition Jointing Kit (For 11 KV, 33 KV Cables)

Annexure – F: Aluminium crimping-type Ferrule for compacted circular conductor only for Heat Shrink joints



Technical Specification For Heat Shrinkable Transition Jointing Kit (For 11 KV, 33 KV Cables)

Annexure – G: Strip type GI canister (V.B. Can) for joint protection only for Heat- Shrink Joints



SIDE-B

SIDE-A-WHICH IS WITH TWO SMALL ALUMINUM FOIL STRIPS, IT SHOULD BE INSTALLED UPWARD. SIDE-B-WITH ALMOST COMPLETE ALUMINUM FOIL, IT SHALL BE RESTING OVER THE JOINT.

SIDE-B-Y-11TH ALMOST COMPLETE ALUMINUM FOIL. IT SHALL BE RESTING OVER THE JOINT

NOTE-ALL DIMENSIONS ARE IN MM

1) MATERIAL-STEEL STRIPS

THICKNESS 1mm +0.2mm

WIDTH 10mm +0.2mm

COATING-SUITABLE ANTI-CORROSIVE

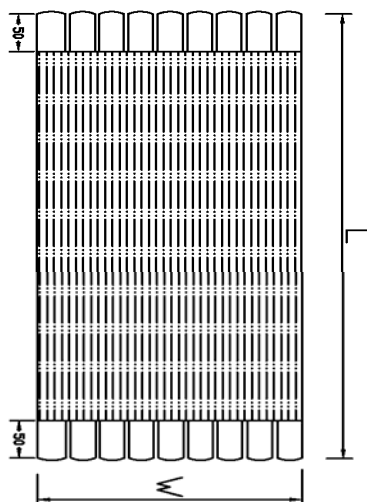
GAP BETWEEN STEEL STRIPS-1mm MINIMUM & 2mm MAXIMUM

2) ADHESIVE TAPE-3 PLY LAMINATE MIDDLE ALUMINIUM FIBRE

CONCLUSIVE INTER-3 FLI CRIMINAL RECORDATION FILE WITH FULCRUM FILE

DIMENSIONS FOR 8TP TYPE G CANISTER

GRNO	VOLTAGE	JUNT SIZE	NO. OF STRIPS	LENGTH	WIDTH (W)
1	1KV	120PILC-120PILC	40	1450	400
2	1KV	240PILC-240PILC	46	1550	460
3	1KV	120PILC-150XL PE	40	1450	400
4	1KV	240PILC-300XL PE	46	1550	460
5	1KV	120PILC-300XL PE	46	1550	460
6	1KV	70PILC-300XL PE	46	1550	460
7	1KV	150XL PE-150XL PE	34	1260	340
8	1KV	300XL PE-300XL PE	36	1360	360
9	1KV	150XL PE-300XL PE	36	1360	360
10	33KV	300PILC-300PILC	50	1650	500
11	33KV	300PILC-400PILC	50	1650	500

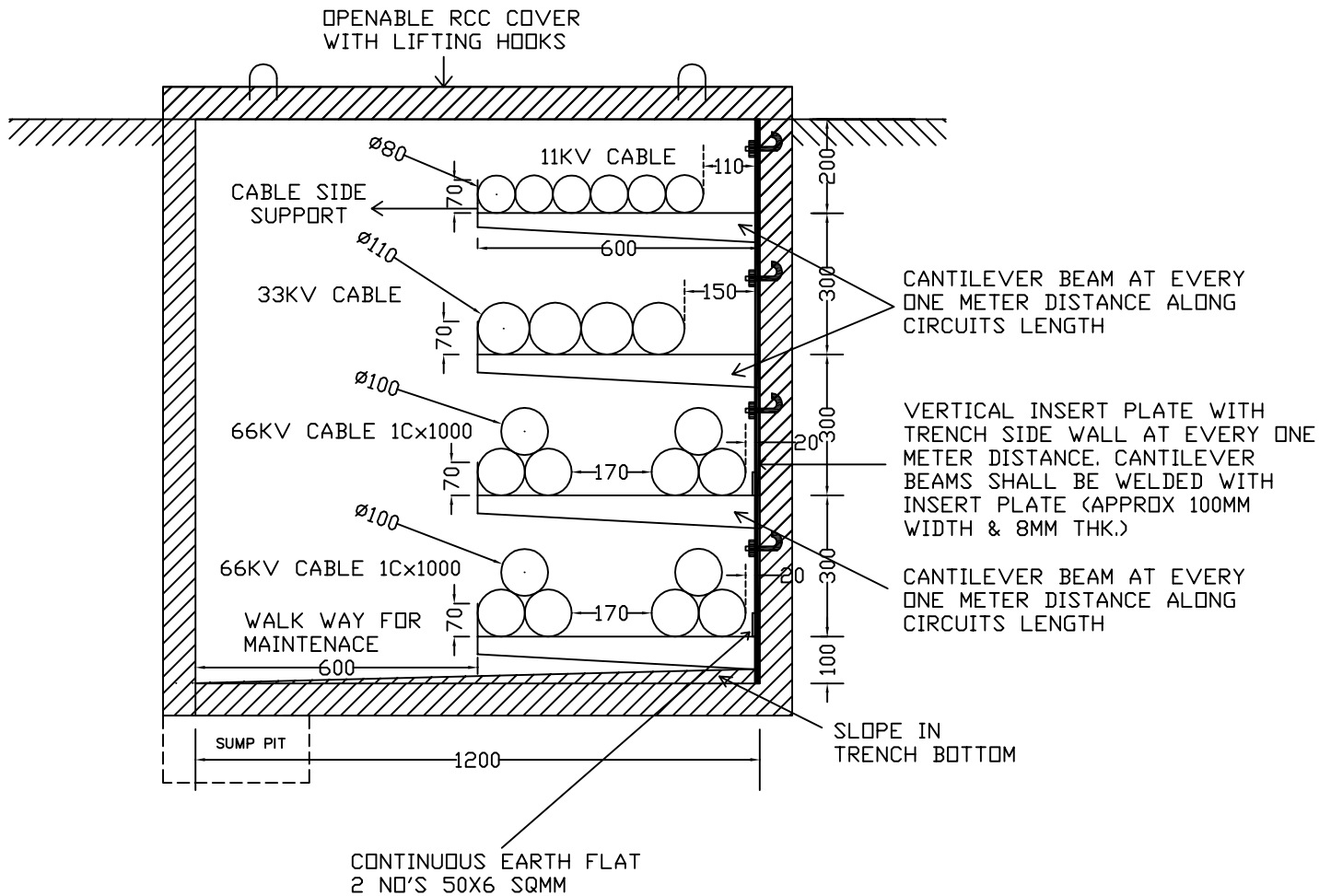


SIDE-B

DATE	15/04/15	 BSES BSES Yamuna Power Limited
CHECKED	ASR/	
DRAWN	RAJESH	
SCALE	1/10	
DATE	15/04/15	

ARRANGEMENT SHOWN IN THIS DRAWING IS SUITABLE FOR OPENABLE RCC TRENCH, CONTINUOUSLY COVERED BY RCC COVERS WITH LIFTING HOOKS ALONG THE TRENCH LENGTH

AS PER IS 1255, CLAUSE 6.6.2; IN CASE OF PASSABLE CABLE TUNNEL; THE HEAD ROOM SHOULD NOT BE LESS THAN 2 METERS. THEREFORE TRENCH DEPTH SHALL BE MINIMUM 3.8 METER.




NOTE:

1. TOTAL CABLE WEIGHT IN EACH TRENCH IS 120 KG/METER. AS CANTILEVER BEAM ARE PLACED AT EVERY ONE METER DISTANCE, CANTILEVER BEAMS & INSTALLATION ARRANGEMENT SHALL BE SUITABLE TO WITHSTAND MINIMUM 120 KG CONTINUOUS WORKING LOADS
2. CABLE CLEAT SHALL BE INSTALLED AT EVERY CABLE RESTING ON CANTILEVER BEAM
3. TREFOIL TYPE CABLE CLEATS SHALL BE USED FOR SINGLE CORE CABLES.
4. SUMP PIT SHALL BE CONSTRUCTED AT EVERY 30 METER DISTANCE
5. 2 NO'S EARTH FLATS OF 50X6 SQMM SHALL BE INTERCONNECTED AT EVERY 30 METER DISTANCE
6. ONLY POWER CABLES AND EARTH FLATS SHALL BE IN BYPL SCOPE
7. CANTILEVER BEAMS SHALL BE COATED WITH PRIMER AND ANTI CORROSIVE PAINT

DETAILED CIVIL DESIGNING OF TRENCH IS TO BE DONE BASED ON INPUTS MENTIONED IN DRAWING

Construction of RCC cable Trench and cable support structure shall not be in the scope of cable SITC bidder/Vendor

DRAWN	RAJESH	 BSES Yamuna Power Limited
CHECKED		
APPD.		
DATE	12/02/2020	TITLE:- CABLE TRENCH ARRANGEMENT FOR CABLE LAYING UNDER METRO PHASE-IV PROJECT
SCALE	NTS	