

Tender Notification for

**SUPPLY, LAYING, TESTING & COMMISSIONING OF 33 KV
3CX400 SQMM CABLES WITH REQUIRED ACCESSORIES ON
SINGLE POINT RESPONSIBILITY BASIS AT DTC DEPOT,
SUKHDEV VIHAR**

NIT NO CMC/BR/22-23/RB/PR/KG/1021 DT 02.05.2022

Due Date for Submission: 23.05.2022 1530HRS

BSES RAJDHANI POWER LTD (BRPL)

Corporate Identification Number: **U74899DL2001PLC111527**

Telephone Number: +91 11 3009 9999

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Website: www.bsesdelhi.com

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SECTION – I: REQUEST FOR QUOTATION

1.00 Event Information

BRPL invites sealed tenders in 2 envelopes for following scope of work

Sl. No.	Description	Estimated Cost (Rs.)	Qty.	Delivery & Installation at
1	SUPPLY, LAYING, TESTING & COMMISSIONING OF 33 KV 3CX400 SQMM CABLES WITH REQUIRED ACCESSORIES ON SINGLE POINT RESPONSIBILITY BASIS AT DTC DEPOT, SUKHDEV VIHAR	7.25 Crores	As per BOQ Attached	Delhi, Sites

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

All envelopes shall be duly super scribed as "SUPPLY, LAYING, TESTING & COMMISSIONING OF 33 KV 3CX400 SQMM CABLES WITH REQUIRED ACCESSORIES ON SINGLE POINT RESPONSIBILITY BASIS AT DTC DEPOT, SUKHDEV VIHAR against **NIT NO CMC/BR/22-23/RB/PR/KG/1021**"

- 1.01 The schedule of specifications with detail terms & conditions can be obtained from address given below against submission of non-refundable demand draft of **Rs.1180/-** drawn in favour of BSES Rajdhani Power Ltd, payable at Delhi. The tender documents & detail terms and conditions can also be downloaded from the website "**www.bsesdelhi.com --> Tenders --> BSES Rajdhani Power Ltd --> 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.

- 1.02 Bids will be received up to 23/05/2022 1530 HRS at the address given at 3.01 below. Part A of the Bid shall be opened on 23/05/2022 1600 HRS.

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.

- 1.03 BSES Rajdhani Power Ltd reserves the right to accept/reject any or all Tenders without assigning any reason thereof in the event of following

- Earnest Money Deposit (EMD)** of value **Rs 7,25,000/-** is not deposited in shape of Demand Draft/Pay Order/Banker's Cheque /Bank Guarantee drawn in favour of BSES Rajdhani Power Ltd, payable at Delhi.
- The offer does not contain prices indicating break-up towards all taxes & duties in prescribed format
- Complete Technical details are not enclosed.
- Tender is received after due date and time.
- Technical offer contains any prices
- Prices are **not FIRM** and subject to Price Variation

2.0 Qualification Criteria:-

Technical

The prospective bidder must qualify all of the following requirements to participate in the bidding process and bidder who meets following requirements will be considered as successful bidder and BRPL has a right to disqualify those bidders who do not meet these requirements.

- a. The Bidder must be a manufacturer of 33 kV or higher grade HV power cable for past 2 years through CCV or VCV line with following
 - i. Bidder shall have true triple extrusion machine along with CCV line with dry curing and dry cooling in Nitrogen
 - ii. Cable eccentricity monitoring system during triple extrusion in CCV line. Chartered Engineer certificate should be submitted in support of this QR.
- b. The Bidder should have supplied at least 25 KMS of cable of 33 KV or higher voltage grade cable during last 3 years from the date of technical bid opening. Documents in support of this QR to be submitted.
- c. The Bidder should have In-house testing facilities for raw material, routine and acceptance tests as per relevant IS/IEC Self-declaration & List of testing equipment to be submitted in support of this QR.
- d. In case of new vendor not registered with BRPL, factory inspection and evaluation shall be carried out to ascertain bidder's manufacturing capability and quality procedure. However, BRPL reserves right to carry out factory inspection and evaluation for any bidder prior to technical qualification evaluation.
- e. 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, Bidder to give the undertaking that it will be obtained by them before the start of the work at site or suitable sub-contractor having the valid license shall be engaged for works at site where copy of valid license shall be submitted to BRPL before the award of the PO.
- f. The bidder must be a manufacturer of offered Power Cables of same or higher voltage, type with similar cross section or higher and having valid Type Test Reports carried out at CPRI/ERDA only (not more than 5 years old from the date of technical bid opening).

In case type test reports are older than five (5) years from the date of bid opening, bidder shall submit the undertaking that there is "No Design Change". Type test older than ten (10) years shall not be acceptable and bid is liable for rejection.

- g. Bidder should have at least two performance/Successful completion Certificates of successful supply, laying, testing & commissioning of 33 KV or higher voltage cable on turnkey basis in the last 3 years from the date of technical bid opening from utilities/SEBs/Govt. Bodies/reputed firms for installation in distribution network. Out of these, one certificate should be more than 10 KMs of cable.
- h. Bidder need to share at least two numbers of sub-vendors (to be engaged in execution work) and their credentials (list of Project executed, T&P, Manpower details, electrical license etc.) to BRPL. Sub-vendors shall meet the qualifying criteria as listed out in QR-2 below.

Indian Subsidiaries of global companies having plant in India are also eligible to bid if the qualification requirements stated above are met independently or in combination with the parent company. Declaration from parent company needs to be submitted.

Financial

- i. **Turnover:** Bidder should have Average Annual Sales Turnover of Rs 100 Crores or more in last three (3) financial years, duly certified CA certificate to be submitted.
- j. The bidder must possess valid ISO 9001:2015 certification and valid BIS License or Equivalent International License.
- k. The bidder should have qualified technical & qualified QA personnel at various stages of manufacture & testing.
- l. An undertaking (self-certificate) that the bidder has not been blacklisted/debarred by any central/state government institution including electricity boards.
- m. The bidder must have valid PAN No., GST registration nos., in addition to other statutory compliances. The bidder must submit the copy of registrations and submit an undertaking that the bidder shall comply with all the statutory compliances as per the applicable laws/rules etc. before the start of the work.

Notwithstanding anything stated above, BRPL 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. BRPL also reserves the right to evaluate the bidder based on performance of past supplies/projects executed in BRPL. In this regard the decision of the purchaser is final.

QR-2.0: For Sub-vendors:

- a. Sub-vendor must provide experience certificate of having successfully laid minimum 10 KM cable of rating 33 KV and above in utilities/SEBs/Govt. Bodies/reputed firms for installation in distribution network during the last five years in Delhi/NCR area.
- b. The Sub-vendor must enclose order copies along with performance certificates/successful completion certificates in support of relevant experience. Experience credential as a joint venture / subcontract/ consortium will not be considered
- c. For Existing vendors of BRPL, performance shall be measured on earlier executed similar works/ other works and will be taken into account in technical evaluation for qualification of bids

Financial

- d. **Turnover:** Sub-vendor should have Average Annual Turnover of Rs 3 Crore or more in last three (3) financial years, duly certified CA certificate to be submitted.
- e. Sub-vendor must provide proof of having solvency of an amount equal to Rs. 50 Lacs from any nationalized/scheduled commercial bank. (Not older than 1st April 2020)
- f. Sub-vendor should have PAN No & should fulfill all statutory compliances like PF, ESI registration, GST no.
- g. Entities that have been debarred/ blacklisted in other utilities in India will not be considered; in this regard a written statement has to be provided on Sub-vendor's letter head along with other documents.
- h. Sub-vendor should have a valid Electrical License issued by Delhi Govt. for doing electrical works in Delhi region.

The Sub-vendor should give an undertaking on the company's letter head that all the documents/certificates/information submitted by them against the tender is genuine.

3.00 **Bidding and Award Process**

Bidders are requested to submit their offer strictly in line with this tender document. **NO DEVIATION IS ACCEPTABLE.** BRPL 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 to the following address

**Head of Department
Contracts & Material Department
BSES Rajdhani Power Ltd
1st Floor, C Block
BSES Bhawan, Nehru Place
New Delhi 110019**

PART A: TECHNICAL **BID** comprising of following (1 original + 1 copy)

- EMD in prescribed format
- Non-refundable demand draft for Rs 1180/- in case the forms are downloaded from website
- Documentary evidence in support of qualifying criteria
- Technical Details / Filled in GTP/Type test report etc
- Qualified Manpower available & Organization Chart
- Testing Facilities
- Copies of Orders, Execution /Performance Certificate & Other Documents to support the QC as per clause 2.0
- Original Tender documents duly stamped & signed on each page as token of acceptance
- Acceptance to Commercial Terms and Conditions viz Delivery schedule/period, Payment terms, PBG etc

PART B: FINANCIAL **BID** comprising of (1 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	Date
1	Date of sale of bid documents	03.05.2022
2	Pre-Bid meeting	13.05.2022 1430 HRS
3	Pre-Bid meeting link	https://bsesbrpl.webex.com/meet/rakesh.bansal
4	Last date of Queries, if any	16.05.2022
5	Last date of receipt of bid documents	23.05.2022 1530HRS
6	Date & time of opening of tender – Part A	23.05.2022 1600HRS

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 after techno-commercial evaluation and only of the qualified bidders.

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

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.

In case RA is not concluded/conducted for any reasons, a "final no regret" financial bid in a sealed envelope will be called for from all qualified bidders

BIDS RECEIVED AFTER DUE DATE AND TIME SHALL 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 **Splitting of Tendered Scope of works in two or more bidders:** BSES reserve the right to split the tender scope amongst techno- commercially qualified bidders. The purchaser reserves all the rights to award the contract to one or more bidders to meet the timelines of the projects /scope of work or nullify the award decision without any reason.

4.03 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.

4.04 In case any supplier is found unsatisfactory during the delivery process, the award will be cancelled and BRPL reserves the right to award other suppliers who are found fit.

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. A bidder who violates the marketplace rules or engages in behavior that disrupts the fair execution of the marketplace shall be restricted from bidding for a 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 Confidentiality

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

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

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

7.00 Contact Information

Technical or Commercial clarifications, 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 email/phone

	Technical	Commercial
Contact Person	Mr. Sheshadri Krishnapura (HOD-TSG)	Mr. Pankaj Goyal (Head Procurement)
Address	BSES Rajdhani Power Ltd , 2 nd Floor, B Block, BSES Bhawan, Nehru Place, New Delhi 110019	BSES Rajdhani Power Ltd , 1 st Floor, D Block, BSES Bhawan, Nehru Place, New Delhi 110019
Email	<u>sheshadri.krishnapura@relianceada.com</u> amit.as.tomar@relianceada.com	<u>pankaj.goyal@relianceada.com</u> <u>kumar.ga.gaurav@relianceada.com</u>

SECTION – II: INSTRUCTION TO BIDDERS

1.00 GENERAL

BSES Rajdhani Power Ltd, hereinafter referred to as "The Company" are desirous of awarding work for "SUPPLY, LAYING, TESTING & COMMISSIONING OF 33 KV 3CX400 SQMM CABLES WITH REQUIRED ACCESSORIES ON SINGLE POINT RESPONSIBILITY BASIS AT DTC DEPOT, SUKHDEV VIHAR".

2.00 SCOPE OF WORK

The scope of the work is as per BOQ in the tender.

3.00 DISCLAIMER

This Document includes statements, which reflect various assumptions, which may or may not be correct. Each Bidder shall conduct its own estimation and analysis and should check the accuracy, reliability and completeness of the information in this Document and obtain independent advice from appropriate sources in their own interest.

Neither Purchaser nor its employees will have any liability whatsoever to any Bidder or any other person under the law or contract, the principles of restitution or unjust enrichment or otherwise for any loss, expense or damage whatsoever which may arise from or be incurred or suffered in connection with anything contained in this Document, any matter deemed to form part of this Document, provision of Services and any other information supplied by or on behalf of Purchaser or its employees, or otherwise arising in any way from the selection process for the Supply.

Though adequate care has been taken while issuing the Bid document, the Bidder should satisfy itself that Documents are complete in all respects. Intimation of any discrepancy shall be given to this office immediately.

This Document and the information contained herein are Strictly Confidential and are for the use of only the person(s) to whom it is issued. It may not be copied or distributed by the recipient to third parties (other than in confidence to the recipient's professional advisors).

4.00 COST OF BIDDING

The Bidder shall bear all cost associated with the preparation and submission of its Bid and the company will be in no case be responsible or liable for those costs.

5.00 BIDDING DOCUMENTS

The Scope of Work, Bidding Procedures and Contract Terms are described in the Bidding Documents. In addition to the covering letter accompanying Bidding Documents, the Bidding Documents include:

Request for Quotation (RFQ) - Section - I
Instructions to Bidders (ITB) - Section - II
Special Terms & Conditions of Contract (SCC) - Section –III

General Terms and Condition Supply (GCC-Supply) - Section –IV
Price Format Supply- Section V
General Terms and Condition Erection, Testing & Commissioning (GCC-ETC) - Section –VI
Price Format Erection, Testing & Commissioning - Section VII
Grand Summary of the Quoted Price – Section VIII
Vendor Code of Conduct - Section IX
Annexure-I General
Scope Demarcation and Route Map – Annexure II
Technical Specifications - Annexure III

The Bidder is expected to examine the Bidding Documents, including all Instructions, Forms, Terms and Specifications. Failure to furnish all information required by the Bidding Documents or submission of a Bid not substantially responsive to the Bidding Documents in every respect will may result in the rejection of the Bid.

6.00 **AMENDMENT OF BIDDING DOCUMENTS**

At any time prior to the deadline for submission of Bids, the Company may for any reasons, whether at its own initiative or in response to a clarification requested by a prospective Bidder, modify the Bidding Documents by amendment.

The Amendment shall be part of the Bidding Documents, pursuant to Clause 5.00, and it will be notified in web site www.bsesdelhi.com, and will be binding on them.

In order to afford prospective Bidders reasonable time in which to take the Amendment into account in preparing their Bids, the Company may, at its discretion, extend the deadline for the submission of Bids. The same shall be published as a corrigendum in website www.bsesdelhi.com.

Purchaser shall reserve the rights to following

- extend due date of submission
- modify tender document in part/whole
- cancel the entire tender

Bidders are requested to visit website regularly for any modification/clarification/corrigendum/addendum of the bid documents

7.00 **LANGUAGE OF BID**

The Bid prepared by the Bidder, and all correspondence and documents relating to the Bid exchanged by the Bidder and the Purchaser shall be written in the English Language. Any printed literature furnished by the Bidder may be written in another Language, provided that this literature is accompanied by English translation, in which case, for purposes of interpretation of the Bid, the English translation shall govern.

8.00 **DOCUMENTS COMPRISING THE BID**

The Bid prepared and submitted by the Bidder shall comprise the following components:

- Bid Form, Price & other Schedules (STRICTLY AS PER FORMAT) and Technical Data Sheets completed in accordance with Technical Specification
- All the Bids must be accompanied with the required EMD as mentioned in the Section-I against each tender.
- Tender documents duly stamped and signed on each page by authorized signatory

9.00 BID FORM

9.01 The Bidder shall submit one "Original" and one "Copy" of the Un-priced Bid Form, Price Schedules & Technical Data Sheets duly filled in as per attached specification/BOM etc enclosed.

9.02 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:

- (a) Banker's Cheque / Demand Draft/Pay Order drawn in favour of BSES Rajdhani Power Ltd, payable at Delhi.
- (b) Bank Guarantee valid for One hundred Twenty (120) days after due date of submission or amended due date of submission drawn in favour of BSES Rajdhani Power Ltd, BSES Bhawan, Nehru Place, New Delhi 110019

The EMD may be forfeited in case of:

- (a) The Bidder withdraws its bid during the period of specified bid validity

OR

- (b) The case of a successful Bidder, if the Bidder does not
 - (i) Accept the Purchase Order, or
 - (ii) Furnish the required performance security BG.

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, Erection, testing & commissioning 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. The Bidder is required, at his expense, to obtain all the information he may require to enable him to submit his tender including necessary visits to the site to ascertain the local conditions, procurement of necessary materials, labour, etc., requirements of the local/government/public authorities in such matters.

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.**

11.00 BID CURRENCIES

Prices shall be quoted in Indian Rupees Only.

12.00 PERIOD OF VALIDITY OF BIDS

12.01 Bids shall remain valid for 120 days from the due date of submission of the Bid & subsequent corrigendum/amendment/extension of due date of submission.

12.02 Notwithstanding Clause 12.01 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.

13.00 ALTERNATIVE BIDS

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" and "copy" 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 copy, the original shall govern.

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 & one Copy (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 super scribed with —"Technical & EMD". The price bid shall be inside another sealed envelope with super scribed "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 and Copy. The envelopes should be super scribed 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 thereafter be subject to the deadline as extended.

17.00 **ONE BID PER BIDDER**

Each Bidder shall submit only one Bid by itself. **No Joint Venture 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**

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 shall 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.

20.00 **PROCESS TO BE CONFIDENTIAL**

Information relating to the examination, clarification, evaluation and comparison of Bids and recommendations for the award of a contract shall not be disclosed to Bidders or any other persons not officially concerned with such process. Any effort by a Bidder to influence the Purchaser's processing of Bids or award decisions may result in the rejection of the Bidder's Bid.

21.00 **CLARIFICATION OF BIDS**

To assist in the examination, evaluation and comparison of Bids, the Purchaser may, at its discretion, ask the Bidder for a clarification of its Bid. All responses to requests for clarification shall be in writing and no change in the price or substance of the Bid shall be sought, offered or permitted.

22.0 **PRELIMINARY EXAMINATION OF BIDS / RESPONSIVENESS**

22.01 Purchaser will examine the Bids to determine whether they are complete, whether any computational errors have been made, whether required sureties have been furnished, whether the documents have been properly signed, and whether the Bids are generally in order. Purchaser may ask for submission of original documents in order to verify the documents submitted in support of qualification criteria.

22.02 Arithmetical errors will be rectified on the following basis. If there is a discrepancy between the unit price and the total price per item that is obtained by multiplying the unit price and quantity, the unit price shall prevail and the total price per item will be corrected. If there is a discrepancy between the Total Amount and the sum of the total price per item, the sum of the total price per item shall prevail and the Total Amount will be corrected.

22.03 Prior to the detailed evaluation, Purchaser will determine the substantial responsiveness of each Bid to the Bidding Documents including production capability and acceptable quality of the Goods offered. A substantially responsive Bid is one, which conforms to all the terms and conditions of the Bidding Documents without material deviation.

22.04 Bid determined as not substantially responsive will be rejected by the purchaser and/or the Purchaser and may not subsequently be made responsive by the Bidder by correction of the non - conformity.

23.00 **EVALUATION AND COMPARISON OF BIDS**

The evaluation of Bids shall be done based on the delivered cost competitiveness basis.

- 23.01 The evaluation of the Bids shall be a stage-wise procedure. The following stages are identified for evaluation purposes: In the first stage, the Bids would be subjected to a responsiveness check. The Technical Proposals and the Conditional ties of the Bidders would be evaluated.
- 23.02 Subsequently, the Financial Proposals along with Supplementary Financial Proposals, if any, of Bidders with Techno-commercially Acceptable Bids shall be considered for final evaluation.
- 23.03 The Purchaser's evaluation of a Bid will take into account, in addition to the Bid price, the following factors, in the manner and to the extent indicated in this Clause:
- Delivery Schedule
 - Conformance to Qualifying Criteria
 - Deviations from Bidding Documents

Bidders shall base their Bid price on the terms and conditions specified in the Bidding Documents.

The cost of all quantifiable deviations and omissions from the specification, terms and conditions specified in Bidding Documents shall be evaluated. The Purchaser will make its own assessment of the cost of any deviation for the purpose of ensuring fair comparison of Bids.

- 23.04 Any adjustments in price, which result from the above procedures, shall be added for the purposes of comparative evaluation only to arrive at an "Evaluated Bid Price". Bid Prices quoted by Bidders shall remain unaltered.

24.00 **CONTACTING THE PURCHASER**

- 24.01 If any Bidder wishes to contact the Purchaser on any matter related to the Bid, from the time of Bid opening to the time of contract award, the same shall be done in writing only.
- 24.02 Any effort by a Bidder to influence the Purchaser and/or in the Purchaser's decisions in respect of Bid evaluation, Bid comparison or Contract Award, will result in the rejection of the Bidder's Bid.

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

The Purchaser reserves the right to accept or reject any Bid and to annul the Bidding process and reject all Bids at any time 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.

26.00 **AWARD OF CONTRACT**

- 26.01 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.
- 26.02 **Splitting of Tendered Scope of works in two or more bidders:** BRPL reserve the right to split the tender scope amongst techno- commercially qualified bidders. The purchaser reserves all the rights to award the contract to one or more bidders to meet the timelines of the projects /scope of work or nullify the award decision without any reason.
- 26.03 The Purchaser intends to issue separate Purchase/Work Orders viz
- a) Purchase Order for Supply
 - b) Work Order for Installation, Testing & Commissioning

27.00 THE PURCHASER 'S RIGHT TO VARY QUANTITIES

The Purchaser reserves the right to vary the quantity i.e. increase or decrease the numbers/quantities without any change in terms and conditions during the execution of the Order.

28.00 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 work.

29.00 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 the 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 up to completion period/handing over, whichever is earlier plus 3 months claim period. Upon submission of the performance security, the EMD shall be released. 2 (two) nos. separate CPBG's shall be submitted against Supply, ETC.

30.00 CORRUPT OR FRADULENT PRACTICES

30.01 The Company requires that the Bidders observe the highest standard of ethics during the procurement and execution of the Project. In pursuance of this policy, the Company:

(a) Defines, for the purposes of this provision, the terms set forth below as follows:

"Corrupt practice" means behavior on the part of officials in the public or private sectors by which they improperly and unlawfully enrich themselves and/or those close to them, or induce others to do so, by misusing the position in which they are placed, and it includes the offering, giving, receiving, or soliciting of anything of value to influence the action of any such official in the procurement process or in contract execution; and

"Fraudulent practice" means a misrepresentation of facts in order to influence a award process or the execution of a contract to the detriment of the Company, and includes collusive practice among Bidders (prior to or after Bid submission) designed to establish Bid prices at artificial non -competitive levels and to deprive the Company of the benefits of free and open competition.

(b) Will reject a proposal for award if it determines that the Bidder recommended for award has engaged in corrupt or fraudulent practices in competing for the contract in question ;

(c) Will declare a firm ineligible, either indefinitely or for a stated period of time, to be awarded a contract if it at any time determines that the firm has engaged in corrupt or fraudulent practices in competing for, or in executing, a contract.

30.02 Furthermore, Bidders shall be aware of the provision stated in the Terms and Conditions of Contract.

31.00 COMPLETION PERIOD

Within 4 months from the date of issuance of LOI/Order

Section III

SPECIAL TERMS AND CONDITIONS OF CONTRACT

- 1.1. Bidders are requested to visit the site to understand the scope of work, site conditions and requirements prior to Bidding. Hence, no price/time escalation shall be admissible on these accounts.
- 1.2. The scope of this tender includes supply , survey , design , engineering , manufacturer , shop testing , inspection , packing , dispatch , loading , unloading and storage at site, storage and construction insurance , assembly , erection , structural , complete pre-commissioning checks , testing and commissioning at site , obtaining statutory clearance & certification from state electrical inspector and handing over to owner after successful laying, testing & commissioning etc of EHV Cables as per BOQ ,with required accessories on single point responsibility basis.
- 1.3. The scope includes supply of all barricading, free issued materials (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 BRPL store including loading & unloading and no additional charges shall be paid against these activities. Used barricading material will be taken back by bidder soon after job is handed over or as directed by BRPL Engineer-In-Charge (E-I-C). 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.
- 1.4. Delivery of cable at site and all other equipments/accessories have to be aligned as per site requirements and progress.
- 1.5. Joints & Terminations installation shall only be done by OEM. No additional cost for this item will be paid to the Bidder. Contractor to provide all support to the Jointers for doing Joints & Terminations of Joint Kits.
- 1.6. Prices for all the activities shall be FIRM till the actual completion of the job. Statutory variation will be allowed for direct supplies only wherever breakup of Taxes & Duties are available in Price Bid. In case bidder has not submitted any price breakup, no variation on account of statutory variation shall be paid extra by BRPL.
- 1.7. There will be no price escalation given to bidder even if there is delay in the project due to ROW permission.
- 1.8. Permission from road owning agencies & statutory clearance for road cutting shall be in the scope of bidder. However statutory fees will be borne by BRPL.
- 1.9. Bidder has to submit the technical parameters with details of Spares for each rating with catalogue, reference codes etc.
- 1.10. Wherever BRPL specifications are not available relevant IS/IEC to be followed. All Drawings mentioned in the Tender Specification and other required for the completeness of the tender shall be submitted. Drawing submission process shall not be deemed complete if all the requirements are not complied during the submission of the same.
- 1.11. The bidder should have own testing equipment's/they have to provide like IR Tester, Hi Pot Test Kit and Earth Tester and Sheath Integrity test kit with Calibration Certificates for testing the cables. Sheath integrity test will in scope bidder before charging of cable(for 66 kV Cable only)

- 1.12. The Bidder should have own Safety equipment like Neon Tester, Portable Earth, Earthing discharge rod etc. along with Calibration Certificates of all the equipment.
- 1.13. The Bidder should have all major tools and tackles for cable laying like Bench Machine, Rollers, Jack for lifting the Cable drum along with calibration certificates etc.
- 1.14. Bidder has to submit the item wise price bifurcation in bid. Unprice copy must be attached with the Part A. Reverse Auction will be carried out on Lump sum Basis/Total Landed Cost i.e. Supply + ETC
- 1.15. Any other material not specifically mentioned above but required for successful commissioning and operation is in the scope of bidder. Prior approval shall be taken from central engineering department before execution. Commercial approval shall be taken from C&M Department before execution.
- 1.16. Successful bidder has to adhere to the statutory compliance.
- 1.17. Successful Bidder has to depute the safety officer and quality officer separately at site for whole duration and they have to submit the safety report and quality report to BRPL E-I-C on weekly basis.
- 1.18. Successful bidder has to send the weekly progress report to BRPL EIC.
- 1.19. In case of any major deviation, deletion or addition which bidder may feel is relevant to this project & for its safe operation and completion of works; Bidder may clearly highlight and communicate the same to the purchaser with his bid.
- 1.20. Necessary Statutory Clearances from CEI of Delhi & any other authority for energizing shall be in the scope of this tender. However, any statutory fees shall be borne by BRPL on production of documentary evidence.
- 1.21. Taking over after commissioning of the complete system and final approval of Electrical Inspector & Compliance to punch points observed to the satisfaction of Projects as per statutory requirements, system shall be handed over to BRPL.

1.22. Guarantee period/Defect Liability period:

The Guarantee Period will be equipment/service/work specific and shall be as specified in the Technical Specifications for the equipment/material/service/work and where Technical specifications are not part of contract documents or guarantee period is not specified in the Technical specifications, the guarantee period shall be as per the Special Terms and Conditions of the Contract. In case of no mention of the guarantee period in Technical specifications, Defect liability period will be 24 Months from the Date of Commissioning or 30 months from the date of delivery of final lot of supplies made, whichever is later.

For Cable & Joints: The defect liability period shall be 60 months from the date of commissioning or 66 months from the date of delivery whichever is later.

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 30 days from the date of receipt of intimation

1.23. Failure during Guarantee Period:

If the equipment and material supplied/service or work rendered under the contract fails to perform its due, rated & intended quality performance, during the Guarantee period, the bidder is liable to undertake repair/rectify/replace the equipment and material supplied/service or work rendered under the contract within time frame as specified below at bidder's cost to make the equipment and material supplied/service or work

rendered under the contract of performing its due, rated and intended quality performance. If bidder fails to repair/rectify/replace the equipment or material supplied/service or work rendered under the contract, failed in Guarantee Period, purchaser will be at liberty to get the same done at bidder's risks and costs and recover all such expenses plus the purchaser own charges (@ 15% of expenses incurred), from the bidder or from the "Performance Bank Guarantee" as the case may be.

If during the Warranty/ Guarantee period some parts of the supplies are replaced owing to the defects/damages under the Warranty, the Warranty period for such replaced parts shall be until the expiry of twelve months from the date of such replacement or renewal or until the end of original Guarantee period, whichever is later.

- a) Service Engineer Availability to Attend, Identify & Restore Defects (Minor) of materials/Equipment's under Guarantee Period within 48 Working Hours (Exclusion of Material Support Cases)
- b) Spare Material Delivery for rectification of defect (Major) Under Guarantee Period within Two Weeks. Bidder must keep Requisite Inventory of Critical Spares & Other Equipments Covered in Guarantee Period to Restore Equipment within Two Weeks.
- c) In Case Of Complete Replacement of material, within a Period of 4 Weeks.

Note: BRPL is in the business of Power distribution and is committed to providing reliable and continuous power supply to its customers. In case of any fault in the system, BRPL's top most priority is to rectify the fault and restore the system as soon as possible and maintain the supply.

If during the defect liability period any fault occurs in the system due to faulty materials, design or workmanship, BRPL shall intimate the vendor of such occurrence for taking immediate corrective action.

However, if the situation, in BRPL's sole discretion warrants an emergency restoration, it reserves the right to take immediate action for identifying the fault and restoring the system with available resources & materials or with help from any other third party agency under intimation to the Vendor. All costs of replacement, substitution, shipping, labour and other related expenses including taxes and levies incurred in connection with the restoration of fault plus 15% of expenses incurred as administrative overheads shall be for the account of Vendor. BRPL will charge the vendor for the costs incurred for fault restoration or may set off such costs against any amounts payable by BRPL to the Vendor or deduct from the PBG submitted by the Vendor. Vendor shall pay BRPL the amount within 30 days.

Root cause analysis of the fault shall be done jointly by BRPL's CES & O&M teams and Vendor. In case the fault is due to any reason other than faulty materials, design or workmanship, Vendor shall be exempted from any further action or Cost.

- 1.24. All the bay equipment (i.e- LA, CT, PT, Disc Insulator, String, Suspension Insulator, Bushing etc.) shall be Polymeric type in the place of porcelain with creepage 31mm/kV. Rest of the parameter to be followed as per tech spec.

1.25. PROJECT INFORMATION & COMPLETION

The contractor shall be fully responsible to complete the project in time. It is desired that the project should be completed as per the schedule from the date of LOI or purchase order whichever is earlier. The detailed completion schedule shall be prepared by vendor and shall be submitted at the time of detailed engineering for approval. Vendor has to submit the progress report fortnightly in the format attached (Appendix VIII) with this tender/as asked by the Purchaser.

1.26. **PROJECT IMPLEMENTATION & EXECUTION CONTROL**

The bidders are requested to submit the following along with the bid, about the project implementation & execution methodology.

- a) Write up/overview of project Plan
- b) Implementation Methodology
- c) Project Organization Chart for Representatives, Project Office & site office teams along with the functions.
- d) Bar Chart & Network Diagram (with critical path) for various activities to achieve scheduled completion.

SECTION IV

GENERAL TERMS AND CONDITIONS - SUPPLY

- 1.01** All the Bids shall be prepared and submitted in accordance with these instructions.
- 1.02** 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.
- 1.03** 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 the other party.
- 1.04** 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 RFQ requirement is incomplete.
- 1.05** 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.

2.0 Definition of Terms

- 2.01** "Purchaser" shall mean BSES Rajdhani Power Limited, on whose behalf this bid enquiry is issued by its authorized representative / officers.
- 2.02** "Bidder" shall mean the firm who quotes against this bid enquiry issued by the Purchaser. "Supplier" or "Supplier" shall mean the successful Bidder and/or Bidders whose bid has been accepted by the Purchaser and on whom the "Letter of Acceptance" is placed by the Purchaser and shall include his heirs, legal representatives, successors and permitted assigns wherever the context so admits.
- 2.03** "Supply" shall mean the Scope of Contract as described.
- 2.04** "Specification" shall mean collectively all the terms and stipulations contained in those portions of this bid document known as RFQ, Commercial Terms & Condition, Instructions to Bidders, Technical Specifications and the Amendments, Revisions, Deletions or Additions, as may be made by the Purchaser from time to time.
- 2.05** "Letter of Acceptance" shall mean the official notice issued by the Purchaser notifying the Supplier that his proposal has been accepted and it shall include amendments thereto, if any, issued by the Purchaser. The "Letter of Acceptance" issued by the Purchaser shall be binding on the "Supplier" The date of Letter of Acceptance shall be taken as the effective date of the commencement of contract.
- 2.06** "Month" shall mean the calendar month and "Day" shall mean the calendar day.
- 2.07** "Codes and Standards" shall mean all the applicable codes and standards as indicated in the Specification.
- 2.08** "Offer Sheet" shall mean Bidder's firm offer submitted to BRPL in accordance with the specification.
- 2.09** "Contract" shall mean the "Letter of Acceptance/Purchase Order" issued by the Purchaser.
- 2.10** "Contract Price" shall mean the price referred to in the "Letter of Acceptance/Purchase Order".

- 2.11** "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.
- 2.12** "Acceptance" shall mean and deemed to include one or more of the following as will be stipulated in the specification:
- a) The written acceptance of material by the inspector at suppliers works to ship the materials.
 - b) Acceptance of material at Purchaser site stores after its receipt and due inspection/ testing and release of material acceptance voucher.
 - c) Where the scope of the contract includes supplying, acceptance shall mean issue of necessary equipment / material takeover receipt after installation & commissioning and final acceptance.

3.0 Contract Documents & Priority

Contract Documents: The terms and conditions of the contract shall consist solely of these RFQ conditions and the offer sheet. 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. Any amendments to Contract
- 2. Commercial Terms & Conditions of the Contract
- 3. Clarifications/addendum/corrigendum to Tender
- 4. Terms & Conditions of the Tender

4.0 Scope of Supply -General

- 4.01 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.
- 4.02 Bidder shall have to quote for the Bill of quantities as listed elsewhere.
- 4.03 All relevant drawings, data and instruction manuals.

5.0 Quality Assurance and Inspection

- 5.01 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, BRPL shall forward the standard QAP which is to be followed by vendor during manufacturing.
- 5.02 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 can proceed with the work past a hold point only after clearance by purchaser or a witness waiver letter from BRPL.
- 5.03 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.

- 5.04 On completion of manufacturing the items can only be dispatched after receipt of dispatch instructions issued by the Purchaser.
- 5.05 All in-house testing and inspection shall be done without any extra cost. The in-house inspection shall be carried out in presence of BRPL/BRPL authorized third party inspection agency. Cost of Futile/abortive visit(s) shall be debited from the invoices
- 5.06 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. To avoid any complaint the supplier is advised to send his representative to the stores to see that the material sent for testing is being sealed in the presence of bidder's representative.

6.0 Packing, Packing List & Marking

- 6.01 **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 BRPL, Delhi/New Delhi stores/site without undue risk of damage in transit.
- 6.02 **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.

7.01 Price basis for supply of materials

Bidder to quote their prices on Landed Cost Basis and separate price for each item.

FIRM prices for supply to BRPL Delhi/New Delhi stores inclusive of packing, forwarding, loading at manufacturer's premises, payment of all taxes, GST, Freight, any other local charges etc.

The above supply prices shall also include unloading at BRPL Delhi/New Delhi stores/site.

Transit insurance will be arranged by bidder.

8.0 Terms of payment and billing – SUPPLY

- a) 70% prorata of supply value shall be payable against R/A bills for supply of equipment and materials within 30 days against receipt of material at site and submission of following documents duly certified by BRPL Project-in-charge:
- i. Consignee copy of LR
 - ii. Detailed invoice showing commodity description, qty, unit & total price,
 - iii. Original certificate issued by BRPL confirming receipt of material at site & acceptance
 - iv. Dispatch clearance & inspection report issued by the inspection authority
 - v. Packing List, Test Reports
 - vi. Guarantee Certificate.
- b) 15% prorata after installation/erection of equipment duly certified by BRPL Project-in-charge
- c) 15% prorata after completion of successful acceptance testing, commissioning and Handing Over of the entire Installation and duly certified by BRPL Project-in-charge and submission of PBG of 10% of contract

value valid up to Defect Liability period i.e. 24 months from the date of Handing over of entire Installation Plus 3 months towards Claim period.

9.0 Price Validity

- 9.01 All bids submitted shall remain valid, firm and subject to unconditional acceptance by BRPL Delhi for 120 days from the due date of submission & subsequent corrigendum/amendment/extension of due date of submission. For awarded suppliers/contractors, the prices shall remain valid and firm till contract completion.

10.0 Performance Guarantee

- 10.01 Bank guarantee shall be drawn in favour of "BSES Rajdhani Power Ltd" as applicable. The performance Bank guarantee shall be in the format as specified by BRPL.
- 10.02 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.
- 10.03 Contractor shall submit the performance bank guarantee equivalent to the 10% of the contract value at the time of claiming the last payment as per clause no. 8.0(C) (Terms of payment and billing – SUPPLY), with the validity of the bank guarantee till Defect Liability Period plus 3 months towards Claim period.

11.0 Forfeiture

- 11.01 Each Performance Bond established under Clause 10.0 shall contain a statement that it shall be automatically and unconditionally forfeited without recourse and payable against the presentation by BRPL 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.
- 11.02 Each Performance BG established under will be automatically and unconditionally forfeited without recourse if BRPL at its sole discretion determines that supplier has failed to comply with any term or condition set forth in the contract.

12.0 Release

All Performance Bonds will be released without interest within seven (7) days from the last date up to which the Performance Bond has to be kept valid (as defined in Clause 10.0) except for the case set forth in Clause 21.0.

13.0 Guarantee of Performance

The bidder shall stand guarantee that the equipment and material supplied/service or work rendered under the contract is free from design, manufacturing, material, construction, erection & installation and workmanship & quality defects and is capable of its due, rated and intended quality performance, as an integrated product delivered under the contract for a specific period termed as Guarantee Period. The bidder should also guarantee that the equipment/material is new and unused except for the usage required for the tests and checks required as part of quality assurance.

14.0 Guarantee Period/Defects Liability Period

The Guarantee Period will be equipment/service/work specific and shall be as specified in the Technical Specifications for the equipment/material/service/work and where Technical specifications are not part of

contract documents or guarantee period is not specified in the Technical specifications, the guarantee period shall be as per the Special Terms and Conditions of the Contract. In case of no mention of the guarantee period in Technical specifications, Defect liability period will be 24 Months from the Date of Commissioning or 30 months from the date of delivery of final lot of supplies made, whichever is later.

For Cable & Joints: The defect liability period shall be 60 months from the date of commissioning or 66 months from the date of delivery whichever is later.

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 30 days from the date of receipt of intimation.

Cost of repairs on failure in Guarantee Period:

The cost of repairs/rectification /replacement, apart from the actual cost of repairs/rectification/replacement is also inclusive of all bidder costs of required transportation, site inspection /mobilization/dismantling and re-installation costs as applicable, to be borne by the bidder. The bidder has to ensure that the interruption in the usage of intended purpose of the equipment is minimized to the maximum extent In lieu of the time taken for repairs/rectification/replacement.

15.0 Latent Defect:

Hidden defects in manufacturing or design of the product supplied and which could not be identified by the tests conducted but later manifested during operation of the equipment are termed as latent defects. Bidder shall further be responsible for 'free replacement' for another period of FIVE years from the end of the guarantee period for any 'Latent Defects' if noticed and reported by the Purchaser.

16.0 Support beyond the Guarantee Period

The Bidder shall ensure availability of spares and necessary support for a period of at least 10 years post completion of guarantee period of equipment /technology supplied against this contract. BRPL shall be duly intimated by the Vendor of End of Life Support for the product /technology supplied at least 12 months in advance.

17.0 Return, Replacement or Substitution

BRPL shall give Supplier notice of any defective Commodity promptly after becoming aware thereof. BRPL may at its discretion elect to return defective Commodities to Supplier for replacement, free of charge to BRPL, or may reject such Commodities and purchase the same or similar Commodities from any third party. In the latter case BRPL 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. BRPL may set off such costs against any amounts payable by BRPL to Supplier. Supplier shall reimburse BRPL for the amount, if any, by which the price of a substitute Commodity exceeds the price for such Commodity as quoted in the Bid.

18.0 Effective Date of Commencement of Contract:

The date of the issuance of the Letter of Acceptance/Purchase Order shall be treated as the effective date of the commencement of Contract.

19.0 Time – The Essence of Contract

The time and the date of completion of the "Supply" as stipulated in the Letter Of Acceptance / Purchase order issued to the Supplier shall be deemed to be the essence of the "Contract". The Supply has to be completed not later than the aforesaid Schedule and date of completion of supply.

20.0 The Laws and Jurisdiction of Contract:

The laws applicable to this Contract shall be the Laws in force in India. To the best of their ability, the parties hereto shall endeavor to resolve amicably between themselves all disputes arising in connection with this work order. If the same remain unresolved within thirty (30) days of the matter being raised by either party, either party may refer the dispute for adjudication by arbitration. The arbitration shall be undertaken by the sole arbitrator jointly appointed by the parties. In case the parties fail to arrive at consensus to appoint the sole arbitrator, either party may approach the Court for appointing an arbitrator under Section 11 of the Arbitration and Conciliation Act, 1996 and the award of the said sole arbitrator, shall be final and binding upon the parties. The arbitration proceeding shall be conducted in accordance with this provisions of the Indian Arbitration & Conciliation Act, 1996 (as amended up to date) and the venue of such arbitration shall be the city of New Delhi only. The Arbitration shall be conducted in English language only. The courts at Delhi shall have the exclusive jurisdiction over the subject matter of Arbitration/dispute. The cost of the Arbitration shall be equally shared by the parties as per directions of the Sole Arbitrator.

21.0 Events of Default

21.01 Events of Default. Each of the following events or occurrences shall constitute an event of default ("Event of Default") under the Contract:

- (a) Supplier fails or refuses to pay any amounts due under the Contract;
- (b) Supplier fails or refuses to deliver Commodities conforming to this RFQ/ specifications, or fails to deliver Commodities within the period specified in P.O. or any extension thereof
- (c) 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;
- (d) 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 BRPL.

22.0 Consequences of Default

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

(iii) Recover any losses and/or additional expenses BRPL may incur as a result of Supplier's default.

23.0 Liquidated Damages

- 23.01 If supply of items / equipment is delayed beyond the supply schedule as stipulated in LOI/PO, then the Supplier shall be liable to pay the Purchaser for delay a sum of 0.5% (half percent) of the total price for every week of delay or part thereof for undelivered units.
- 23.02 The total amount for delay under the contract will be subject to a maximum of ten percent (10%) of the total contract value.
- 23.03 The Purchaser may, without prejudice to any method of recovery, deduct the amount for such damages from any amount due or which may become due to the Supplier or from the Performance Bond or file a claim against the supplier.

24.0 Statutory variation in Taxes and Duties

The total order value shall remain **FIRM** within stipulated delivery period and shall not be adjusted on account of any price increase/variations in commodities & raw materials. However Statutory Taxes, duties and Levies imposed by Competent Authorities by way of fresh notification(s) within the stipulated delivery period shall be borne by BRPL on submission of necessary documents claiming such variation. The variation will be applicable only on such value wherever price breakup of same is submitted by vendor/available in PO/WO

25.0 Force Majeure

25.01 General

An "Event of Force Majeure" shall mean any event or circumstance not within the reasonable control directly or indirectly, of the Party affected, but only if and to the extent that:

- (i) Such event or circumstance materially and adversely affects the ability of the affected Party to perform its obligations under this Contract, and the affected Party has taken all reasonable precautions, due care and reasonable alternative measures in order to prevent or avoid the effect of such event on the affected party's ability to perform its obligations under this Contract and to mitigate the consequences thereof.
- (ii) For the avoidance of doubt, if such event or circumstance would not have materially and adversely affected the performance of the affected party had such affected party followed good industry practice, such event or circumstance shall not constitute force majeure.
- (iii) Such event is not the direct or indirect result of the failure of such Party to perform any of its obligations under this Contract.
- (iv) Such Party has given the other Party prompt notice describing such events, the effect thereof and the actions being taken in order to comply with above clause.

25.02 Specific Events of Force Majeure subject to the provisions of above clause, Events of Force Majeure shall include only the following to the extent that they or their consequences satisfy the above requirements:

- (i) The following events and circumstances:
 - a) Effect of any natural element or other acts of God, including but not limited to storm, flood, earthquake, lightning, cyclone, landslides or other natural disasters.
 - b) Explosions or fires

- (ii) War declared by the Government of India, provided that the ports at Mumbai are declared as a war zone.
- (iii) Dangers of navigation, perils of the sea.

- 25.03 Notice of Events of Force Majeure If a force majeure event prevents a party from performing any obligations under the Contract in part or in full that party shall:
- i) Immediately notify the other party in writing of the force majeure events within 7(seven) working days of the occurrence of the force majeure event
 - ii) Be entitled to suspend performance of the obligation under the Contract which is affected by force majeure event for the duration of the force majeure event.
 - iii) Use all reasonable efforts to resume full performance of the obligation as soon as practicable
 - iv) Keep the other party informed of all such efforts to resume full performance of the obligation on a regular basis.
 - v) Provide prompt notice of the resumption of full performance or obligation to the other party.
- 25.04 Mitigation of Events of Force Majeure Each Party shall:
- (i) Make all reasonable efforts to prevent and reduce to a minimum and mitigate the effect of any delay occasioned by an Event of Force Majeure including recourse to alternate methods of satisfying its obligations under the Contract;
 - (ii) Use its best efforts to ensure resumption of normal performance after the termination of any Event of Force Majeure and shall perform its obligations to the maximum extent practicable as agreed between the Parties; and
 - (iii) Keep the other Party informed at regular intervals of the circumstances concerning the event of Force Majeure, with best estimates as to its likely continuation and what measures or contingency planning it is taking to mitigate and or terminate the Event of Force Majeure.
- 25.05 Burden of Proof In the event that the Parties are unable in good faith to agree that a Force Majeure event has occurred to an affected party, the parties shall resolve their dispute in accordance with the provisions of this Agreement. The burden of proof as to whether or not a force Majeure event has occurred shall be upon the party claiming that the force majeure event has occurred and that it is the affected party.
- 25.06 Termination for Certain Events of Force Majeure. If any obligation of any Party under the Contract is or is reasonably expected to be delayed or prevented by a Force Majeure event for a continuous period of more than 3 months, the Parties shall promptly discuss in good faith how to proceed with a view to reaching a solution on mutually agreed basis. If a solution on mutually agreed basis cannot be arrived at within a period of 30 days after the expiry of the period of three months, the Contract shall be terminated after the said period of 30 days and neither Party shall be liable to the other for any consequences arising on account of such termination.
- 25.07 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
- 25.08 Limitation of Force Majeure event. The Supplier shall not be relieved of any obligation under the Contract solely because cost of performance is increased, whether as a consequence of adverse economic consequences or otherwise.
- 25.09 Extension of Contract Period due to Force Majeure event The Contract period may be extended by mutual agreement of Parties by way of an adjustment on account of any period during which an obligation of either Party is suspended due to a Force Majeure event.

25.10 Effect of Events of Force Majeure. Except as otherwise provided herein or may further be agreed between the Parties, either Party shall be excused from performance and neither Party shall be construed to be in default in respect of any obligations hereunder, for so long as failure to perform such obligations shall be due to an event of Force Majeure."

26.0 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.

27.0 Recoveries

When ever 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.

28.0 Waiver

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

29.0 Indemnification

Notwithstanding contrary to anything contained in this RFQ, 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.

30.0 Documentation:

The Bidder's shall procure all equipment from BRPL approved sources as per attached specifications. The Bidder's shall submit 5 copies of Material/Type Test Certificates, O&M Manuals, and Approved & As-built drawings. The Bidder's shall ensure for the strict compliance to the specifications and Field Quality Procedures issued by BRPL Engineer in-charge.

31.0 Commissioning Spares

Commissioning Spares shall be deemed to be included in the quoted prices

SECTION V

PRICE FORMAT – SUPPLY

Part:A- Material								
S No .	Description	Unit	Quantity	Basic (Rs)	Freight (Rs)	GST (Rs)	Unit Landed (Rs)	Total Landed Cost (Rs)
1	CBL,PWR,OFC EMDDED;400MM2;3C;33KV;AL;XLPE	M	12400					
2	KIT,JOINTG,STGT THRO ;33KV;3CX400MM2;OFC	EA	66					
3	KIT,JOINTING,TERM;33KV;3X400MM2;HS;OD;RY	EA	10					
4	CHNL,STRCTL,ISMC100;100MM;50mm;7.7mm	MT	2.5					
5	ANGLE,STRCTL,75MM;75MM;6MM;IS2062	MT	1					
6	ANGLE,STRCTL,65MM;65MM;6MM;MS	MT	1					
7	STRIP,MTLC,EARTHNG;50X6MM;MS GALVANIZED	KG	90					
8	P.G. CLAMP,F/ZEBRA CONDUCTOR	EA	24					
9	CBL,CNTRL,1.1KV;2.5MM2;CU;6;PVC	M	1000					
10	CBL,CNTRL,CNTRL;1.1KV;2.5MM2;CU;10;PVC	M	1000					
11	CHNL,STRCTL,ISMC;150MM;75MM;16.8KG/M; MS	MT	2					
	RD,ERTH,40MM;3000MM;BEAR MS	MT	1					
13	FITTING,S/TENSION,BOLT,F/ACSR TWIN ZEBRA		12					
14	CNCTR,ELEC TE,CWDG AMPACT;ZEBRA TO ZEBRA	EA	24					
15	SPCR,BUS BAR SPCR;FOR ACSR ZEBRA	EA	18					
16	FTG,SGL SUSPN BOLTED;TWIN ZEBRA	EA	12					
17	CABLE INSUL DISC 11KV 120KN	EA	72					
18	CBL,PWR,50MM2;4C;1.1KV;AL	M	500					

19	EXTNGSR,FIRE,CO2;22.5KG;TRLLY MOUNTED	LOT	1					
20	Supply of Cable identification Tags	EA	190					
21	Supply of RCC Slab (550X675) as per the specification of BRPL/BYPL	EA	3166					
22	Supply of Warning Tape	M	1900					
23	Supply of HDPE pipes as per IS ,PN 6 class PE 80 - 180mm dia	M	8600					
24	Supply of RFID Electronic Passive Ball Marker	EA	102					
25	Supply of RFID Electronic Active Ball Marker	EA	66					
26	Supply of B Class GI Pipe 8" O.D.	M	96					
27	Supply of RCC Coffin for joint as per the specification of BRPL/BYPL	EA	66					
28	Supply Cable Route Marker as per the specification of BRPL/BYPL	EA	102					
29	Supply Cable Joint Marker as per the specification of BRPL/BYPL	EA	25					
30	Supply of Glands 10X2.5MM	EA	100					
31	Supply of Glands 5X 2.5MM	EA	100					
32	Supply of HDPE Duct-40mm	M	700					
33	Supply of Optical Fiber Cable	M	700					
34	Supply of RCC Chamber for OFC joints	EA	10					
35	Supply of Joint enclosure 48F Optic Fiber Cable	EA	16					
36	Supply of LIU	EA	12					

Appendix- I**COMMERCIAL TERMS AND CONDITIONS - SUPPLY**

Sl No	Item Description	AS PER BRPL	BIDDER'S CONFIRMATION
1	Validity	120 days from the due date of submission or amended due date of submission	
2	Price basis	a) Firm , FOR Delhi store basis. Prices shall be inclusive of all taxes & duties, freight up to Delhi stores. b) Unloading at stores - in vendor's scope c) Transit insurance in Bidder scope	
3	Payment terms	a. 70 % against R/A bills within 30 days against receipt of material at site b. 15% prorata after installation/erection of equipment c. 15% prorata after completion of successful acceptance testing, commissioning and Handing Over of the entire Installation and duly certified by BRPL Project-in-charge and submission of BG of 10% of contract value valid up to Defect Liability period i.e. 24 months from the date of Handing over of entire Installation Plus 3 months towards Claim period	
4	Completion time	4 months from date of LOI/Order	
5	Defect Liability period	24 months from the date of Handing over of entire Installation. For Cable & Joints: The defect liability period shall be 60 months from the date of commissioning or 66 months from the date of delivery whichever is later.	
6	Liquidated damages	0.5% of total price for every week delay subject to maximum of 10% of total contract value	
7	Contract Performance Bank Guarantee	10% (Ten percent) of the Contract Price valid up to completion period/handing over.	
8	Performance Bank Guarantee	10% (Ten percent) of the Contract Price valid up to Defect Liability Period plus 3 months towards claim period.	



BSES RAJDHANI POWER LIMITED

APPENDIX II

BID FORM

To

Head of Department
Contracts & Material Deptt.
BSES Rajdhani Power Ltd
New Delhi 110019

Sir,

1 We understand that BRPL is desirous of execution of
.....(Name of work)

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 above 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 120 days from the due date of bid submission & subsequent corrigendum/amendment/extension of due date of submission. 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).....

Appendix III**ACCEPTANCE FORM FOR PARTICIPATION IN REVERSE AUCTION EVENT**

(To be signed & stamped by the bidder along-with bid)

BSES Rajdhani Power Ltd (BRPL) intends to use reverse auction through SAP-SRM tool as an integral part of entire tendering process. All techno-commercially qualified bidders shall participate in the reverse auction.

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

1. In case of bidding through Internet medium, bidders are advised to ensure availability of all associated infrastructure as required to participate in the reverse auction event. Inability to bid due to telephone glitch, internet response issues, software & hardware hangs/failures, power failures or any other reason shall not be the responsibility of BRPL.
2. In case bidder fails to participate in the reverse auction event due to any reason whatsoever, it shall be presumed that the bidder has no further discounts to offer and the initial bid submitted by them as a part of tender shall be considered as bidder's Final No Regret offer. Any off-line price bids received from a bidder in lieu of non-participation in the reverse auction event shall be rejected by BRPL.
3. The bidder is advised to understand the auto bid process & safeguard themselves against any possibility of non-participation in the reverse auction event.
4. The bidder shall be prepared with competitive price quotes during the day of reverse auction event.
5. The prices quoted by bidder in reverse auction event shall be on FOR Landed cost BRPL Store/site basis inclusive of all relevant taxes, duties, levies, transportation charges etc.
6. The prices submitted by the bidder during reverse auction event shall be binding on the Bidder.
7. The bidder agrees to non-disclosure of trade information regarding bid details e.g. purchase, Identity, bid process/technology, bid documentation etc.
8. BRPL will make every effort to make the bid process transparent. However award decision of BRPL will be final and binding on the bidder.
9. The prices submitted during reverse auction event shall be binding on the bidder.
10. No request for Time extension of the reverse auction event shall be considered by BRPL.
11. BRPL shall provide the user id and password to the authorized representative of the bidder. Authorization letter in lieu of the same shall be submitted along with the signed and stamped acceptance form.
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 reverse auction event for arriving at contract amount

APPENDIX IV**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 Rajdhani Power Ltd., with its Corporate Office at BSES Bhawan Nehru Place, New Delhi -110019, (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 Twenty (120) 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

APPENDIX - V**LITIGATION HISTORY**

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

APPENDIX - VI**CURRENT CONTRACT COMMITMENTS/ WORK IN PROGRESS**

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

APPENDIX - VII**FINANCIAL DATA**

(Duly Certified by Chartered Accountant)

	FY 18-19	FY 17-18	FY 16-17
Total assets			
Current assets			
Total Liability			
Current Liability			
Profit before taxes			
Profit after taxes			
Sales Turnover			

APPENDIX VIII**Progress Report Format**

SCHEDULE Format									
Section Name	Approx length	Material Availability	Digging	Preparing trench/HDPE Pipe	Cable Laying	Jointing	Back Fill	Issue	Remarks
End termination									
Section 1									
Section 2									
Section 3									
Section 4									
Section X									
End termination									

Cable laying and Joint completion	
Cable testing Date	
Electrical Inspection Date	
Final Energisation Date	

APPENDIX IX**CHECK LIST**

Sl No	Description	Compliance
1	INDEX	YES/NO
2	COVERING LETTER	YES/NO
3	BID FORM (UNPRICED) DULY SIGNED	YES/NO
4	BILL OF MATERIAL (UNPRICED)	YES/NO
5	DOCUMENTS IN SUPPORT OF QUALIFICATION CRITERIA	YES/NO
6	TECHNICAL BID	YES/NO
7	ACCEPTANCE TO COMMERCIAL TERMS AND CONDITIONS	YES/NO
8	FINANCIAL BID (IN SEALED ENVELOPE)	YES/NO
9	EMD IN PRESCRIBED FORMAT	YES/NO
10	DEMAND DRAFT OF RS 1000/- DRAWN IN FAVOUR OF BSES RAJDHANI POWER LTD	YES/NO
11	POWER OF ATTORNEY/AUTHORISATION LETTER FOR SIGNING THE BID	YES/NO
12	FINANCIAL DATA IN TABULAR FORMAT	YES/NO
13	LIST OF CURRENT COMMITMENTS/ WORK IN PROGRESS	YES/NO
14	BANK SOLVENCY CERTIFICATE	YES/NO
15	NO LITIGATION CERTIFICATE	YES/NO

SECTION VI

GENERAL TERMS & CONDITIONS - ERECTION, TESTING & COMMISSIONING

1. DEFINITIONS and INTERPRETATION

The following terms shall have the following meanings:

1.1 "Company": means BSES Rajdhani Power Ltd, a company incorporated under the Companies Act 1956 and having its office at BSES Bhawan, Nehru Place, New Delhi 110 019, which expression shall include its authorized representatives, agents, successors and assigns.

1.2 "Contractor": shall mean the successful Tenderer / vendor to whom the contract has been awarded

1.3 "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.

1.4. 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.

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

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

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

3. 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.

4. SCOPE OF WORK:

The scope includes survey , design , engineering , manufacture , shop testing ,inspection , packing , dispatch , loading, unloading and storage at site, storage and construction insurance , assembly , erection ,structural , complete pre-commissioning checks , testing and commissioning at site , obtaining statutory clearance & certification from state electrical inspector and handing over to owner after successful laying of EHV Cable with required accessories & dismantling of existing circuits and installation, testing & commissioning of EHV cables etc as per BOQ ,with required accessories on single point responsibility basis. Schedule of work shall be as mentioned in the Bill of quantity attached herewith.

After completion of E/T/C work of the scheme, contractor has to obtain the Electrical Inspectorate's Clearance from the Electrical Inspector of Delhi Govt.

All the labour, cranes, tool and tackles, and technical supervision etc. are including in your scope of work. Adequate number of engineers, supervisors and laborers 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.

The Contractor shall also make his own arrangement for the accommodation/conveyance requirements for its staff at site. Company will be provided at site the adequate open space for contractor's site store for storing the materials, tools, tackles etc. The entire 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 Bidder's 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.

The contractor at his own shall arrange Water and Electricity Power at his cost.

Special Instruction:-

- a. Contractor need to conduct sheath voltage test after finishing the cable laying to check integrity of outer sheath in presence of project engineer(for 66kV only)
- b. EHV Cable should be tested as per the specification only. Contractor shall test the complete cable; BRPL will also witness the same.
- c. All cable laying tools and tackles and testing equipment shall be available with contractor in event of order.
- d. Contractor shall submit copy of cable laying schedule to BRPL in event of order so that quality checks can be done on sample basis.
- e. Penalty clause shall be incorporated in case any of workmen of contractor is found violating safety protocol as per BRPL WO.
- f. In case cable is damaged / fails during commissioning or during period of defect liability contractor shall bear all the repair and material cost.

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.

5. 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 Bidder's scope and value shall be included in the unit rates finalized.



BSES RAJDHANI POWER LIMITED

The unit rates finalized is also inclusive of barricading and watch & ward during execution and no separate charges shall be paid for the same.

The cost of training of BRPL Official shall be included in the prices quoted by vendor.

6. TAXES AND DUTIES:

Prices are inclusive of all taxes and duties including GST as applicable. However, IT as per applicable rate will be deducted from your bills as Tax Deduction at Source (TDS).

The total order value shall remain **FIRM** within stipulated delivery period and shall not be adjusted on account of any price increase/variations in labour. However Statutory Taxes, duties and Levies imposed by Competent Authorities by way of fresh notification(s) within the stipulated delivery period shall be borne by BRPL on submission of necessary documents claiming such variation. The variation will be applicable only on such value wherever price breakup of same is submitted by vendor/available in PO/WO.

7. TERMS OF PAYMENT (Erection, Testing & Commissioning)

Payment shall be made as under:

(i) 10% mobilization advance against submission of Advance Bank Guarantee of equivalent amount valid up to completion period/ handing over, whichever is earlier plus 3 months claim period. In case of delay, the BG shall be extended suitably.

ii) 75% prorata of total installation value shall be payable against R/A bills payable within 30 days after installation, testing & commissioning of material at site duly certified by Engineer in charge.

iii) 15% of contract value payable after completion of successful acceptance testing, commissioning and handing over of complete systems duly certified by Engineer in charge, submission of Electrical Inspector Clearance Certificate & submission of Performance Bank Guarantee of 10% of contract value valid up to defect liability period i.e. 24 months from the date of Handing over of entire Installation Plus 3 months towards Claim period.

All the Bank guarantees shall be submitted as per Company's format (Appendix I) and from any scheduled Bank approved by Company.

Company shall make payments of the bills either; By crossed cheque or by electronic transfer directly to Contractor's designated bank account.

8. Guarantee of Performance

The bidder shall stand guarantee that the equipment and material supplied/service or work rendered under the contract is free from design, manufacturing, material, construction, erection & installation and workmanship & quality defects and is capable of its due, rated and intended quality performance, as an integrated product delivered under the contract for a specific period termed as Guarantee Period. The bidder should also guarantee that the equipment/material is new and unused except for the usage required for the tests and checks required as part of quality assurance.

9. Guarantee period/Defect Liability period:

The Guarantee Period will be equipment/service/work specific and shall be as specified in the Technical Specifications for the equipment/material/service/work and where Technical specifications are not part of contract documents or guarantee period is not specified in the Technical specifications, the guarantee period shall be as per the Special Terms and Conditions of the Contract. In case of no mention of the guarantee period in Technical specifications, Defect liability period will be 24 Months from the Date of Commissioning or 30 months from the date of delivery of final lot of supplies made, whichever is later.

For Cable & Joints: The defect liability period shall be 60 months from the date of commissioning or 66 months from the date of delivery whichever is later.

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 30 days from the date of receipt of intimation.

10. Performance Guarantee

10.01 Bank guarantee shall be drawn in favour of "BSES Rajdhani Power Ltd" as applicable. The performance Bank guarantee shall be in the format as specified by BRPL.

10.02 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.

10.03 Contractor shall submit the performance bank guarantee equivalent to the 10% of the contract value at the time of claiming the last payment as per clause no. 7.0 (iii) (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 Installation plus 3 months.

11. COMPLETION PERIOD

You are 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 entire Erection, Testing & Commissioning work should be completed within 4 months from the date of issue of LOI/WO. 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. You shall submit a weekly progress report to Engineer In charge.

12. CLEANLINESS

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, you 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.

13. 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.

14. 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 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.

15. PENALTY AND LIQUIDATED DAMAGES

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

14.2 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.

If the Contractor failed perform the services within the time period specified in the order, the Company shall, without prejudice to its other remedies under the contract, deduct liquidated damages a sum equivalent to 0.5 % of the order value for each week or part there of delay until the actual date of completion up to a maximum deduction of 10% of total order value. Once the maximum is reached to Company may consider termination of contract without any liabilities to Company.

Engineer In charge should specifically mention the amount of LD levied on the bill of contractor.

16. 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.

17. STATUTORY OBLIGATIONS:

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

(The Contractor shall provide BRPL Engineer-in-charge a copy of Labour License responsible for execution of the job before start of the work.)

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}

18. WORKMAN COMPENSATION:

The Contractor shall take insurance policy 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 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.

19. 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.

(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.

20. INSURANCE**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 awaiting settlement by insurance claim at contractors own cost.

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

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.

21. 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.

22. 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 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.

23. 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.

24. 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.

25. 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.

Contractor shall at all times indemnify COMPANY against all liabilities to other persons, including he 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.

26. 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.

27. 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 cancelled 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 Contractor.

28. 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 is 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.

29. FORCE MAJEURE:**29.1 General:**

An "Event of Force Majeure" shall mean any event or circumstance not within the reasonable control, of the Party affected, but only if and to the extent that:

(i) Such event or circumstance, despite the exercise of reasonable diligence, could not have been prevented, avoided or reasonably foreseen by such Party;

(ii) Such event or circumstance materially and adversely affects the ability of the affected Party to perform its obligations under this Contract, and the affected Party has taken all reasonable precautions, due care and reasonable alternative measures in order to prevent or avoid the effect of such event on the affected party's ability to perform its obligations under this Contract and to mitigate the consequences thereof. For the avoidance of doubt, if such event or circumstance would not have materially and adversely affected the performance of the affected party had such affected party followed good industry practice, such event or circumstance shall not constitute force majeure.

(iii) Such event is not the direct or indirect result of the failure of such Party to perform any of its obligations under this Contract; and

(iv) Such Party has given the other Party prompt notice describing such events, the effect thereof and the actions being taken in order to comply with above clause

29.2 Specific Events of Force Majeure:

Subject to the provisions of above clause, Events of Force Majeure shall include only the following to the extent that they or their consequences satisfy the above requirements:

The following events and circumstances:

- a) Effect of any natural element or other acts of God, including but not limited to storm, flood, earthquake, lightning, cyclone, landslides or other natural disasters, and



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- b) Explosions or fires
- c) Declaration of the Site as war zone.
- d) Any order, regulation, directive, requirement from any Governmental, legislative, executive or judicial authority.

29.3 Notice of Events of Force Majeure

If a force majeure event prevents a party from performing any obligations under the Contract in part or in full, that party shall:

- (i) Immediately notify the other party in writing of the force majeure events within 2 working days of the occurrence of the force majeure event
- (ii) Be entitled to suspend performance of the obligation under the Contract which is affected by force majeure event for the duration of the force majeure event
- (iii) Use all reasonable efforts to resume full performance of the obligation as soon as practicable
- (iv) Keep the other party informed of all such efforts to resume full performance of the obligation on a regular basis
- (v) Provide prompt notice of the resumption of full performance or obligation to the other party.

29.4 Mitigation of events of force majeure:

The Contractor shall:

- (i) Make all reasonable efforts to prevent and reduce to a minimum and mitigate the effect of any delay occasioned by an Event of Force Majeure, including applying other ways in which to perform the Contract;
- (ii) Use its best efforts to ensure resumption of normal performance after the termination of any Event of Force Majeure and shall perform its obligations to the maximum extent practicable as agreed between the Parties; and Keep the Company informed at regular intervals of the circumstances concerning the event of Force Majeure, with best estimates as to its likely continuation and what measures or contingency planning it is taking to mitigate and or terminate the Event of Force Majeure.

29.5 Burden of proof:

In the event that the Parties are unable in good faith to agree that a Force Majeure event has occurred to an affected party, the parties shall resolve their dispute in accordance with the provisions of this Contract. The burden of proof as to whether or not a force majeure event has occurred shall be upon the party claiming that the force majeure event has occurred and that it is the affected party.

29.6 Terminations for certain events of force majeure:

If any obligation of any Party under the Contract is or is reasonably expected to be delayed or prevented by a Force Majeure event for a continuous period of more than 1 (one) month during the Term of the Contract the Contract shall be terminated at the discretion of the Company and neither Party shall be liable to the other for any consequences arising on account of such termination.

30. 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.

This 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.

31. TERMINATION

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

31. QUALITY

Contractor shall ensure that strict quality is maintained and execution of works under the 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.

32. ACCEPTANCE

Acceptance of the 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 the work order as a token of your acceptance and return to us.

SECTION VII**PRICE FORMAT – ERECTION, TESTING & COMMISSIONING**

LABOUR PART: Infeed Part (Part-II)							
S No.	Description	Unit	Quantity	Basic (Rs)	GST (Rs)	Unit Landed (Rs)	Total Landed Cost (Rs)
1	Digging of cable trench as per specification and drawings. Rate is inclusive of digging and backfilling. Measurement shall be as per actual depth excavated . For Dense Carpeted bituminous Road.	CUM	1430				
2	Digging of cable trench as per specification and drawings. Rate is inclusive of digging and backfilling. Measurement shall be as per actual depth excavated . For Ordinary Bituminous/C.C.Road.	CUM	364				
3	Digging of joint pit suitable for 33/66 KV cable joint box and covering the joint box with sand and providing protection as per BYPL/BRPL design. Dense carpet	CUM	308				
4	Digging of joint pit suitable for 33/66 KV cable joint box and covering the joint box with sand and providing protection as per BYPL/BRPL design. For Ordinary bituminous road	Cum	66				
5	Digging of test pits of required size(not less than 1/2 Mtr. Wide at site for identification of cable route). Relevant volume shall be deducted from quantities of same item of cable digging For Dense carpeted bituminous road / CC Road	EA	101				
6	Digging of test pits of required size(not less than 1/2 Mtr. Wide at site for identification of cable route). Relevant volume shall be deducted from quantities of same item of cable digging For Ordinary bituminous road	EA	8				
7	Removal of Malba including Loading / Unloading on own vehicle. The payment shall be restricted to the quantity of sand laid.	CUM	483				

8	Laying of under ground cable in trench, fixing of cable identification tags (9" X 4") at every 30 Mtrs, refilling the trench and ramming the surface, including watch and ward till charging of cable (This activity includes only labour jobs) for 33 KV three core cable Running Mtr	M	12400				
9	Supply of Sand for cable route as per BRPL/BYPL specification	CUM	483				
10	Laying Sand Cushioning for cable route as per BRPL/BYPL specification, Sand cushion will be min 75mm below and 75mm above the cable,	CUM	483				
11	Installation of RCC Cable Cover	EA	3166				
12	Installation of Warning Tape as per the Specification of BRPL/BYPL	M	1900				
13	Laying of HDPE pipe of 180mm dia. of PN6 Class PE80 For crossing of roads by trenchless technology including required equipment, manpower & transport of equipment from one place to another.	M	5600				
14	Crossing of roads by trench-less technology by laying of HDPE pipe excluding supply of pipe .Laying by Pneumatic Jack Hammer Road Cutting.laying . 180mm dia.	M	3000				
15	Installation, testing and commissioning of RFID active Electronic ball markers (for 33kV and 66kV joint)	EA	66				
16	Installation, testing and commissioning of RFID passive Electronic ball markers (for 33kV and 66kV joint)	EA	102				
17	Laying of 8" O.D. GI pipe for crossing small Nallas in the cable route.	M	96				
18	Charges of making 33kv, 3x400SQ MM Straight through joints	EA	66				
19	Making O/D and I/D End termination Kit for 33 kV cables 3CX400 SQMM XLPE	EA	10				
20	Providing 1:2:4 concrete including supply of all required materials, labour curing etc. complete.	CUM	7				
21	Charges for providing continuous steel barricade including cost of all material plant consumables transport and labour for shifting placing painting and regular maintenance. As per new specification.	M	5100				

22	Survey and submission of Ground penetration report for entire Route.	M	5100				
23	Charges for carrying out Route survey and identification of underground utilities of various civic agencies before/ during execution of scheme involving cable laying work. Route length will be considered for payment. Route length will be specifically verified by DGM.	M	12400				
24	Charges for Hi pot test - Testing equipment to be provided by the contractor. For 33 KV cables	EA	12				
25	Fabrication MS structure for different equipment like isolator, C.T.'s, P.T.'s, CVT, LA's etc, cable supporting structure including supply of nuts and bolts, consumables , welding electrode, hacksaw blades etc. excluding supply of steel.	MT	6.5				
26	Erection of MS as well as galvanised structure for different equipment like isolator, C.T.'s, P.T.'s, CVT, LA's , ISO etc, cable supporting structure, 33kV/66 kV GI gantry structure , Tower Structure i/c consumables , welding electrode ,tack welding & hacksaw blades etc.	MT	6.5				
27	Painting of Fabrication MS Structure for diff.equip.	KG	6500				
28	Erection of ground earthing with 40 mm dia, 3 mtr long, MS rod electrode, fabrication and fixing of clamps and test links, including supply of sand and charcoal.	EA	10				
29	Erection of electrical equipment Including supply of T & P, all consumable items such as welding rods, hacksaw blades etc and minor modification in support structure for fixing as required.For 33 kV SF6 circuit breaker with mechanism and structure	EA	1				
30	Erection of electrical equipment Including supply of T & P, all consumable items such as welding rods, hacksaw blades etc and minor modification in support structure for fixing as required.For 33 kV isolator with one earth switch	EA	1				
31	Erection of electrical equipment Including supply of T & P, all consumable items such as welding rods, hacksaw blades etc and minor modification in support structure for fixing as required.For 33 kV isolator without earth switch	EA	2				

32	Erection of electrical equipment Including supply of T & P, all consumable items such as welding rods, hacksaw blades etc and minor modification in support structure for fixing as required.For 33 kV LA's with/without surge counter	EA	12				
33	Erection of electrical equipment Including supply of T & P, all consumable items such as welding rods, hacksaw blades etc and minor modification in support structure for fixing as required.For Bay Terminal/Marshalling Kiosk	EA	1				
34	Erection of electrical equipment Including supply of T & P, all consumable items such as welding rods, hacksaw blades etc and minor modification in support structure for fixing as required.For CT/PT Junction Box	EA	2				
35	Erection of electrical equipment Including supply of T & P, all consumable items such as welding rods, hacksaw blades etc and minor modification in support structure for fixing as required.For Control and relay panel for Transformer, line, Bus coupler.- 33 kV, C & R panel	EA	1				
36	Erection of electrical equipment Including supply of T & P, all consumable items such as welding rods, hacksaw blades etc and minor modification in support structure for fixing as required.For 66 kV /33KV CT, any ratio	EA	3				
37	Erection of electrical equipment Including supply of T & P, all consumable items such as welding rods, hacksaw blades etc and minor modification in support structure for fixing as required.For 66 kV/33KV PT	EA	3				
38	Stringing of Single Suspension String Insulator with double tension clamp for twin Zebra conductor	EA	6				
39	Stringing and sagging of main bus and cover bus bar with ACSR Zebra conductor and Jumpering of various electrical equipment by ACSR Zebra conductor in between equipment to equipment of any length required and from bus bar to equipment of any length required with the help of PG clamps, T connectors and other clamps. For 66 kV /33KV Yard	M	100				
40	Stringing of Rigid Spacer Clamp with tee – off suitable for single Zebra conductor and double zebra to single zebra convertor.	EA	24				

41	Erection of MOM box for 33 and 66KV Insulator including welding, cutting etc.	EA	4				
42	Stringing of Bolted type 'T'/PG Connector suitable for single Zebra conductor	EA	48				
43	Laying, dressing, megger and continuity test of PVC, armoured control and auxiliary power cables in excavated trench/cable trays .For 10CX2.5 sqmm, Cu	M	1000				
44	Laying, dressing, megger and continuity test of PVC, armoured control and auxiliary power cables in excavated trench/cable trays .For 6/5CX2.5 sqmm, Cu	M	1000				
45	Erection of double compression gland including termination For 10CX2.5 sqmm, Cu	EA	100				
46	Erection of double compression gland including termination For 5CX2.5 sqmm, Cu	EA	100				
47	Laying of HT/LT cable of following size in S/ Stn. Trench. Up to 70 sqmm.	M	50				
48	Laying of MS flat in the excavated trench including risers, equipment earthing, overlapping of MS flat at the joints by twice of its width and welding of overlapping and cross joints including supply of electrodes, red oxide/bitumin compound, paint etc and Laying of GI earth strip for equipment earthing, along the wall, trench, cable trays etc including fabrication of supports/cleats and fixing with wall bolts, welding works, painting of earth strip and riser with red oxide paint/bitumin compound and final. For 50X6 sqmm	M	1200				
49	Excavation of trench below the ultimate good earth level in following type of soil including refilling after laying of earth mat riser, fixing of earth electrodes welding etc. For Soft soil	CUM	30				
50	Excavation of trench below the ultimate good earth level in following type of soil including refilling after laying of earth mat riser, fixing of earth electrodes welding etc. For Semi rocky/rocky soil with providing of good earth	CUM	50				

51	Digging of earth pit upto depth of 10 ft. in rocky/ semi rocky as per feasibility at site of embedding 600 x600mm earth plate with M.S Plate 50 x8 mm running the same through 3/4 " dia G.I. grouting pipe. Earth Plate to be covered by charcoal 200kg. And 100 Kg. Sodium chloride in the earth pit and refilling etc. NOTE: Charcoal, commonsalt, earth plate, G.I. Pipe, MS flat, Badarpur, Cement and bricks to be supplied by the contractor	EA	15				
52	Making of civil goomitties around GI earthpipe as per standard design of BSES. Supply of necessary bricks, cement, badarpur, sand, C1 cover of size 1'x1' and providing the same at the top of goomitties.	EA	15				
53	Supply and fixing of wire mesh fencing 2.65 mtr height with gate frame of 3 mtr x 2.5 mtr with complete material including painting eg angle, chain link, wire mesh and civil material etc complete as per specification, drawing no. Angle iron size 50x50x6 mm & MS strip 50 x 3 mm wire mesh 1"x3", 8 SWG wire to be used for wire-mesh with providing support at 1.25 distance.	SQM	48				
54	Grouting of cable mounting structure with cement concrete having ratio 1:3:6 including fixing with gantry structure. Badarpur, cement and stone ballast shall be supplied by contractor. Suitable for mounting 33/66 KV cable.	EA	7				
55	Mounting of 33KV, 3x400sq.mm. XLPE cable with cable end box on the steel structure and fixing it with suitable wooden cleats (wooden cleats shall be supplied by contractor) i/c. its jumpering with the isolator as required.	EA	14				
56	Laying of 40mm dia HDPE Duct in open trench	M	2800				
57	Laying of Optical Fiber cable	M	3400				
58	Laying of 40mm dia, HDPE Duct through trenchless method using HDD machine	M	600				
59	Installation of RCC Chamber for OFC joints	EA	10				
60	Splicing of 48F Optic Fiber Cable	EA	16				
61	Installation of LIU (OFC) with wall	EA	12				
62	Splicing Termination 48F Optical Fiber Cable at LIU	EA	12				



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63	Testing and Commissioning of LDR	EA	6				
64	ETC of Fire Extinguisher and mat	LOT	1				
65	Civil job	LS	1				

Appendix-X**COMMERCIAL TERMS AND CONDITIONS – E/T/C**

Sl No	Item Description	AS PER BRPL	BIDDER'S CONFIRMATION
1	Validity	120 days from the due date of submission or amended due date of submission	
2	Price basis	Firm. Prices shall be inclusive of all taxes & duties.	
3	Payment terms	<p>a) 10% mobilization advance against submission of Advance Bank Guarantee of equivalent amount valid up to completion period/ handing over, whichever is earlier plus 3 months claim period. In case of delay, the BG shall be extended suitably.</p> <p>b) 75% prorata of total installation value shall be payable against R/A bills payable within 30 days after installation, testing & commissioning of material at site duly certified by Engineer in charge.</p> <p>c) 15% of contract value payable after completion of successful acceptance testing, commissioning and handing over of complete systems duly certified by Engineer in charge, submission of Electrical Inspector Clearance Certificate & submission of Bank Guarantee of 10% of contract value valid up to defect liability period i.e. 24 months from the date of Handing over of entire Installation Plus 3 months towards Claim period.</p>	
4	Completion time	4 months from date of LOI/Order	
5	Defect Liability period	<p>24 months from the date of Handing over of entire Installation.</p> <p>For Cable & Joints: The defect liability period shall be 60 months from the date of commissioning or 66 months from the date of delivery whichever is earlier.</p>	
6	Liquidated damages	0.5 % of the order value for each week or part there of delay until the actual date of completion up to a maximum deduction of 10% of total order value	
7	Contract Performance Bank Guarantee	10% (Ten percent) of the Contract Price valid up to completion period/handing over.	
8	Performance Bank Guarantee	10% (Ten percent) of the Contract Price valid up to Defect Liability Period i.e. 24 months from the date of Handing over of entire Installation plus 3 months towards claim period.	

APPENDIX-XI
FORMAT FOR PERFORMANCE BANK GUARANTEE

(TO BE ISSUED ON RS 100/- STAMP PAPER)

Bank Guarantee No.

Place:

Date:

To
BSES Rajdhani Power Limited

Whereas BSES RAJDHANI POWER LTD (hereinafter referred to as the "Purchaser", which expression shall unless repugnant to the context or meaning thereof include its successors, administrators and assigns) has awarded to M/s. _____ with its Registered/ Head Office at _____

(Hereinafter referred to as the "Supplier" which expression shall unless repugnant to the context or meaning thereof, include its successors administrators, executors and assigns), a contract no. _____ Dated _____ (the Contract);

And whereas the value of the Contract is Rs. _____ (The Contract Value).

And whereas it is a condition of the Contract that the Supplier shall provide a Performance Bank Guarantee for the due and faithful performance of the entire Contract for a sum equivalent to - % of the Contract Value to the Purchaser on or before _____

And whereas the Bank under instructions from the Supplier has agreed to guarantee the due performance of the Contract.

Now it is agreed as follows:

1. we _____ (Name of the Bank) having its Head Office at _____ (hereinafter referred to as the Bank, which expression shall unless repugnant to the context or meaning thereof, include its successors, administrators, executors and assigns) shall indemnify and keep indemnified the Purchaser for, and guarantee and undertake to pay to the Purchaser immediately on written demand, a sum equivalent to _____ % of the Contract Value as aforesaid at any time upto _____ (day/month/year) without any demur, reservation, contest, recourse or protest and/or without any reference to the Supplier, against all losses, damages, costs and expenses that may be caused to or suffered by the Purchaser by reason of any default on the part of the Supplier in performing and observing any and all the terms and conditions of the Contract or breach on the part of the Supplier of terms or conditions of the Contract.
2. The demand shall consist only of an original letter issued by Purchaser stating that the Supplier has failed to fulfill its obligations under the Contract. Such demand made by the Purchaser on the Bank shall be conclusive and binding notwithstanding any difference or dispute between the Purchaser and the Supplier or any difference or dispute pending before any Court, Tribunal, Arbitrator or any other authority.
3. The Bank undertakes not to revoke this guarantee during its currency without previous written consent of the Purchaser and further agrees that the guarantee herein contained shall continue to be enforceable during the period that would be taken for satisfactory performance and fulfillment in all respects of the Contract or in the event of any dispute between the Purchaser and Supplier until the dispute is settled (provided that the claim/ demand under this guarantee is



BSES RAJDHANI POWER LIMITED

lodged /referred during the currency of this guarantee) or till the Purchaser discharges this guarantee whichever is earlier.

4. The Purchaser shall have the fullest liberty without affecting in any way the liability of the Bank under this guarantee from time to time to extend the time for performance of the Contract by the Supplier. The Purchaser shall have the fullest liberty, without affecting the liability of the Bank under this guarantee, to postpone from time to time the exercise of any powers vested in them or of any right which they might have against the Supplier, and to exercise the same at any time in any manner, and either to enforce or to forbear to enforce any covenants, contained or implied, in the Contract. or any other course or remedy or security available to the Purchaser. The Bank shall not be released of its obligations under these presents by any exercise by the Purchaser of its liberty with reference: to the matters aforesaid or any of them or by reason of any other act or forbearance or other acts of omission or commission on the part of the Purchaser or any other indulgence shown by the Purchaser of by any other matter or thing whatsoever which under law would, but for this provision, have the effect of relieving the Bank.

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

6. Notwithstanding anything contained hereinabove the liability of the Bank under this guarantee is restricted to a sum equivalent to % of the Contract Value ie. Rs.(Rupees) and it shall remain in force upto and including .Unless a demand to enforce a claim under this guarantee is made against the Bank within 3 months from the the above date of expiry i.e. up to all the rights of the Purchaser under the said guarantee shall be forfeited and the Bank shall be released and discharged from all liabilities thereafter.

7. This Performance Bank Guarantee shall be governed by the laws of India.

Dated this Witness

day of 20..... at

1. For Bank

2. Signature
Name Power of Attorney No:

Banker's Seal

SECTION VIII**GRAND SUMMARY OF THE QUOTED PRICE**

Sr. Nos.	SCHEME DESCRIPTION	Total price for supply F.O.R site inclusive all duties taxes	Total for Erection, Testing & Commissioning inclusive all Taxes(INR)	Grand Total(INR)
1	SUPPLY, LAYING, TESTING & COMMISSIONING OF 33 KV 3CX400 SQMM CABLES WITH REQUIRED ACCESSORIES ON SINGLE POINT RESPONSIBILITY BASIS AT DTC DEPOT, SUKHDEV VIHAR			
TOTAL Package Cost				
In words :				

We declare that the following are our quoted prices in INR for the entire project/schemes.

Date:

Bidder Name:

Place:

Bidders Address:

Name & Signature

Designation:

Common Seal:.....

SECTION IX

VENDOR CODE OF CONDUCT

Bidder shall agree to comply with Vendor code of Conduct as mentioned in BRPL Website. 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 Labour - Child labour 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 Labour - 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 the 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 with appropriate emergency egress, 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.

- 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, targets and 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 modelled 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.

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/GSTN 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)

INSURANCE POLICY

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 premium amount for such policy shall be in contractor scope. The policy document shall be submitted before commencement of the work by the contractor.

ANNEXURE-II

SCOPE DEMARACATION AND ROUTE MAP



BSES Rajdhani Power Ltd

**TECHNICAL SPECIFICATION
FOR
SUPPLY, ERECTION, TESTING & COMMISSIONING
OF
33KV CABLE LAYING WORK (IN-FEED)**

BSES RAJDHANI POWER LTD			
Prepared By	Gautam Deka		Rev: 00
	Pronab Bairagi		
Reviewed by	Amit Tomar		Page 1 of 11
Approved By	Gopal Nariya		04.05.2022
Registered office: BSES Bhawan , Nehru Place , New Delhi- 19			

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**TECHNICAL SPECIFICATION FOR SUPPLY, ERECTION, TESTING & COMMISSIONING OF 33KV CABLE
LAYING WORK (IN-FEED)**

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8.	GI and Earthing pipe, GI strip	
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TECHNICAL SPECIFICATION FOR SUPPLY, ERECTION, TESTING & COMMISSIONING OF 33KV CABLE LAYING WORK (IN-FEED)**1.00.00 GLOSSARY LIST**

S. No.	Abbreviation	Description
1	F.O. R.	Freight On Road
2	CT	Current Transformer
3	PT	Potential Transformer
4	kV	Kilo Volts
5	MVAR	Mega Volt Amperes Reactive
6	MVA	Mega Volt Amperes
7	kVA	Kilo Volt Amperes
8	O&M	Operation and Maintenance
9	LOA	Letter of Award
10	FO	Fiber Optic
11	MCD	Municipal Corporation of Delhi
12	DDA	Delhi Development Authority
13	PWD	Public Works Department
14	U/G	Underground
15	HT	High Tension
16	ACSR	Aluminum Conductor Steel Reinforced
17	BOQ	Bill of Quantity
18	GA	General Arrangement
19	RCC	Reinforced Cement Concrete
20	CPRI	Central Power Research Institute
21	ERDA	Electrical Research and Development Association
22	CRP	Control & Relay Panel
23	T&P	Tools & Plant
24	IR	Insulation Resistance
25	OFC	Optical Fiber Cable
26	GAIL	Gas Authority of India Limited
27	IGL	Indraprastha Gas Limited
28	IOCL	Indian Oil Corporation Limited
29	DMRC	Delhi Metro Rail Corporation
30	PPE	Personal Protective Equipment
31	FRLS	Fire Retardant Low Smoke
32	GI	Galvanized Iron
33	GPR	Ground Penetration Radar
34	P/L	Providing and laying
35	P/F	Providing and fixing
36	TAC	Tariff Advisory Committee
37	IS	Indian Standard
38	IEC	International Electro technical Commission

TECHNICAL SPECIFICATION FOR SUPPLY, ERECTION, TESTING & COMMISSIONING OF 33KV CABLE LAYING WORK (IN-FEED)**2.00.00 GENERAL DESIGN CRITERIA****2.01.00 General Service condition**

- a) Maximum ambient temperature (Degree C): 50
- b) Minimum ambient temperature (Degree C): 0
- c) Relative Humidity (%): 100
- d) Maximum annual rainfall (mm): 750
- e) Maximum wind pressure (Kg/Sq.m): 150
- f) Maximum Altitude above mean sea level (Meters): 1000
- g) Seismic level Zone IV as per IS 1893
- h) Pollution Level: Heavy/Dry

2.02.00 Code and Standards

Contractor shall follow latest Indian Standards or International Standards. Refer respective equipments specification for applicable standards.

2.03.00 Scope and Services

S.No.	Head	BRPL Scope	Contractor's Scope	Remarks
1	Road Cutting Permission	X	√	Statutory fees will be borne by BRPL
2	Supply, Laying, testing and commissioning of 66kV cable , Cable Jointing , Cable termination including laying , testing and commissioning of OFC joint and OFC termination.	X	√	NA
3	Permissions from relevant External and Internal Agencies regarding Cable Laying and Commissioning (Traffic Police, GAIL, IGL, IOCL, PWD, CPWD, Pollution Control Board, DMRC etc.)	X	√	Statutory fees will be borne by BRPL
4	Supply, Erection, Testing and commissioning of Equipments related to schemes like CT, CVT, CB, Isolator, LA etc. if any.	X	√	As per specifications and Standards
5	Supply and Erection of structure for mounting equipments in the bay like structure for CT, CVT, CB, Isolator, LA etc.	X	√	

TECHNICAL SPECIFICATION FOR SUPPLY, ERECTION, TESTING & COMMISSIONING OF 33KV CABLE LAYING WORK (IN-FEED)

S.No.	Head	BRPL Scope	Contractor's Scope	Remarks
6	GPR/Scanning of the whole route shall be done and the same shall be submitted to BRPL. The report shall be submitted within 15 days after the issue of LOI	X	√	This work shall be done by vendor before execution of job.
7	Drawing Submissions	X	√	NA
8	Engineering Approvals	√	X	NA
9	Testing Equipments	X	√	NA
10	Lighting Arrangement	X	√	NA
11	Construction Power and Construction Water	X	√	NA
12	Safety , Security and insurance of Manpower(Labour, Engineers, Supervisors etc)	X	√	Labour should be provided with every safety gear like safety jacket, helmet etc.
13	Various Tools and Tackles related to Job	X	√	NA
14	Transportation of Material and any other tender related work	X	√	NA
15	Cleanliness around project site	X	√	NA
16	Security and Safety of material until handing over the project to BRPL	X	√	NA
17	Providing of Various Machines e.g Crane, Hydra, JCB, Hammer , Cutting Machine etc to complete the project	X	√	NA
18	Providing of Trenchless Machine	X	√	NA
19	Loading and Unloading of material at site including scrap returning to BRPL site	X	√	NA
20	Electrical Inspector Clearance	X	√	Statutory fees will be borne by BRPL
21	Providing of Continuous Steel Barricading with Mobile no of project supervisor, sufficient traffic marshal, becon light, Fluorescent tape, PPE etc. (Mobile no shall be clearly visible on the barricading)	X	√	as per drawing enclosed with specification.
22	Permit to work requesting Agency in BRPL premises	X	√	Permit Should be applied to Engineer Incharge prior to work through proper procedure
23	Permit to work issuing agency inside BRPL Premises	√	X	NA
24	Temporary office and Material Store near work premises	X	√	NA

TECHNICAL SPECIFICATION FOR SUPPLY, ERECTION, TESTING & COMMISSIONING OF 33KV CABLE LAYING WORK (IN-FEED)

S.No.	Head	BRPL Scope	Contractor's Scope	Remarks
25	Storage of all kind of Material required for project	X	√	BRPL premises will not provide for any kind of material storage and issuance
26	Dismantling of material at project site, , Dismantled material loading, Unloading and transportation and deposit to BRPL store	X	√	Store location will be within BRPL premises
27	Preparation, updation and submission of PERT chart fortnightly to track activities	X	√	NA
28	Submission of final drawing showing layout of cable in Google map along with of cable joint location with GPS Coordinates	X	√	Approval will be done by BRPL Representative
29	Removal and renaming of existing signboard of other utilities (if any) including painting as per their actual route	X	√	Painting colour and material should be in line with the existing ones for aesthetic look
30	Surface levelling, removal and disposal of excess earth (malwa) after back filling of trench. During execution excavated earth shall be covered with green mat to prevent dust pollution. Also regular Water Sprinkling is to be required at site.	X	√	NA
31	Supply, installation, testing and commissioning of Active and Passive ball markers	X	√	NA
32	Supply & installing of RCC cable route marker, RCC cable joint marker and RCC Coffin for joint. , RCC slab, warning tape etc.	X	√	Shall be designed as per tender document
33	Cable Route Tracer and Marker-supply, testing and commissioning (as applicable)	X	√	NA
34	Sheath Integrity test before Charging of Cable	X	√	Mandatory
35	All cable drum shall be returnable basis so immediate after laying of cable, empty cable drum shall be removed away from site at their risk and cost by respective bidder from time to time in line with project progress.	X	√	

TECHNICAL SPECIFICATION FOR SUPPLY, ERECTION, TESTING & COMMISSIONING OF 33KV CABLE LAYING WORK (IN-FEED)

S.No.	Head	BRPL Scope	Contractor's Scope	Remarks
36	Compliance of instructions/ orders issued by National Green Tribunal/ Central Pollution Control Board/ any other agency related to pollution.	X	√	Any kind of penalty shall be borne by the vendor
37	De-watering of pits	X	√	Scope shall be covered as per execution team requirement.
38	Civil works	X	√	Any kind of civil works related to the project

Special requirement

1. All jointing Kit shall have "Mechanical Connector" and not "Crimping".
2. All the joints shall be covered with RCC coffin. Each coffin or nos of coffin shall fully cover the joint. Drawing provided only for constructional purpose not showing complete length of coffin. Bidder has to consider coffin length or numbers such that the complete joint shall be covered.
3. Delivery of cable at site and all other associate equipments/accessories have to be aligned as per site requirement and progress.
4. All kind of structural steel shall be GI unless otherwise specified.
5. Make of all kind of materials shall be as per BRPL approved make list, no deviation shall be allowed from make list.
6. The 33kV 3Cx400 sqmm cable is required with OFC embedded inside (OFC cable is of 48 fibre with 36 single mode and 12 multi mode). For OFC cable details please refer attached specification.

3.00.00 PACKAGE

- 3.01.00 33KV Switching Substation at Kalkaji DTC Depot
- 3.02.00 33KV Switching Substation at DTC Depot, Sukhdev Vihar
- 3.03.00 33KV Switching Substation at DTC Cluster Depot, Kushak Nallah
- 3.04.00 In-feed route map (attached below)

4.00.00 TECHNICAL SPECIFICATION

Please refer individual Technical Specification

**TECHNICAL SPECIFICATION FOR SUPPLY, ERECTION, TESTING & COMMISSIONING OF 33KV CABLE
LAYING WORK (IN-FEED)****5.00.00 SCHEDULES****SCHEDULE -1****TECHNICAL DEVIATION FROM THE SPECIFICATION**

(This shall be part of Technical bid)

Technical deviation from specification if any, shall be listed out in below format

SI no	Specification cl no	Deviation	Remark

SCHEDULE -II**BRPL APPROVED MAKE LIST OF MAJOR ITEMS**

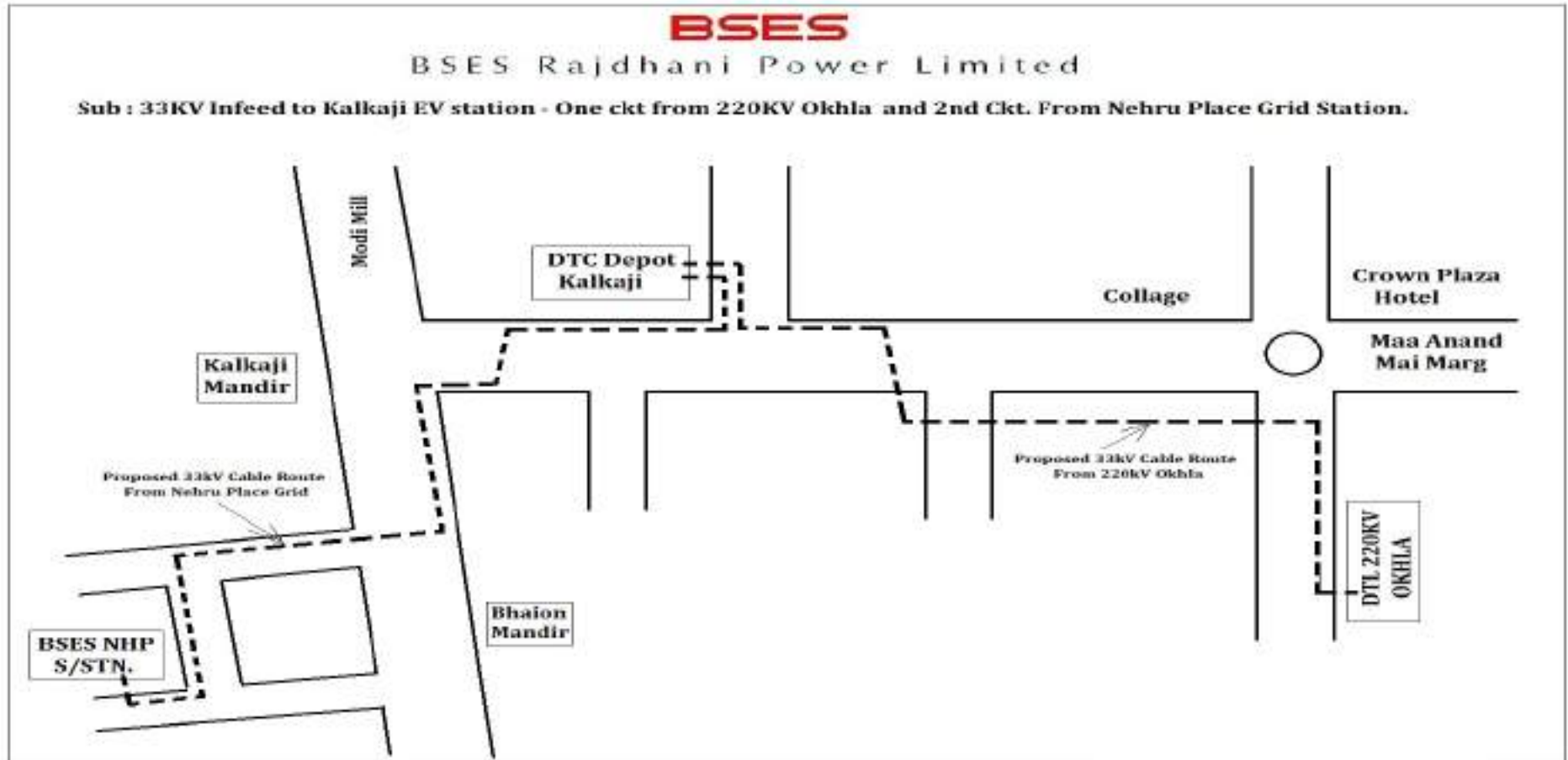
SI no	Items Description	Approved Make	Remark
1	33 kV Jointing and Termination KIT	1. Raychem 2. 3M 3. Compaq 4. Yamuna Denson	
2	HDPE Pipes	1. Flow well 2. Tirupati 3. Narendra Polyplast 4. Eon plast	



BSES Rajdhani Power Ltd

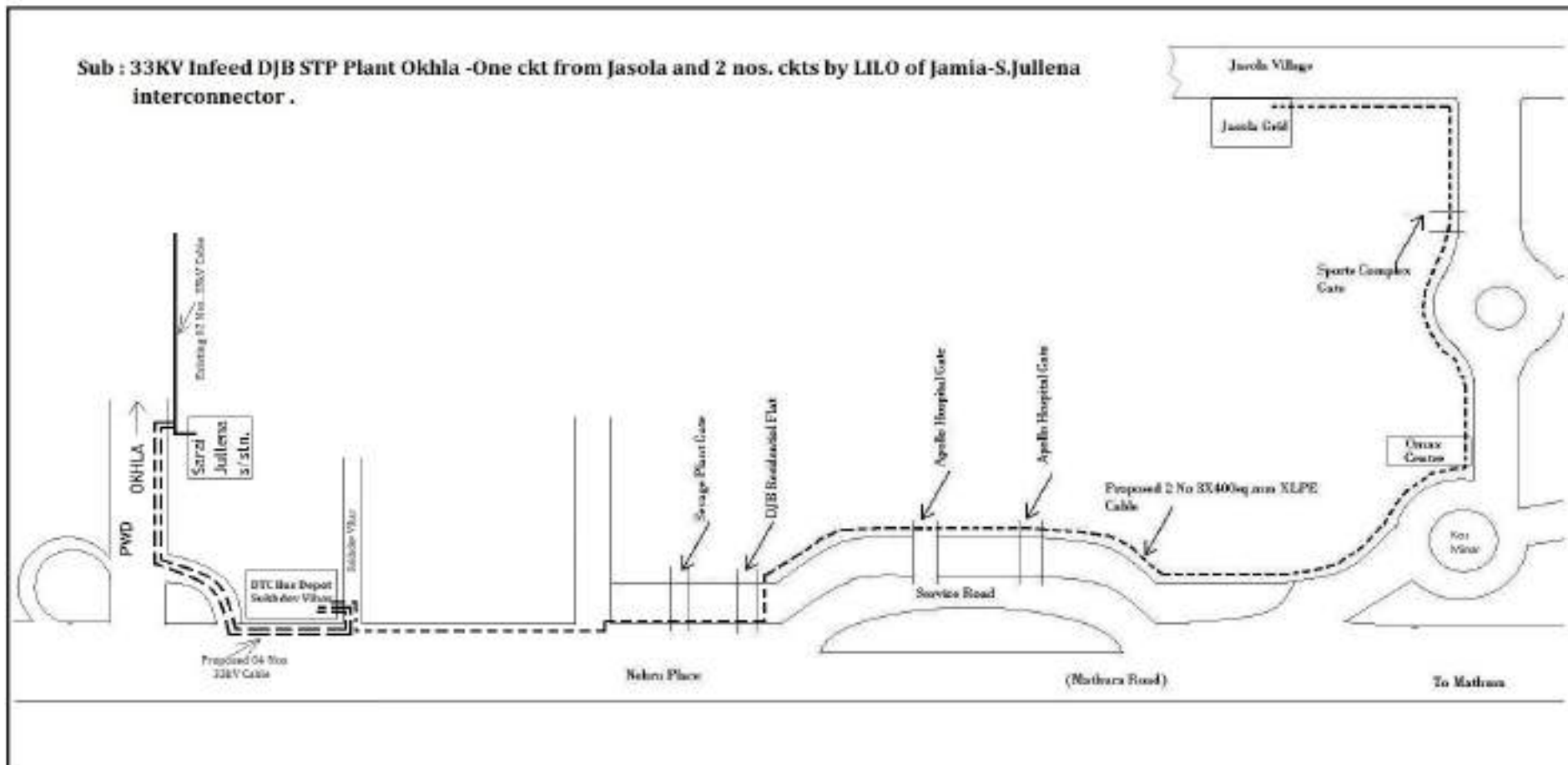
Route Map

Package A: 33KV Switching Substation at Kalkaji DTC Depot



TECHNICAL SPECIFICATION FOR SUPPLY, ERECTION, TESTING & COMMISSIONING OF 33KV CABLE LAYING WORK (IN-FEED)

Package B: 33KV Switching Substation at DTC Depot, Sukhdev Vihar

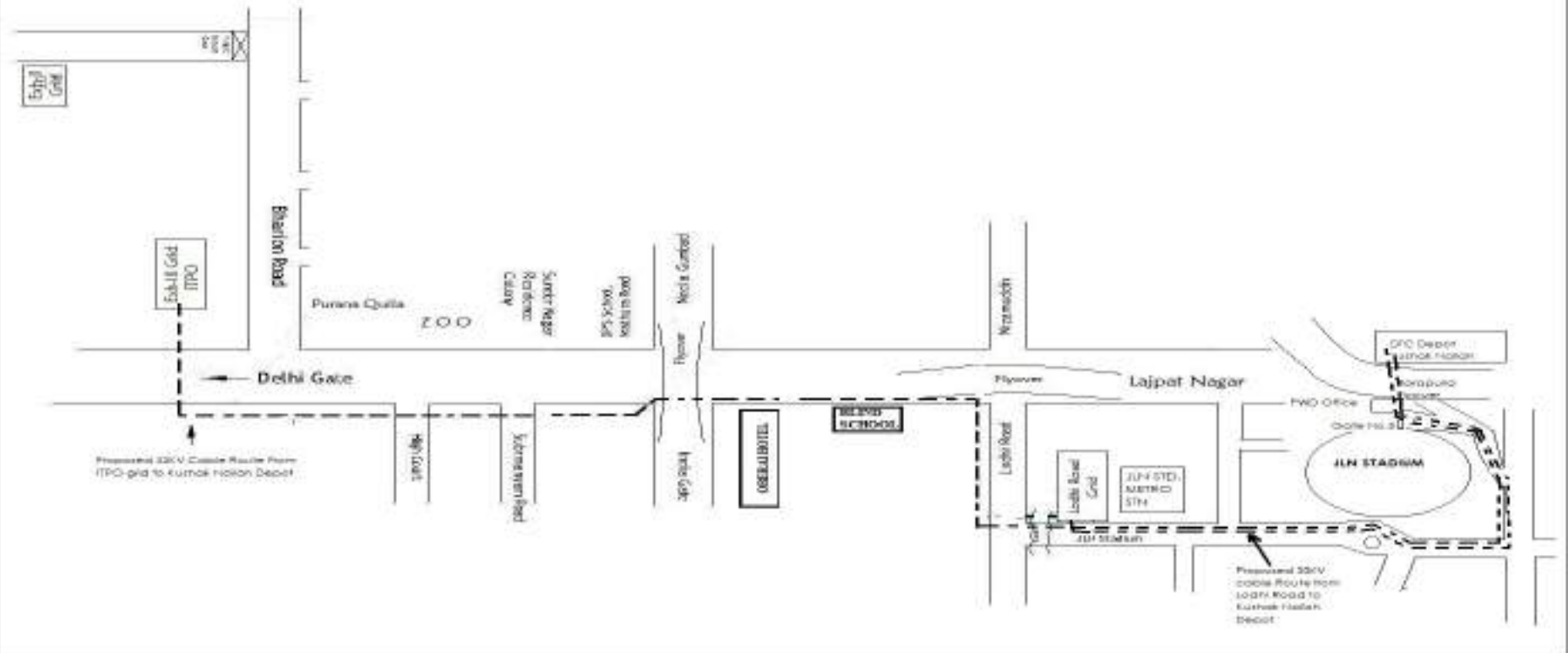


Package C: 33KV Switching Substation at DTC Cluster Depot, Kushak Nallah

TECHNICAL SPECIFICATION FOR SUPPLY, ERECTION, TESTING & COMMISSIONING OF 33KV CABLE LAYING WORK (IN-FEED)

BSES RAJDHANI POWER LTD.

Sub : 33KV Infeed and 33KV switching substation to DTC cluster depot at Kushak Nallah on account of DTC.



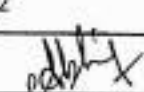
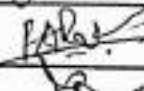
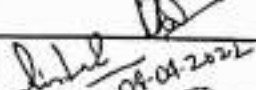
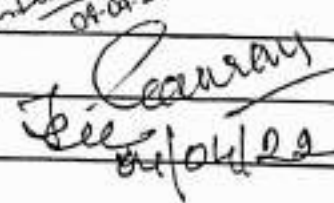
ANNEXURE-III

TECHNICAL SPECIFICATIONS



Technical Specification of
ACSR CONDUCTORS
(Insulated & Bare)

Specification no – BSES-TS-05-ACSR-R0

Rev:	0	
Date:	04 Apr 2022	
Prepared by	Abhishek Vashistha	
	Rohit Patil	
Reviewed by	Puneet Duggal	
	Amit Tomar	
Approved by	Gaurav Sharma	 
	K. Sheshadri	

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TECHNICAL SPECIFICATION OF ACSR CONDUCTOR**1. SCOPE**

- 1.1 This specification covers the design, manufacture, testing at manufacturer's works, packing and delivery at site of the ACSR conductor along with necessary accessories.
- 1.2 The conductor and its accessories shall be complete with all fittings and components necessary for the effective working and efficient performance and satisfactory maintenance under the various operating conditions specified. All such parts shall be deemed to be included within the scope of supply where specifically included or not in this specification in the tender schedule. The successful bidder shall not be eligible for any extra charge for such accessories.
- 1.3 The specification includes both insulated & un-insulated ACSR conductor. Following table suggests requirement of conductors under insulated & un-insulated type as per tender enquiry

Conductor name	Zebra	Goat	Panther	Wolf	Dog	Rabbit	Squirrel
Insulated	X	X	X	X	√	√	√
Un-Insulated	√	√	√	√	√	√	√

2. CODES AND STANDARDS

- 2.1 All equipment and material shall be designed, manufactured and tested in accordance with the latest applicable Indian Standard, IEC standard and CBIP manuals enlisted in the appendix 1, except where modified and / or supplemented by this specification.
- 2.2 Equipment and material conforming to any other standard, which ensures equal or better quality, may be accepted. In such case copies of English version of the standard adopted shall be submitted by the vendor with the offer
- 2.3 The electrical installation shall meet the requirement of Indian Electricity Rules as amended up to date; relevant IS code of practice and Indian electricity act. In addition other rules & regulations applicable to the work shall be followed. In case of any discrepancy the most stringent & restrictive one shall be binding.
- 2.4 The equipment offered shall in general comply with the latest issues including amendments of the standards enlisted in the appendix 1 but not restricted to it.

3. DESIGN**3.1 General**

- All steel strands shall be smooth, uniform and free from all imperfections, such as spills and splits, die marks, scratches, abrasions and kinks after drawing and also after stranding.
- The finished material shall have minimum brittleness, as it will be subjected to appreciate vibration while in use.
- The steel strands shall be hot dip galvanized and shall have a maximum zinc coating of 240gms/sq.mm after stranding. The zinc coating shall be smooth, continuous of uniform thickness, free from imperfections and shall withstand three and a half dips after stranding in standard Price test.
- The steel wire rod shall be of such quality and purity that, when drawn to the size of the strands specified and coated with zinc, the finished strands shall be of uniform quality and have the same properties and characteristic as prescribed in relevant ASTM/IS/IEC standards.
- To avoid susceptibility towards wet storage stains (while rust), the finished material shall be provided with a protective coating of boiled linseed oil.
- The finished conductor shall have a smooth surface without any surface cuts, abrasions, scuff

TECHNICAL SPECIFICATION OF ACSR CONDUCTOR

marks and shall be free from dirt, grit etc.

- The Steel wire shall be made from materials produced either by the acid or basic Open Hearth process or by electric process. No steel wire drawn from 'Bessemer processes shall be used. The steel wire shall not contain sulphur or phosphorous exceeding 0.5% and the total of sulphur and phosphorous shall not exceed 0.085%.
- The steel strands shall be performed and post formed in order to prevent spreading of strands in the event of cutting of composite core wire. Care shall be taken to avoid damages to galvanization during performing and post forming operations.

3.2 MATERIALS

- The aluminium strands shall be hard drawn from electrolytic aluminum rods having a purity of not less than 99.5% and a copper content not exceeding 0.04%.
- The steel wire strands shall be drawn from high carbon steel wire rods produced by either the acid or basic open hearth process, the electric furnace process, or the basic oxygen process and shall conform to the following requirements as to the chemical composition:

Element	% composition
Carbon	0.50 to 0.85
Manganese	0.50 to 1.10
Phosphorus	Not more than 0.035
Sulphur	Not more than 0.045
Silicon	0.10 to 0.35

- The zinc used in galvanizing shall be electrolytic high grade zinc of 99.95% purity. It shall conform to and satisfy all the requirements of IS/IEC.

3.3 STANDARD LENGTH

- The standard length of the conductor shall be 3000 meters. A tolerance of +/-5% on the standard length offered by the Bidder shall be permitted. All lengths outside this limit of tolerance shall be treated as random lengths.
- Random lengths will be accepted provided no length is less than 70% of the standard length and the total quantity of such random length shall not be more than 10% of the total quantity ordered. When one number random length has been manufactured at any time, five (5) more individual lengths, each equivalent to the above random length with a tolerance of +/-5% shall also be manufactured and all the above six random lengths shall be dispatched in the same shipment. At any point, the cumulative quantity supplied including such random lengths shall not be more than 12.5% of the total cumulative quantity supplied including such random lengths. However, the last 20% of the quantity ordered shall be supplied only in standard lengths as specified.
- Bidder shall also indicate the maximum single length, above the standard length, he can manufacture in the guaranteed technical particulars of offer. This is required for special stretches like river crossing etc. The employer reserves the right to place orders for the above lengths on the same terms and conditions applicable for the standard lengths during the pendency of the Contract.

TECHNICAL SPECIFICATION OF ACSR CONDUCTOR**3.4 JOINT IN WIRES**

- **Aluminium wires**

No joints shall be permitted in the individual wires in the outer most layer of the finished conductor. However, joints in the 12 wire and 18 wire inner layer of the conductor shall be allowed but these joints shall be made by cold pressure butt welding and shall be such that no such way joints are within 15 meters of each other in the complete stranded conductor. The joints shall withstand a stress of not less than the breaking strength of individual strand guaranteed.

- **Steel Wires**

There shall be no joint of any kind in the finished wire entering into manufacture of the non strand joint or strand splices in any length of the complete stranded steel core of the conductor.

3.5 INSULATION

S. No.	Particular	Data
1	Voltage Grade	1.1 kV
2	Insulation Material	XLPE
3	Nominal Thickness of Insulation	As per table 3 of IS 7098 P-1

4. QUALITY ASSURANCE

- 4.1 Vendor shall follow his standard procedures for quality assurance and control. These standard procedures including quality assurance plan shall be submitted to the purchaser for approval.
- 4.2 The procedures shall be in such a form as to clearly indicate the manufacturing sequence and major inspection points and to reference Bidder's test in inspection procedures.
- 4.3 Manufacturing and quality control procedures shall be available for audit to the Purchaser and / or its representatives at the place of manufacture.
- 4.4 The Purchaser and/or its representative reserves the right to inspect the equipment at the point of manufacture and witness factory and other such tests as may be necessary to ensure conformance to the specification.
- 4.5 The Purchaser and / or its representative shall inspect the Vendor facilities prior to award of contract.
- 4.6 The Purchaser and/or its representative may conduct surveillance of the Vendor facilities for compliance to his standard procedures of quality assurance and quality control while work is in progress.

5. INSPECTION AND TESTING**5.1 INSPECTION**

- The purchaser's representative shall at all times be entitled to have access to the works and all places where conductor shall be manufactured and shall have full facilities for unrestricted inspection of the manufacturer works, raw materials and process of manufacture for conducting necessary tests as detailed herein.
- The manufacturer shall keep the Employer informed in advance of the time of starting and of the progress of manufacture of conductor in its various stages so that arrangements can be made for inspection.
- No material shall be dispatched from its point of manufacture before it has been satisfactory inspected and tested, unless the inspection is waived off by the purchaser in writing. In the latter

TECHNICAL SPECIFICATION OF ACSR CONDUCTOR

case also the conductor shall be dispatched only after satisfactory testing for all tests specified herein have been completed.

- The acceptance of any quantity of material shall in no way relieve the manufacturer of any of his responsibilities for meeting all requirements of the Specification and shall not prevent subsequent rejection if such material is later found to be defective.

5.2 TESTS

The following acceptance and routine tests and tests during manufacture shall be carried out on the conductor. For the purpose of this clause, the following shall apply

- Acceptance tests shall mean those tests which are to be carried out on samples taken from each lot offered for pre-dispatch inspection, for the purpose of acceptance of that lot.
- Routine tests shall mean those tests, which are to be carried out on each strand/spool/length of the conductor to check requirements which are likely to vary during production.
- Tests during manufacture shall mean those tests, which are to be carried out during the process of manufacture to ensure the desired quality of the end product.
- For all acceptance tests, the acceptance values shall be the values shall be the values guaranteed by the Bidder in the guaranteed technical particulars of his proposal or the acceptance value specified in this Specification, whichever is more stringent for that particular test.

5.3 TYPE TESTS

Supplier shall submit all Type test report with validity of 5 years, along with the bid. The entire test certificate as per relevant IS/IEC shall be submitted for purchaser review. In case type tests have not been conducted earlier the same has to be carried out without any cost implication to purchaser. Purchaser has the right of witnessing any of the tests for which the supplier has to give prior notice before the date of conducting such tests. The unit rates for each type of the tests to be carried out shall be indicated in the offer. Requirement of type test shall be as listed below. Type test charges shall not be included as part of main price to be indicated in the offer.

The following tests shall be performed on a typical length of conductor. The cost of these tests shall be quoted separately.

- a) Surface condition test
- b) Test for ultimate breaking load on stranded conductor
- c) Stress strain test
- d) Measurement of diameter of individual aluminium and steel wires.
- e) Measurement of lay ratio.
- f) Breaking load of individual wires
- g) Ductility test
- h) Wrapping test
- i) Resistance test and
- j) Galvanizing test

5.4 ACCEPTANCE TESTS

- a) Visual and dimensional check by drum
- b) Visual check for joints scratches etc and lengths of conductor by rewinding
- c) Dimensional check on steel and Aluminium strands

TECHNICAL SPECIFICATION OF ACSR CONDUCTOR

- d) Galvanizing test on steel strands
- e) Torsion and elongation test on steel strands
- f) Check for lay ratio of various layers
- g) Breaking load test on steel and aluminium strands
- h) Wrap test on steel and aluminum strands
- i) DC resistance test on aluminium strands
- j) UTS Test on welded joint of strands
- k) Tensile test (For Aluminium)
- l) Test for thickness of insulation
- m) Tensile strength & elongation at break test for insulation
- n) High voltage test
- o) Insulation resistance (Volume resistivity) test

All above tests except (j-o) shall be carried out on aluminium and steel strands after stranding only.

5.5 ROUTINE TESTS

- a) Check to ensure that the joints are as per Specification.
- b) Check that there are no cuts, fins etc on the strands.
- c) Check that drums as per Specification.
- d) All acceptance test as mentioned above to be carried out on each coil

6. EMBOSSING & PRINTING

Following text shall be embossed on insulated conductor only

- a) BSES, PO No. & Date, Manufacturing month & year, Type of Conductor- one each meter length
- b) Printing of running meter No.- on each meter length- White colour

7. APPROVED VENDORS & SUPPLIERS OF RAW MATERIAL

S. No	Material	Approved Suppliers
1	Steel	TATA /SAIL
2	Aluminium	NALCO/BALCO/HINDALCO
3	Insulation	KLJ/KALPENA/DOW/HANWHA/BOREALIS

8. DOCUMENT SUBMISSION MATRIX

Document/Drawing submission shall be as per the matrix given below:

- a. All documents/drawings shall be provided in soft copy only via mail or in returnable Pen drives
- b. Language of the documents shall be English only.
- c. Document check sheet compliance shall be the first sheet for each submission stage i.e. Technical bid, Drawing Approval, Pre Dispatch, Pre closure
- d. No submission is acceptable without check list compliance.
- e. Deficient/ improper or incomplete document/ drawing submission shall be liable for rejection.
- f. Order of documents shall be strictly as per the check list.

TECHNICAL SPECIFICATION OF ACSR CONDUCTOR

- g. Any document 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	Bid	Approval	Pre Dispatch
1	Guaranteed Technical Particulars (GTP)	Required	Required	
2	Deviation Sheet, if any	Required	Required	
3	Detailed cross sectional drawing of ACSR Conductor	Required	Required	
4	Dimensional drawing of drum	Required	Required	
5	Type test reports of offered type and rating of ACSR conductor	Required	Required	
6	BIS certificate	Required		
7	Complete cable catalogue	Required		
8	Make of Raw Materials	Required	Required	
09	Inspection test reports and Routine Test Certificates carried out in manufacturer's works			Required
10	Test certificates of all raw materials			Required
11	Calibration test reports of instruments			Required

9. ANNEXURE - I**CONDUCTOR DATA SHEET**

S.N.	Particulars	Conductor Details						
1	Conductor Name	Zebra	Goat	Panther	Wolf	Dog	Rabbit	Squirrel
2	Stranding and wire diameter	54/3.18 mm Al. + 7/3.18 mm Steel	30/3.71 mm Al. + 7/3.71 mm Steel	30/3.0 mm Al. + 7/3.0 mm Steel	30/2.59 mm Al. + 7/2.59 mm Steel	6/4.72 mm Al. + 7/1.57 mm Steel	6/3.35 mm Al. + 1/3.35 mm Steel	6/2.11 mm Al + 1/2.11 mm Steel
3	Number of strands							
3a	Core	1	1	1	1	1	1	1
3b	1 st layer	6	6	6	6	6	6	6
3c	2 nd Layer	12	12	12	12	6	--	--
3d	3 rd layer	18	18	18	18	--	--	--
3e	4 th Layer	24	--	--	--	--	--	--
4	Sectional	428.9 Sq.	324.30	212.10	158.10	105.00	52.88 Sq.	20.98 Sq.

TECHNICAL SPECIFICATION OF ACSR CONDUCTOR

	Area of Aluminum	mm	Sq. mm	Sq. mm	Sq. mm	Sq. mm	mm	mm
5	Total Sectional Area	484.5 Sq. mm.	400.00 Sq. mm	261.50 Sq. mm	194.90 Sq. mm	118.50 Sq. mm	61.70 Sq. mm	24.48 Sq. mm
6	Overall Diameter	28.62 mm	25.97 mm	21.00 mm	18.13 mm	14.15 mm	10.05 mm	6.33 mm
7	Approx. Weight							
7a	Aluminum	1186 kg/Km	878 kg/Km	587 kg/Km	428 kg/Km	287 kg/Km	145 kg/Km	58 kg/Km
7b	Steel	435 kg/Km	610 kg/Km	387 kg/Km	298 kg/Km	107 kg/Km	69 kg/Km	27 kg/Km
7c	Total	1621 kg/Km	1488 kg/Km	974 kg/Km	726 kg/Km	394 kg/Km	214 kg/Km	85 kg/Km
8	Calculated DC resistance at 20°C	0.06868 Ohm/Km	0.09106 Ohm/Km	0.13900 Ohm/Km	0.18710 Ohm/Km	0.27920 Ohm/Km	0.55240 Ohm/Km	1.39400 Ohm/Km
9	Minimum UTS	130.32 KN	137.00 KN	89.67 KN	67.34 KN	32.41 KN	18.25 KN	7.61 KN

Lay Ratio of Aluminum Conductors, Steel Reinforced

S. No.	Conductor	No. of wire		Ratio of Aluminum Wire Diameter to Steel wire Diameter	Lay ratio to Steel core (6 wire ratio)		Lay ratio for Aluminum wire					
							Outermost Layer		Layer immediately beneath Outermost Layer		Innermost Layer of conductors with 3 Aluminum wire Layers	
1	Zebra	Aluminum	Steel		Min	Max	Min	Max	Min	Max	Min	Max
		6	1		-	-	10	14	-	-	-	-
		6	7		13	28	10	14	-	-	-	-
		30	7		13	28	10	14	10	16	-	-
		42	7		13	28	10	14	10	16	10	17
		54	7		13	28	10	14	10	16	10	17

TECHNICAL SPECIFICATION OF ACSR CONDUCTOR

Diameter of Aluminum & Steel Strands

S. No.	Conductor Name	Aluminum			Steel		
		Nominal	Maximum	Minimum	Nominal	Maximum	Minimum
1	Zebra	3.18	3.21	3.15	3.18	3.24	3.12
2	Goat	3.71	3.74	3.68	3.71	3.76	3.65
3	Panther	3.00	3.03	2.97	3.00	2.94	2.06
4	Wolf	2.59	2.62	2.56	2.59	2.64	2.54
5	Dog	4.72			1.57		
6	Rabbit	3.35	3.32	3.38	3.35	3.42	3.28
7	Squirrel	2.11	2.13	2.9	2.11	2.15	2.07

10. ANNEXURE - II

VENDOR DATA (GURANTEED TECHNICAL PARTICULARS)(SEPARATE DATA SHEET SHALL BE SUBMITTED FOR EACH TYPE OF CONDUCTOR)

SI.NO.	DESCRIPTION	BSES Requirement	PARTICULARS
1	Name of the material offered	XLPE Insulated ACSR Conductor	
2	Maker's Name	Required	
3	Address and Phone No.		
4	Reference Standards	IS-398Pt-1, IS 1778 , IS 7098	
5	No.of strands/diameter of Galvanised steel wire/Al strand	Required	
6	Apporx.Dia over covered conductor		
7	Minimum Ultimate Tensile Strength of Conductor	18.25	
8	Direction Of Lay	Successive layers shall have opposite directions of lay outermost layer being Right Handed	
9	Lay ratio of Aluminum wire		
10	Continuous max. current rating of ACSR	Required	
	Conductor in still air at an ambient temperature at 45 Deg C		
11	Temperature rise for the above current	Required	
12	Short Circuit current rating of ACSR	Required	
	Conductor for 1sec		
13	Module of elasticity of complete	79	

TECHNICAL SPECIFICATION OF ACSR CONDUCTOR

	Conductor		
14	Coefficient of linear expansion of complete conductor	19.1×10^{-6}	
15	Cross sectional area	Required	
16	Nominal aluminium area	Required	
16.1	Conductivity and Grade of Al	61% EC Grade	
16.2	% Composition of steel wire	As Per spec	
17	Chemical composition certificate from NABL approved lab	Required	
18	Minimum breaking load		
18.1	Aluminum strand (After Stranding)	Required	
18.2	Galvanised steel wire (After Stranding)	Required	
19	Total Conductor	Required	
20	Max.Working tension of conductor	75% of UTS	
21	Resistance of Al conductor at 20Deg C(Max)	Required	
22	Weight		
22.1	Aluminium strand	Required	
22.2	Steel Strand	Required	
22.3	Conductor without insulation	Required	
22.4	Conductor with insulation	Required	
23	Purity of AL.rod in %age	Required	
24	Zinc coating on steel wire		
24.1	Grade of Zinc	Electrolytic High Grade Zinc not less Than 99.95% purity as per IS209-1992	
24.2	Min wt of Zinc Coating	Required	
24.3	No.& duration of dips of Zinc coating (Before Stranding)	Required	
25	Type of Insulation	XLPE Type as per IS 7098	
25.1	Nominal thickness of XLPE insulation	1.6	
25.2	Min thickness of XLPE insulation	1.5	
25.3	Color of XLPE insulation	Black	
25.4	Tensile strength of Insulation (Min)	12.5	
25.5	Percentage elongation at break of Insulation(Min)	200	
25.6	Insulation resistance test (Volume resistivity) Min	1×10^{14} at 27deg C 1×10^{12} at 90deg C	

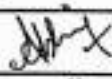
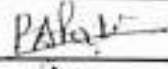

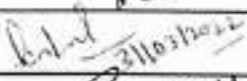
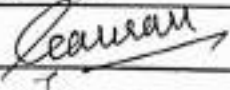
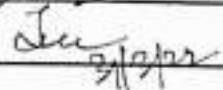
TECHNICAL SPECIFICATION OF ACSR CONDUCTOR

26	Chemical composition test certificate of XLPE insulation material	Required, shall be weather proof and have property of protection against ultraviolet light having 2.5% black carbon content	
27	Drum	Required	
27.1	Ref IS	IS-1778-1980	
27.2	Gross weight of drum including weight of Conductor	Required	
27.3	Standard length of each piece of Conductor	3Km	
27.4	Non standard length	length	
28	Order quantity tolerance	(+/-)2%	Yes/No
29	Embossing	Name of manufacturer, Manufacture year, Manufacturing month, Type of conductor, BSES, P.o no & date	



Technical Specification of
LT Power Cable(Single & Multi-Core)

Specification no – BSES-TS-01-LTPC-R0

Rev:	0	
Date:	31 Mar 2022	
Prepared by	Abhishek Vashistha	
	Rohit Patil	
Reviewed by	Puneet Duggal	
	Amit Tomar	
Approved by	Gaurav Sharma	
	K. Sheshadri	

BSES	BSES-TS-01-LTPC-R0
TECHNICAL SPECIFICATION OF LT POWER CABLE	

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TECHNICAL SPECIFICATION OF LT POWER CABLE**1.0 SCOPE OF SUPPLY**

The specification covers design, manufacture, shop testing, packing and delivery of 1100 Volts grade, Aluminium conductor XLPE insulated power cables.

2.0 CODES & STANDARDS

The cables shall be designed, manufactured and tested in Accordance with the following Indian & IEC standards.

2.1	IS- 7098 (Part-1)	Cross linked polyethylene insulated PVC sheathed cables for working voltages upto and including 1100V.
2.2	IS- 6474	Polyethylene insulation & sheath of electric cables.
2.3	IS- 5831	PVC insulation and sheath of electrical cables.
2.4	IS : 10810	Methods of tests for cables.
2.5	IS : 8130	Conductors for insulated electrical cables and flexible cords.
2.6	IS : 3975	Low carbon galvanized steel wires, formed wires and tapes for armouring of cables.
2.7	IS- 4026	Aluminum ingots, billets and wire bars (EC grade)
2.8	IS-5484	EC Grade aluminium rod produced by continuous casting and rolling
2.9	IS : 10418	Specification for drums for electric cables.
2.10	IS : 3961	Recommended current ratings for cables.
2.11	IS:1255	Installation and Maintenance of power cables upto and including 33 kV rating.
2.12	IS:4826	Specification for hot-dipped galvanized coatings on round steel wires
2.13	IS:1717	Metallic Materials – Wire – Simple torsion test
2.14	IEC 60228	Conductors of insulated cables. Guide to the dimensional limits of circular conductors.
2.15	IEC 60331	Fire resisting characteristics of electric cables.
2.16	IEC 60332 – 3	Tests on electric cables under fire conditions. Part 3: Tests on bunched wires or cables.
2.17	IEC 60502	Extruded solid dielectric insulated power cables for rated voltages from 1kV to 30 kV.
2.18	IEC 60754 – 1	Test on gases evolved during combustion of materials from cables. Part 1: Determination of the amount of halogen acid gas evolved during combustion of polymeric material taken from cables.
2.19	IEC 60811	Common test methods for insulating and sheathing materials of electric cables
2.20	IEC 60885	Electric test methods for electric cables
2.21	IEC 60304	Standard colours for insulation for low frequency cables and wires.
2.22	IEC 60227	PVC insulated cables of rated voltages up to and including 460/760 V.

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2.23	IEC 1034	Measurement of smoke density of electric cables burning under defined conditions
2.24	ASTMD 2843	Standard Test Method for density of Smoke from the burning or decomposition of cables
2.25	ASTM 2863	Standard Test Method for measuring of minimum oxygen concentration
2.26	IEC 60754-1	Test on gases evolved during combustion of materials for cables. Part 1 – Determination of the Halogen Acid gas Content
2.27	IS 1554 part 1	Specification for PVC insulated (Heavy duty) Electric cable

3.0 CABLE DESIGN

Description of each item mentioned in the specification (the text, BOQ, GTP or any site specific requirement) shall be followed along with IS: 7098 – P1

3.1	Conductor	a) Electrolytic Grade Stranded Aluminium Conductor b) Grade: H2 as per IS: 8130/1984 c) Class 2 d) Chemical Composition as per IS 4026 e) Shape& Size:			
		S. no.	Shape	Single core (sq.mm)	Multi core (sq.mm)
		1	Compacted Circular	<ul style="list-style-type: none"> 1cx25 1cx95 1cx300 1cx630 1cx1000 	<ul style="list-style-type: none"> 2cx10
		2	Sector	---	<ul style="list-style-type: none"> 2cx25 4cx25 4cx50 4Cx150 4Cx300 4Cx400
3.2	Insulation	Extruded XLPE insulation as per IS : 7098 part-1			
3.3	Core Identification	a) Single Core Cable – Natural b) Two Core Cable – Red & Black c) Four Core Cable – Red, Yellow, Blue and Black			
3.4	Inner Sheath	a) For Single Core Cable – Inner Sheath Not Required b) For 2 Core cable- Pressurized Extruded, Black PVC type ST-2 (IS 5831-1984) c) For 4 core cable –Extruded Black PVC type ST-2 (IS 5831-1984)			
3.5	Armour	a) For 2C X 10 mm ² – Galvanized Steel round wire. b) For all sizes above 10 mm ² -Galvanized Steel Strip c) Armour not required for single core cables d) Minimum area of coverage of armouring shall be 90%			

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		<p>e) The breaking load of armour joint shall not be less than 95% of that of armour wire / strip</p> <p>f) Zero negative tolerance for thickness of armour strip shall be as per IS:3975</p> <p>g) Zinc rich paint shall be applied on strip/wire and its joint surface.</p>
3.6	Outer Sheath	<p>a) Extruded FRLS outer sheath of PVC (ST-2) shall be as per IS:5831</p> <p>b) Colour :</p> <ul style="list-style-type: none"> • For multi core cables-Orange/Yellow as per tender requirement • For single core cables – Orange/Black as per tender requirement <p>c) FRLS Outer sheath of all the LT cables shall be UV resistant; as these cables are laid in air exposed to sun. Bidder to ensure the same for these requirements supported by required test.</p> <p>d) Shape of the cable over the outer sheath shall be circular, when manufactured/completed.</p> <p>e) The FRLS outer Sheath shall be embossed with following minimum text:</p> <ol style="list-style-type: none"> i) The voltage designation ii) Type of construction /cable code (For e.g. A2XWY/A2XFY) iii) FRLS iv) Manufacture name/Trade mark v) Number of Cores and nominal cross section area of conductor vi) Name of buyer i.e BSES vii) Month & year of manufacturing viii) IS reference , i.e. IS:7098 ix) P.O No. and Date x) Font size shall be 5/5mm xi) ISI mark <p>The embossing shall be progressive, automatic, in line and marking shall be legible and indelible.</p> <p>Following points shall be printed on every meter of cable</p> <ol style="list-style-type: none"> i. Progressive (Sequential) length of cable at every meter, starting from zero for every drum. Colour filled in for the progressive marking, shall be with proper contrast in colouring. ii. Drum number marking on every meter of the cable length
3.7	Bending Radius	Bending Radius of cable shall comply to IS:1255
3.8	Sealing of cable end	Both ends of the cable shall be sealed by means of non-hygroscopic

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		heat shrinkable PVC caps
3.9	FRLS Properties	Oxygen Index : Not less than 29% as per ASTM 2863
		Temperature Index : 250 Deg C at Oxygen Index 21 (when tested as per ASTM D 2863)
		Max Acid Gas Generation – Not more than 20% as per IEC -60754-1
		Light Transmission - Minimum 40% when tested as per ASTM D 2843 (Smoke Density rating shall be max 60%)
		Flammability Test – IEC 60332 part -1

4.0 CABLE DRUM

4.1	Reference Standard	Cable drum shall comply with IS: 10418.
4.2	Type of Drum	Wooden drums with anti termite treatment. (The drums shall be provided with M.S spindle plate and nut-bolts arrangement as per IS : 10418)
4.3	Drum Length & Tolerance	<ul style="list-style-type: none"> For 2C X 10 mm² Cable - 1000+/-5% Mtr For all Other cable sizes - 500 +/-5% Mtr
4.4	Overall Tolerance	-2 % for the total cable length for the entire order.
4.5	Short Length of Cable	a) Minimum acceptable length (Max. is 525 mtr) shall be 1 % of the total ordered qty. & no length shall be less than 250 mtr. Manufactures shall be taken prior approval from BSES Engineering for any short length supply. Short length will be accepted in last lot. b) Manufacture shall not be allowed to put two cable pieces of different short length in same cable drum
4.6	Preventive Measure for cable Drum	a) The surface of the drum and outer most cable layer shall be covered with water proof layer b) Ferrous part of wooden drum shall be treated with suitable rust preventive paint/coating to minimize rusting during storage.
4.7	Drum Identification Labels	a) Drum identification number b) Cable voltage grade c) Cable code (eg. A2XFY/A2XWY) d) Number of cores and cross sectional area e) Cable quantity i.e cable length (Meters) f) Purchase order number, date & SAP item code g) Total weight of cable and drum (kg) h) Manufacture's and Buyer's name i) Month & year of manufacturing j) Direction of rotation of drum; an arrow and suitable accompanying wording shall be marked on one end of the reel indicating the direction in which it should be rolled. k) Cable length final end-marking (i.e reading at the inner end

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		and reading at the outer end, just before packing shall be marked on the drum.
--	--	--

5.0 PACKING, SHIPPING, HANDLING & STORAGE

5.1	Shipping information Plan	The seller shall be give complete shipping information concerning the weight ,size of each package
5.2	Transit Damage	The seller shall be held responsible for all transit damage due to improper packing/inside cable damaged found in store/site
5.3	Cable Drum Handling	The drum shall be with M.S spindle plate(with nut –bolts) of adequate size to suit the spindle rod , normally required for handling the drums , according to expected weight of the cable drums as per IS:10418

6.0 QUALITY ASSURANCE, TESTING& INSPECTION

All the tests shall be carried out in accordance with IEC / IS standards.

6.1	Quality Assurance Plan	In event of order manufacturer has to submit the signed copy of QAP.
6.2	Inspection hold points	AS per approved QAP (QAP shall be approved at the time of GTP approval)
6.3	Routine Test	a) Measurement of Electrical Resistance b) HV test with power frequency AC voltage
6.4	Type Test	<p>For bid participation–</p> <p>(a) Bidder must be submitted cable type tested report from CPRI/ERDA/NABL approved lab for the type, size & rating of similar or higher sizes of offered cable along with bid.</p> <p>After award of P.O.-</p> <p>(b) If a bidder has valid type test report from CPRI/ERDA lab for the type, size & rating of similar or higher sizes of offered cable (including FRLS)—No need to conduct fresh type test from CPRI/ERDA lab.</p> <p>(c) If a bidder has valid type test report from CPRI/ERDA lab for the type, size & rating of similar or higher sizes of offered cable (except FRLS)—Need to conduct only fresh type test of FRLS properties test from CPRI/ERDA/NABL lab(list of tests mentioned in clause 3.9)without any commercial implication to BSES.</p> <p>(d) If a bidder has valid type test report from NABL lab for the type, size & rating of similar or higher sizes of offered cable (including FRLS)—Need to conduct complete type test (including FRLS properties) from CPRI/ERDA lab without any</p>

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		<p>commercial implication to BSES. (Type test shall not be more than 5 years old. If the type test report is more than 5 years old (max 10 years), it can be considered subject to no change in their design)</p> <p>(e) UV resistance test to be carried out on one sample from CPRI/ERDA/NABL Accredited Lab as per ASTM standard (sample shall meet minimum 80% retention in tensile strength and elongation after exposure of 21 days as per ASTM standard).</p>
6.5	Acceptance Test (Shall be conducted as per Cl.15.2 of IS 7098 Part-1 & IS 1554 part 1 for each lot of cable)	<p>a) For cable sizes up to 25 mm² – one sample for chemical composition and purity test of aluminium shall be conducted per 300km of ordered quantity and multiple thereof.</p> <p>b) For cable sizes 50mm² – one sample for chemical composition and purity test of aluminium shall be conducted per 100km of ordered quantity and multiple thereof.</p> <p>c) For cable sizes above 50 mm² – one sample for chemical composition and purity test of aluminium shall be conducted upto 50km of ordered quantity and multiple thereof.</p> <p>d) Chemical composition and purity test of aluminium shall be conducted from the lot offered to BSES on each size involved in the purchase order. Test shall be carried out at NABL accredited third party lab without any price implication to BSES.</p> <p>e) The sample will be selected either during acceptance test or after receipt of cable in BSES Stores.</p>
6.6	Inspection	<p>a) The buyer reserves the right to witness all tests specified on completed cables</p> <p>b) The buyer reserves the right to inspect cables at the seller's works at any time prior to dispatch either in finished form or during manufacturing, to prove compliance with the specifications.</p> <p>c) In-process and final inspection call intimation shall be given in 10 days advance to purchaser/CES.</p>
6.7	Test Certificates	Complete test certificates (routine & acceptance tests) need to be submitted along with the delivery of cables.

7.0 DOCUMENT SUBMISSION MATRIX

Document/Drawing submission shall be as per the matrix given below:

- All documents/drawings shall be provided in soft copy only via mail or in returnable Pen drives
- Language of the documents shall be English only.
- Document check sheet compliance shall be the first sheet for each submission stage i.e. Technical bid, Drawing Approval, Pre Dispatch, Pre closure

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- d. No submission is acceptable without check list compliance.
- e. Deficient/ improper or incomplete document/ drawing submission shall be liable for rejection.
- f. Order of documents shall be strictly as per the check list.
- g. Any document 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	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	Dimensional drawing of cable drum	Required	Required	
4	Type test reports of offered type and rating of cable	Required	Required	
5	BIS certificate	Required		
6	Complete cable catalogue	Required		
7	Make of Raw Materials	Required	Required	
8	Cable de-rating factors	Required	Required	
9	Armour coverage calculation		Required	
10	Inspection test reports and Routine Test Certificates carried out in manufacturer's works			Required
12	Test certificates of all raw materials			Required
13	Calibration test reports of instruments			Required

8.0 PROGRESS REPORTING

8.1	Outline Document	To be submitted for purchaser approval for outline of Production-inspection, testing-inspection, packing, dispatch, documentation programme.
8.2	Detailed Progress Report	To be submitted to purchaser once a month containing <ul style="list-style-type: none"> a) Progress on material procurement b) Progress on fabrication (As applicable) c) Progress on assembly (As applicable) d) Progress on internal stage inspection e) Reason for any delay in total programme f) Details of test failures if any in manufacturing stages. g) Progress on final box up constraints/forward path.

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9.0 DEVIATION

- a) Deviations from this specification shall be listed separately by bidder clause wise (format given below) along with optional offer and has to submit the list along with bid/quotation. BSES will review the deviations and if BSES is agreed with the deviation, seller has to take written confirmation from BSES on deviation during tender evaluation.
- b) In the absence of any separate list of deviations from the bidders with bid as well as written confirmation from BSES on deviations, it will be assumed by the Buyer that the Seller complies with the Specification fully.
- c) Any deviations mentioned in any other submitted bid documents (i.e.in filled GTP, Catalog, BSES old approval, buyer's/seller's standards etc) by seller without separate deviation sheets will not consider as a deviation from this tech spec at any stage of contract.

Deviation sheet format

Sl. No.	Document Name	Clause No.	Deviation	Reason	Merit to BSES

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10.0 Annexure -A

GUARANTEED TECHNICAL PARTICULARS (Multi-core)

(Standard Cable sizes are 2cx10, 2cx25, 4cx25, 4cx50, 4C X 95, 4cx150, 4cx300, 4cx400)

For each size /rating separate GTP need to be furnished

Sr. No.	Description	Buyer's Requirement	Seller's data
	Manufacture Contact Person & Number		
	Purchase Req. No.	
	Guarantee Period: (Min)	60 Months (from date of commissioning) / 66 months (from date of receipt at purchaser's store) whichever is earlier	
	Applicable IS / IEC Standard followed by vendor	As mentioned in the clause no – 2.0	
1	Make	...	
2	Type (as required by purchaser)		
A	For 2CX10Sqmm	A2XWY	
B	For Sizes above 10 mm ²	A2XFY	
3	Voltage Grade (kV)	1.1	
4	Maximum Conductor temperature		
A	Continuous	90°C	
B	Short time	250°C	
5	Conductor		
A	Material and Grade	As per Cl.3.1	
B	Make of Al	Ref Annexure D	
C	Size (mm ²) mm ²	
D	Min no. of wires in each conductor (Nos.)	As per Manufacturer Standard	
E	Min Dia. of wires in each conductor before compaction (mm)	As per Manufacturer Standard	

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Sr. No.	Description	Buyer's Requirement	Seller's data
F	Shape of Conductor	As per Cl.3.1 (e)	
G	Diameter over conductor (mm)	
H	Maximum Conductor resistance at 20 ° C(Ohm/Km)	As per Table 2 of IS 8130	
6	Insulation		
A	Insulation Material	As per Cl. 3.2	
B	Nominal thickness (mm)	As per Table 3 of IS 7098 Part-1	
C	Diameter over Insulation (mm) Approx.	
D	Make of insulation compound	Ref: Annexure D	
7	Inner Sheath		
A	Material and Type	As per Cl. 3.4	
B	Minimum thickness	As per Table 5 of IS 7098 Part-1	
C	Approx. dia. Over sheath (mm)	
8	Galvanized Steel Armour	as per purchaser's site - specific condition	
A	Material		
a)	For 2CX10 mm ²	G.I. Wire	
(i)	Wire Dia. (mm)	1.4+/-0.040	
(ii)	No. of wires	As per Manufacturer Standard	
b)	For sizes above 10 mm ²	G.I. Strip	
(i)	Strip size (Width and Thickness)	4x0.8 (Zero negative tolerance for thickness)	
(ii)	No. of Strips	As per Manufacturer Standard	
B	Area covered by Armour	Min 90% and calculations shall be strictly as per Annexure-D	
C	Dia. over Armour – Approx.(mm)	

TECHNICAL SPECIFICATION OF LT POWER CABLE

Sr. No.	Description	Buyer's Requirement	Seller's data
9	Outer Sheath (FRLS)		
A	Material and Type	As per Cl. 3.6	
B	Minimum Thickness	As per Table 8 of IS 7098 Part-1	
C	Colour	Orange	
D	Embossing Details	As per Cl.3.6 (e)	
10	Approx. overall dia. (mm)	
11	Overall order tolerance	- 2 % for the total cable length for the entire order	
12	Cable Drum		
A	Type of Drum	Wooden	
B	Drum Length & tolerance	As per Spec. Cl. 4.3 & 4.4	
C	Marking on Drum	As per Spec. Cl. 4.7	
D	Drums provide with MS Spindle plate & nut bolts arrangement (as per IS:10418)	Required	
13	End Cap	Required	
14	Weights	
a)	Net Weight of cable (Kg/Km.) – Approx		
b)	Weight of empty drum	Kg	
c)	Weight of cable with drum	Kg	
15	Continuous current rating for standard I.S condition laid direct		
a)	In ground 30° C	Amps	
b)	In duct 30° C	Amps	
c)	In Air 40° C	Amps	
16	Short circuit current for 1 sec of Conductor (kAmp)	
17	Electrical Parameters at Maximum operating temperature:		
A	AC Resistance	Ohm/Km	

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Sr. No.	Description	Buyer's Requirement	Seller's data
B	Reactance at 50 C/s	Ohm/Km	
C	Impedance	Ohm/Km	
D	Capacitance	Micro farad / Km	
18	Recommended minimum bending radius x O/D	
19	De-rating factor for following Ambient temperature in	Ground / Air	
a)	At 30° C		
b)	At 35° C		
c)	At 40° C		
d)	At 45° C		
e)	At 50° C		
20	Group factor for following Nos. of cables laid	Touching / Trefoil	
a)	3 Nos.		
b)	4 Nos.		
c)	5 Nos.		
d)	6 Nos.		
21	Process of Cross linking of Polyethylene	Dry/ Sioplas Cure	
22	Type test	Is copy of latest valid TTR for respective Sizes enclosed? Yes /No	
23	FRLS Properties	As per IS 1554, Part-1	
	Oxygen Index	As per IS 1554, Part	
	Temperature Index	As per IS 1554, Part	
	Max Acid Gas Generation	As per IS 1554, Part	
	Light Transmission / Smoke Density	As per IS 1554, Part	

11.0 ANNEXTURE- B**GUARANTEED TECHNICAL PARTICULARS (Single Core)****(Separate GTP needs to be furnished for 25, 95, 300, 500, 630 & 1000 mm² cables)**

TECHNICAL SPECIFICATION OF LT POWER CABLE

S.No.	Description	Buyer's Requirement	Seller's data
	Manufacture Contact Person & Number		
	Purchase Req. No.	
	Guarantee Period: (Min)	60 Months (from date of commissioning) / 66 months (from date of receipt at purchaser's store) whichever is earlier	
	Applicable IS / IEC Standard followed by Vendor	As mentioned in the clause no-2.0	
1	Make	
2	Type	A2XY (Un-armoured)	
3	Voltage Grade (kV)	1.1kV	
4	Maximum Conductor temperature		
A	Continuous	90°C	
B	Short time	250°C	
5	Conductor		
A	Material and Grade	As per Cl. 3.1	
B	Size (mm ²)mm ²	
C	Min no. of wires in each conductor (Nos.)	As per Manufacturer Standard	
D	Min Dia. of wires in each conductor before compaction (mm)	As per Manufacturer Standard	
E	Shape of conductor	Compacted Circular	
F	Diameter over conductor (mm)	
G	Maximum Conductor resistance at 20 ° C(Ohm/Km)	As per Table 2 of IS 8130	
H	Make of Al	Ref Annexure D	
6	Insulation	As per Table 3 of IS7098 Part-1	
A	Insulation Material	As per Cl. 3.2	

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S.No.	Description	Buyer's Requirement	Seller's data
B	Nominal thickness (mm)		
(i)	For 1Cx300 mm ²	1.8 mm	
(ii)	For 1Cx500 mm ²	2.2 mm	
(iii)	For 1Cx630 mm ²	2.4 mm	
iv)	For 1Cx1000 mm ²	2.8 mm	
C	Diameter over Insulation (mm) Approx.	
D	Make of insulation compound	Ref: Annexure D	
7	Inner Sheath	Not applicable	
8	Armour	Not applicable	
9	FRLS Outer Sheath		
A	Material and Type	As per Cl. 3.6	
B	Minimum Thickness	As per Table 8 of IS 7098 Part-1	
C	Colour	Orange	
D	Embossing Details	As per Cl.3.6 (e)	
10	Approx. overall dia. (mm)	
11	Overall order tolerance	-2 % for the total cable length for the entire order	
12	Cable Drum		
A	Type of Drum	Wooden	
B	Drum Length & tolerance	As per Spec. Cl. 4.3 & 4.4	
C	Marking on Drum	As per Spec. Cl. 4.7	
D	Drums provide with MS Spindle plate & nut bolts arrangement (as per IS:10418)	Required	
13	End Cap	Required	
14	Weights	
a)	Net Weight of cable (Kg/Km.) – Approx		
b)	Weight of empty drum	Kg	

TECHNICAL SPECIFICATION OF LT POWER CABLE

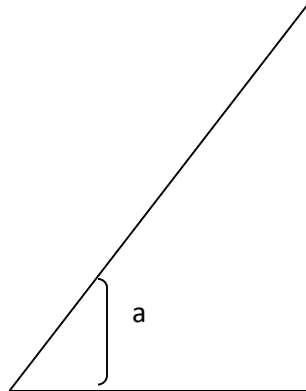
S.No.	Description	Buyer's Requirement	Seller's data
c)	Weight of cable with drum	Kg	
15	Continuous current rating for standard I.S condition laid direct		
a)	In ground 30° C	Amps	
b)	In duct 30° C	Amps	
c)	In Air 40° C	Amps	
16	Short circuit current for 1 sec of Conductor (kAmp)	
17	Electrical Parameters at Maximum operating temperature:		
A	AC Resistance	Ohm/Km	
B	Reactance at 50 C/s	Ohm/Km	
C	Impedance	Ohm/Km	
D	Capacitance	Micro farad / Km	
18	Recommended minimum bending radius x O/D	
19	Derating factor for following Ambient temperature in	Ground / Air	
a)	At 30° C		
b)	At 35° C		
c)	At 40° C		
d)	At 45° C		
e)	At 50° C		
20	Group factor for following Nos. of cables laid	Touching / Trefoil	
a)	3 Nos.		
b)	4 Nos.		
c)	5 Nos.		
d)	6 Nos.		
21	Process of Cross linking of Polyethylene	Dry/ Sioplas Cure	
22	Type test	Is copy of latest valid TTR for respective Sizes enclosed?	

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S.No.	Description	Buyer's Requirement	Seller's data
		Yes /No	
23	FRLS Properties		
	Oxygen Index	As per IS 1554, Part	
	Temperature Index	As per IS 1554, Part	
	Max Acid Gas Generation	As per IS 1554, Part	
	Light Transmission / Smoke Density	As per IS 1554, Part	

12.0 ANNEXTURE – C

ARMOUR COVERAGE PERCENTAGE



$$\text{Percent coverage} = \frac{N \times d}{W} \times 100$$

Where,

N = number of parallel wires / Strips

d = diameter of wire / width of formed wires

$W = \pi \times D \times \cos a$,

D = diameter under armour

a = angle between armouring wire / formed wires and axis of cable

$\tan a = \pi \times D/C$, and

C = lay length of armouring wires / formed wires.

Min 90% armour coverage shall be provided both in case of wires and strips.

The gap between armour wires / formed wires shall not exceed one armour wire / Formed wire space and there shall be no cross over / over-riding of armour wire / Formed wire so, the minimum area of coverage of armouring shall be 90%.

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13.0 ANNEXTURE – D

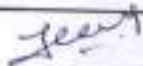
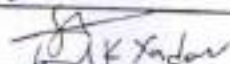

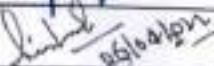
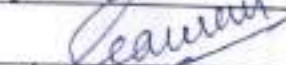

LIST OF SUB-VENDORS

Sr. No.	Description of Material	Sub-Vendors
1	E.C Grade Aluminium Rod	Bharat Aluminium Co. Ltd. (BALCO) Hindustan Aluminium Co. Ltd. (HINDALCO) National Aluminium Co. Ltd. (NALCO)
2	XLPE Compound	Kkalpana Industries Ltd. KLJ Polymers and Chemicals Ltd. Dow Chemical, U.S.A Borealis, Sweden Hanwha, Seoul, South Korea
3	PVC Compound	Kkalpana Industries Ltd. KLJ Polymers and Chemicals Ltd. Universal SCJ Plastic Sriram Polytech Shri Ram Vinyl, Kota
4	GI Strip	Tata Balaji Systematic Mica Wires Pvt Ltd. Bansal Industries

BSES

Technical Specification of Earthing Strip & GI Earthing Pipe

Specification no – BSES-TS-23-ESEP-R0

Rev:	0	
Pages	7	
Date:	06 April 2022	
Prepared by	Jeena Borana	
	Sunil Yadav	
Reviewed by	Srinivas Gopu	
	Amit Tomar	
Approved by	Gaurav Sharma	
	K. Sheshadri	

TECHNICAL SPECIFICATION OF GI EARTHING PIPE & EARTHING STRIPS**INDEX**

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TECHNICAL SPECIFICATION OF GI EARTHING PIPE & EARTHING STRIPS**1.0 SCOPE OF SUPPLY**

The specification covers the manufacturing, testing and inspection of Earthing Pipe and Earthing strips at manufacturers works before dispatch.

2.0 CLIMATIC CONDITION

The material to be supplied against this specification shall be suitable for satisfactory operation under following climatic condition

Location : At various location in the Delhi	
Maximum ambient temperature (°C)	50
Minimum ambient temperature (°C)	0
Maximum altitude above mean sea level (m)	1000
Relative Humidity (%)	100
Rainy month	June to October
Maximum Rainfall (mm)	1450
Wind Pressure (Kg/Sq.m)	195
Seismic Zone	Zone IV as per IS : 1893

3.0 CODES & STANDARDS

Earthing Pipe and Earthing Strip shall be designed, manufactured and tested in Accordance with the following Indian standards.

IS 1239: Part (1)	Steel Tubes, Tubular And Other Wrought Steel Fittings
IS 6745/72	For galvanising testing
IS 4759	Hot-dip zinc coatings on structural steel and other allied products
IS 1161: 1998	Steel Tubes for Structural Purposes
IS 1387: 1993	General requirements for the supply of metallurgical Materials
IS 228 :1987	Methods of chemical analysis of steels
IS 2633: 1986	Methods for testing uniformity of coating of zinc coated articles
IS 2629: 1985	Recommended Practice for Hot-Dip Galvanizing of Iron and Steel
IS 2500: 2000	Sampling of lot by lot
IS 2062	Hot Rolled Medium and High Tensile Structural Steel
IS 808	Dimension for Hot Rolled Steel Beam, Column, Channel and Angle Section
IS 3043: 1987	Code of Practice for Earthing
IS 5561: 1970	Specification for electric power connection
IEC	

TECHNICAL SPECIFICATION OF GI EARTHING PIPE & EARTHING STRIPS**4.0 DESIGN PARAMETERS****4.1 EARTHING STRIPS**

S. No.	Parameter	Requirement
4.1.1	Size	a) 25X3 mm; galvanized b) 50X3 mm; galvanized c) 50X6 mm; galvanized
4.1.2	Material	Material shall be mild steel, grade 'A', Designation E-250 as per IS 2062.
4.1.3	Make	TATA/SAIL/ESSAR/RINL/JSPL/JSW/BSES approved
4.1.4	Galvanization	Mass of zinc coating shall be min 610 gsm in accordance with IS 4759

4.2 GI EARTHING PIPE

S. No.	Parameter	Requirement
4.2.1	Type (Light, Medium, Heavy)	Medium
4.2.2	Size	Dia- 40mm NB
4.2.3	Thickness	Required
4.2.4	Max & Min outside diameter of tube	48.8 mm (max) & 47.9 (min)
4.2.5	Length of Pipe	2500 MM (+ 6 mm & - NOT ACCEPTABLE)
4.2.6	Make	TATA/SAIL/ESSAR/RINL/JSPL/JSW/BSES approved
4.2.7	Mass of Tube	3.56 Kg/m
4.2.8	Tolerance on thickness	(+) Not limited, (-) 8%
4.2.9	Tolerance on Mass	(+/-)10%
4.2.10	Galvanising thickness	80 Microns (min)
4.2.11	Tensile strength	320 N/mm ² (Mpa) (min)
4.2.12	Elongation percent	20%
4.2.13	Color of band	Blue Color
4.2.14	General	
a)	Supply of 6 Nos of M10*30mm elctrogalvanised Nuts+bolts+Plain& Spring Washer	Shall be provided

TECHNICAL SPECIFICATION OF GI EARTHING PIPE & EARTHING STRIPS

S. No.	Parameter	Requirement
b)	GI Strip Size	50 X 6 mm
4.2.15	Marking	a) Manufacture's name or trade mark b) ISI mark with CML No. c) Purchase no. shall be stencilled indelible link d) The manufacturer's identification symbol e) Hot marking at every running meter Name/logo of manufacturer, ISI, class of tube i.e. L for Light colour of Band

5.0 TESTING & INSPECTION

All the tests shall be carried out in accordance with IEC / IS standards.

5.1	Type Test	Type test report of Short time current test to be provided for Earthing Pipe in accordance with IEC 6 approved by CPRI/ERDA Lab.
5.2	Visual Check	Material shall be visually checked and shall free from external defects.
5.3	Dimensional Check	The dimensional requirements shall be checked for material as per the drawing and requirement.
5.4	Acceptance Test	Following tests need to be conducted by the vendor during inspection (value shall be followed as per IS1239-part 1 and IS 4759) a) Chemical composition and galvanization test to be carried out from NABL approved lab on one sample sealed by BSES representative. b) Leak tightness test (Hydrostatic test) c) Bend test

6.0 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, requirements of the Specification shall be met without exception.

BSES	BSES-TS-23-ESEP-R0
TECHNICAL SPECIFICATION OF GI EARTHING PIPE & EARTHING STRIPS	

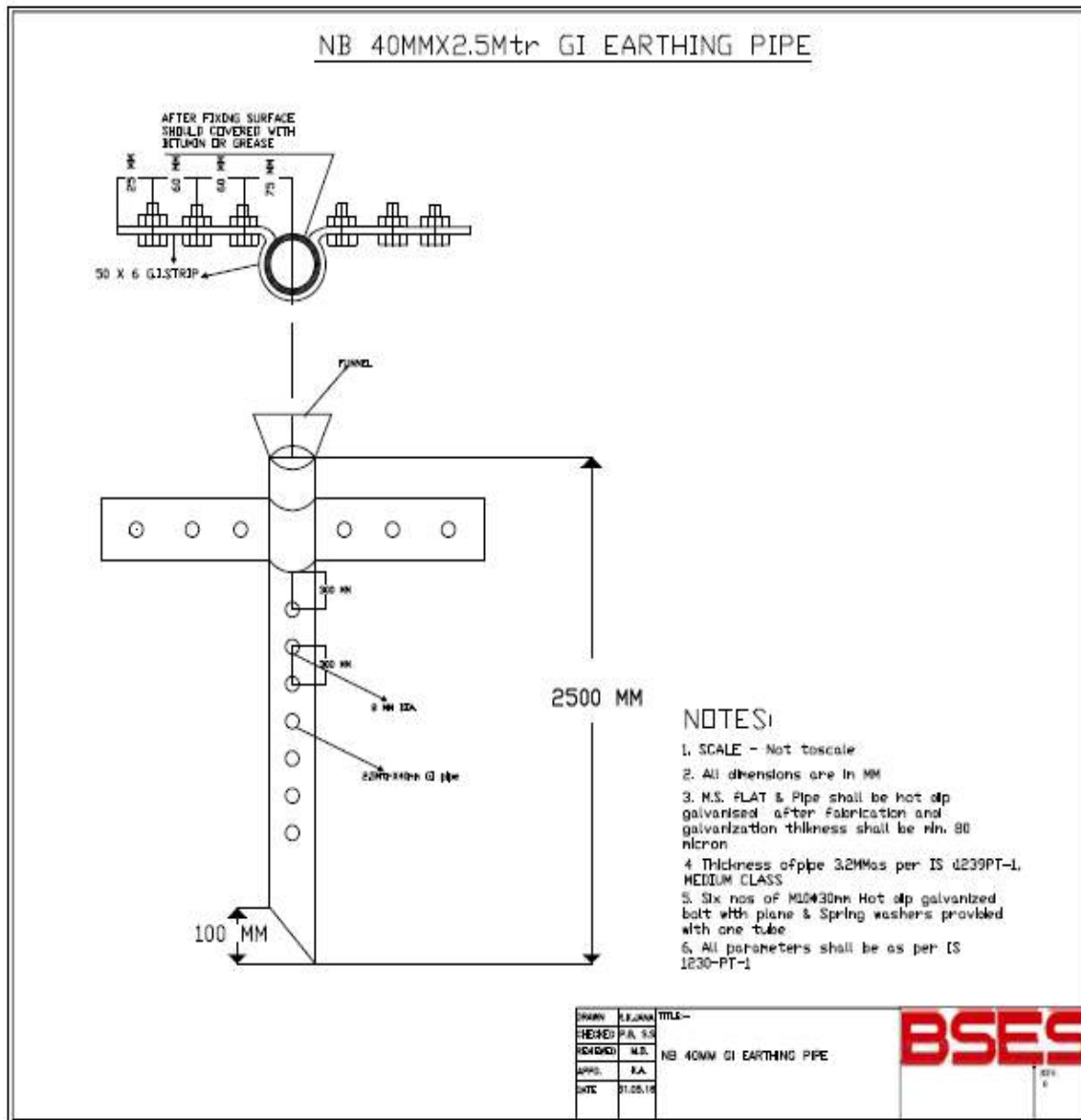
7.0 DOCUMENTS SUBMISSION

Document submission shall be as per the matrix given below. All documents/drawing shall be provided in soft copy for each section. Language of the documents shall be English only. Deficient/improper drawing submission may liable for rejection.

S.No.	Detail of Document	For Tender	For Approval/Review	Final Submission
7.1	Guaranteed Technical Particulars (GTP)	Required	Required	Required
7.2	Deviation Sheet, if any	Required	Required	Required
7.3	GA and Dimensional Drawing	Required	Required	Required
7.4	Manufacturer's quality assurance plan and certification for quality standards		Required	Required
7.5	Make of Raw Materials	Required	Required	Required
7.6	Type Test Report	Required		
7.7	Inspection and test reports, carried out in manufacturer's works			Required
7.8	Routine Test Certificates			Required
7.9	Test certificates of all the raw materials			Required

TECHNICAL SPECIFICATION OF GI EARTHING PIPE & EARTHING STRIPS







8.0 Drawing of G.I. Earthing Pipe



BSES

Technical Specification of Chemical Earthing Kit

Specification no – BSES-TS-06-CHER-R0

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No of Pages	18	
Date:	04 April 2022	
Prepared by	Abhishek Harsh	
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Approved by	Gaurav Sharma	
	K. Sheshadri	 04/04/22



BSES-TS-06-CHER-R0

TECHNICAL SPECIFICATIONS OF CHEMICAL EARTHING

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TECHNICAL SPECIFICATIONS OF CHEMICAL EARTHING**1.0 SCOPE**

This specification provides design, manufacturing, testing, inspection, packing, dispatch and installation of Chemical Earthing along with required accessories to BSES New Delhi store/ site, specified herein for their satisfactory operation in the network of BSES, New Delhi.

Such earthing shall last for minimum of 15 – 20 years and shall maintain the ohmic values despite of seasonal changes and water conditions. The conductivity of the material shall remain uncompromised

Chemical Earthing shall be used for various EHV, HV and LV equipments such as PTRs, Panels, Feeders, Distribution Transformers, Poles, Distribution boxes, RMUs etc.

2.0 STANDARDS

Chemical Earthing shall conform to the following International/Indian Standards and shall also abide the guidelines of CEA of India, which shall mean latest revisions, with amendments/changes adopted and published, unless specifically stated otherwise in the Specification.

S.No	International/ Indian standard	Title
1	IS 3043	Code for practice of Earthing
2	IEEE Std. 80	Guide for Substation Grounding

3.0 CLIMATIC CONDITIONS

1	Average grade atmospheric condition	Heavily polluted, dry
2	Maximum altitude above sea level	1000 M
3	Air temperature Ambient	i) Highest : 50°C ii) Average : 30°C iii) Minimum : 0°C
4	Relative Humidity	100 % max
5	Thermal Resistivity of Soil	150°C. cm / W (max.)
6	Seismic Zone	4
7	Rainfall	750 mm concentrated in four months

4.0 GENERAL TECHNICAL REQUIREMENT**4.1 GROUND RESISTANCE VALUE**

TECHNICAL SPECIFICATIONS OF CHEMICAL EARTHING

Ideally the ground resistance value should be "ZERO". As per IEEE recommendation the ground resistance value should be 5 ohms or less for effective grounding for small sub-station.

In BSES, the primary guidelines shall be followed for a good earthing system in a Distribution Sub-Station & down stream LT Equipments / Installations are as under-

- a) The impedance to ground should be as low as possible. In large Sub-Stations , it should not exceed 1 ohm and in small **Sub-Stations 5 ohm as per IEEE Std.80, cl no 14.1** and as per cl. no. 3.2.6 of Chapter-III of CBIP Technical report no. 3 (Revised) Reprinted 1990 & 1995 on Manual on Layout of Sub-Stations.
- b) At condition in BSES area, Mesh resistance shall not cross 5ohm and that shall maintain throughout the warranty period without any maintenance.

The specification generally covers the technical parameters of Chemical Earthing kit, earthing pit and installation of chemical earthing.

The Chemical Earthing shall therefore be suitable for satisfactory operation under the climatic conditions listed in clause 3.0.

4.2 GENERAL REQUIREMENT

A. Supply:

1. Copper bonded electrode/Rod electrode or any suitably designed copper electrode of length of 3 meter with below size as per tender requirement.
 - i. 17.2 mm dia (Minimum fault current carrying capacity 20kA for 1 sec)
 - ii. 25 mm dia (Minimum fault current carrying capacity 44kA for 1 sec)

Copper bonded rod shall be UL certified and type tested from CPRI/ERDA which are mandatory.

Copper coating shall be 250 micron minimum.

2. Earth enhancing material shall have lower ground resistivity, better conductivity, corrosion protection of electrode, non leaching and environment friendly properties. 25kg shall be normal packaging. Restriction of Certain Hazardous Substances (ROHS) certification is required for the Chemical compound.
3. Inspection joint which shall be used for testing of pit resistance

TECHNICAL SPECIFICATIONS OF CHEMICAL EARTHING

4. Heavy duty Polyplastic cover for Earth pit
5. Copper bonded steel conductor (17.2 or 25 mm dia as per requirement) for mesh formation
6. Exothermic joint (L, T and Cross joint)
7. Exothermic welding accessories
8. GI Strip for connection of equipment to mesh

B. Service:

1. All the earthing shall be in mesh formation
2. Mesh resistance shall not cross 5ohm and that shall maintain throughout the warranty period without any maintenance
3. All tools & tackles, equipment, boring equipment, hardware and services required for successful completion of the work shall be in OEM scope of work.
4. BSES reserves the right of inspection and monitor work progress time to time and ask for amendment / rework if the job is not up to the requirement.
5. Time is the essence of the contract and the bidder shall comply with the schedule and complete the execution of the contract within the time frame specified during award of contract.
6. All safety rules and codes as applicable to work shall be followed without exception. All safety and protective devices / appliances including belts, hand gloves, aprons, helmets, shields, goggles, and safety shoe shall be provided by the contractor to his personnel.

4.3 DESIGN PARAMETERS

1. Mesh resistance shall be less than 5 ohm and should never exceed 5 ohms throughout the warranty period
2. Fault current carrying capacity for the Earthing rod shall be as below
 - i. 20 kA for 1 sec for 17.2 mm dia Rod
 - ii. 44 kA for 1 sec for 25 mm dia Rod.
3. Enhancing material shall provide better conductivity, corrosion protection of electrode, non leaching and environment friendly
4. Chemical Earthing arrangement should be maintenance free for the warranty period

TECHNICAL SPECIFICATIONS OF CHEMICAL EARTHING

5. Minimum Warranty of 10 years
6. General Arrangement as per approved in Annexure –B
7. Soil resistivity shall be considered 100ohm mtr max.

4.4 INSTALLATION OF EARTH PIT

1. The pits shall be drawn with the help of a boring machine, an auger or any other means as required by site conditions and nature of ground strata
2. The pit for electrode shall be of 200 mm larger than the length of the pipe.
3. The top of the pipe will be approximately **150 mm** below the level of the Grade/ground level.
4. No. of Earth pits shall be as per BSES requirements.
5. The earth pit shall be placed at a distance of 3.0M apart minimum
6. In case of congested area , the distance between the earth pits shall not be less than 2.50 M.
7. Minimum of 1.0 M distance of Earth pit from electrical equipment and structures shall be maintained.
8. The earth pits shall be backfilled with Earth enhancing material.
9. Top of the pit shall be covered by polyplastic pit cover
10. After completion of earthing, area dressing shall be done by OEM

4.5 EARTH CONDUCTOR

1. 50X6/50x10 GI strips shall be used for equipments connection
2. Copper bonded conductor shall be laid 600mm below FGL for mesh formation
3. The connection of GI flat (50x6/50x10) with the Copper bonded electrode/Rod shall be done by M10 GI bolt joint. GI Bolt shall be provided by OEM of Earthing
4. The connection of GI flat (50x6/50x10) with equipments (with the earthing provision given by equipment OEM) shall be done by M10 GI bolt.

TECHNICAL SPECIFICATIONS OF CHEMICAL EARTHING

5. In case the copper bonded rod/GI flat is to cross any obstruction, it shall be laid 300 mm below the obstruction.

6. Wherever bolted connection is taken, it shall be taken through two bolts at each joint to ensure tightness and avoid loosening with passage of time.

4.6 GROUND EARTH ENHANCEMENT MATERIAL

Earth enhancement material is a superior conductive material that improves earthing effectiveness, especially in areas of poor conductivity (rocky ground, areas of moisture variation, sandy soils etc.). It may contain conductive cement, graphite, hydrous aluminium silicate, sodium montmorillonite etc. It improves conductivity of the earth electrode and ground contact area. It shall have following characteristics-

1. It should have low resistivity preferably below 0.12 Ohm-meters. Resistivity shall be tested by making a 20cm. cube of the material and checking resistance across the opposite face of the cube.
2. It shall not depend on the continuous presence of water to maintain its conductivity.
3. It should be a little alkaline in nature with pH value >7 but <9, test certificate from NABL approved laboratory to be provided for the composition so designed.
4. It should have better hygroscopic properties to absorb moisture. It should absorb and release the moisture in dry weather condition and help in maintaining the moisture around the earth electrode.
5. It should have capacity to retain >10% moisture at 105°C. Test certificate from NABL approved lab to be submitted for the composition so designed.
6. It should have water solubility < 5%. Test certificate from NABL approved lab be submitted for the composition so designed.
7. It should be granular with granule size 0.1 mm to 3 mm.
8. It should be non toxic, non reactive, non explosive & non corrosive.
9. It shall be thermally stable between 0 degree centigrade to +60 degree centigrade ambient temperature.
10. It shall not decompose or leach out with time.
11. It shall not pollute the soil or local water table and meets environmental friendly requirement for landfill.



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TECHNICAL SPECIFICATIONS OF CHEMICAL EARTHING

12. It should expand & swell considerably and removes entrapped air to create strong connection between earth electrode and soil.
13. It should be diffuses into soil pores and creates conductive roots enlarging conductive zone of earth pit.
14. It shall be permanent & maintenance free and in its “set form”, maintains constant earth resistance with time.
15. It shall not require periodic treatment or replacement.
16. It shall be suitable for any kind of electrode and all kinds of soils of different resistivity.
17. It shall not cause burns, irritation to eye, skin etc.
18. The Earth enhancement material shall be supplied in sealed, moisture proof bags. These bags shall be marked with Manufacturer's name or trade name, quantity, batch no & date of manufacture, Buyer's name, PO no, date of PO.

5.0 TESTS

5.1 GENERAL

BSES reserves the right to inspect the material at the time of tests. All tests shall then be performed in the presence of BSES representative. The Bidder shall have to give intimation in advance to witness the test. All the test results must be recorded in presence of the inspecting authority.

5.2 TYPE TESTS

All the product shall be type tested from CPRI/ERDA .Type test report shall not be more that 5 years old.

Type test report is valid only 5 years from the date of tender floating. In case of type test report is more than 5 years old, bidder has to conduct the type test from BSES sample at CPRI/ERDA without any cost implication to BSES.

5.2 ACCEPTANCE TESTS

1. Visual examination test
2. Dimensional verification

TECHNICAL SPECIFICATIONS OF CHEMICAL EARTHING

3. Resistivity verification

5.3 TESTING CHARGES

5.3.1	The testing charges for the type tests specified and as per relevant standard shall be borne by the bidder. All the manufacturers irrespective of quantity allotted to them, will have to carry out the Type Tests at their own cost and BSES will not have any bearing on this account. The type test reports shall not be older than 5 yrs and shall be valid till the validity of offer
5.3.2	In case of failure in any of the type tests, the manufacturer is required to modify the design of the material if required and repeat the particular type test and same shall pass within three times at his own expenses. The decision of the BSES in this regard shall be final. BSES at its own desecration may also cancel the order at the risk and cost of the manufacturer if the material fails twice in the type test.
5.3.3	Type test shall be done from CPRI/ERDA. Ensure that the tests can be completed in these laboratories within the time schedule guaranteed by them in the appropriate schedule. BSES reserves the right to specify the name of the laboratory also, if so felt.
5.3.4	The entire cost of testing for the acceptance and routine tests and tests during manufacture specified herein shall be treated as included in the quoted unit price of conductor.

5.4 ADDITIONAL TESTS

BSES reserves the right of getting done any other test(s) of reasonable nature carried out at Manufacturer's premises, at site, or in any other place/ third party lab in addition to the aforesaid type, acceptance and / or routine tests to satisfy with the fact that the material comply with the specifications. In such case all the expenses will be to Manufacturer's account.

5.5 TEST REPORTS

5.5.1	Soft copies of type test reports shall be furnished through mail only. BSES may ask original type test report to verify soft copy. BSES will not receive any hard copy for their office record. BSES will give final dispatch clearance after validating type test report.
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TECHNICAL SPECIFICATIONS OF CHEMICAL EARTHING

5.5.2	Record of routine test reports shall be maintained by the Manufacturer at their works for periodic inspection by the BSES's representative and shall be reviewed during inspection.
5.5.3	Test Certificates of tests done during manufacturing shall be maintained by the Bidder. These shall be produced for verification as and when desired by the BSES.

6.0 INSPECTION

6.0.1	BSES representative shall at all times be entitled to have access to the works and all places of the manufacturer and the representative shall have full facilities for unrestricted inspection of the Manufacturer's works, raw materials, store process and process of manufacture and conducting necessary tests as may be deemed fit, for certifying the quality of product.
6.0.2	The Manufacturer shall keep BSES informed in advance of the time of starting and of the progress of manufacturing of materials in its various stages so that arrangements can be made for inspection.
6.0.3	No material shall be dispatched from its point of manufacture and works before it has been satisfactorily inspected, tested, and necessary dispatch instructions are issued in writing, except for the cases where waiver of Inspection is granted by BSES, and even in this case also, written dispatch instructions will be issued. Any dispatches before the issue of Dispatch Instructions in writing will be liable for rejection and non acceptance by the consignee.
6.0.4	The acceptance of any quantity of material shall in no way relieve the Manufacturer of any of his responsibilities for meeting all requirements of the specification, and shall not prevent subsequent rejection if such material is later found to be defective.
6.0.8	Only soft copy of inspection report shall be furnished by manufacturer through mail. BSES shall not receive any hard copy of report for their office record.

7.0 QUALITY ASSURANCE PLAN

7.1 The bidder shall invariably furnish following information along with his offer, failing which his offer shall be rejected.

TECHNICAL SPECIFICATIONS OF CHEMICAL EARTHING

7.1.1	Statement giving list of important raw materials, names of sub manufacturers for the raw materials, list of standards according to which the raw materials are tested, list of tests normally carried out on raw materials in presence of manufacturer's representative and as routine and / or acceptance during production and on finished goods, copies of test certificates.
7.1.2	Information and copies of test certificates as in mentioned above in respect of bought out accessories.
7.1.3	List of manufacturing facilities available.
7.1.4	Level of automation achieved and list of areas where manual processing exists.
7.1.5	List of areas in manufacturing process, where stage inspections are normally carried out for quality control and details of such tests and inspections.
7.1.6	List of testing equipment available with the Manufacturer for final and calibration certificate
7.1.7	Testing of Earthing and its related accessories to be specified. In the case if the manufacturer does not possess all the Routine and Acceptance testing facilities, the bid / PO shall be rejected.
7.1.8	BSES reserves the right for factory inspection to verify the quoted offer. If any of the facts are found to be misleading or incorrect the offer of that Bidder will be out rightly rejected and he may be black listed.
7.1.9	Special features provided to make it maintenance free.

7.2 The bidder shall also submit following information to the BSES along with the technical Bid.

7.2.1	List of raw materials as well as bought out accessories, and the name of manufacturers of raw materials as well as bought out accessories.
7.2.2	Type test certificates of the raw material and bought out accessories.
7.2.3	Quality assurance plan (QAP) with hold points for BSES's inspection.

7.3 The Manufacturer shall submit the routine test certificates (only soft copy through mail) of all the bought-out items, accessories etc.

NOTE: Final QAP shall be approved by BSES.



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TECHNICAL SPECIFICATIONS OF CHEMICAL EARTHING

8.0 DOCUMENTATION

Submission of drawings, calculations, catalogues, manuals, test reports shall be as mentioned below:

8.1 Drawing, Data and Manuals

The vendor shall submit-

- Cross sectional drawing
- GTP (all data to appear)
- Type test certificates
- Fault level calculation

Document Submission

Document/Drawing submission shall be as per the matrix given below:

- All documents/drawings shall be provided in soft copy only via mail or in returnable Pen drives
- Language of the documents shall be English only.
- 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 or incomplete document/ drawing submission shall be liable for rejection.
- Order of documents shall be strictly as per the check list.
- Any document not included in the below table but necessary for detailed engineering shall be deemed to be included in bidder's scope

SNo.	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	Required	Required	
4	Type test reports	Required	Required	
5	BIS certificate	Required		
6	Inspection test reports and Routine Test Certificates carried out in manufacturer's works			Required
7	Calibration test reports of instruments			Required

TECHNICAL SPECIFICATIONS OF CHEMICAL EARTHING**9.0 PACKING & FORWARDING**

9.0.1	Shipping Information	The seller shall give complete shipping information concerning the weight, size of each package
9.0.2	Transit damage	The seller shall be responsible for any transit damage due to improper packing
9.0.3	Markings on Earthing Rod	<ul style="list-style-type: none">As per mentioned in the Drawing (Annexure-B)
9.0.4	Delivery Schedule	<ul style="list-style-type: none">Delivery period Start Date : From date of LOI / LOADelivery period End Date : As agreed with manufacturerMaterial dispatch Clearance : After inspection by purchaser
9.0.5	Accessories	<ul style="list-style-type: none">Accessories shall be packed separately item wise with proper protection to prevent damage and easy handling.MarkingMaterial descriptionTypeDimensionPO number and dateSAP item codeTotal weightManufacturer's nameBuyer's nameMonth and year of manufacturingStorage type

10.0 DEVIATIONS

10.0.1 Deviations from this specification shall be listed separately by bidder clause wise (format given below) along with optional offer and has to submit the list along with bid/quotation. BSES will review



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TECHNICAL SPECIFICATIONS OF CHEMICAL EARTHING

the deviations and if BSES is agreed with the deviation, seller has to take written confirmation from BSES on deviation during tender evaluation.

10.0.2 In the absence of any separate list of deviations from the bidders with bid as well as written confirmation from BSES on deviations, it will be assumed by the Buyer that the Seller complies with the Specification fully.

10.0.3 Any deviations mentioned in any other submitted bid documents (i.e.in filled GTP, Catalog, BSES old approval, buyer's/seller's standards etc) by seller without separate deviation sheets will not consider as a deviation from this tech spec at any stage of contract.

Deviation Sheet Format-

S.no	Document Name	Clause No.	Deviation	Reason	Merits to BSES

ANNEXURE-A GUARANTEED TECHNICAL PARAMETERS

Note:

- 1) Every data shall be mentioned.
- 2) Seller may submit separate GTP for the earthing, as suitable.
- 3) GTP shall be read in line with purchaser's Project Site Specific Requirement.

TECHNICAL DATASHEET FOR EARTHING			
S.No.	Parameter	BSES requirement	Vendor data
1	Name ,Address and ph no of Manufacturer		
2	Ref IS No	IS 1239 (Part -1) 2004	
3	Type (Light, Medium, Heavy) Medium, B class	NA	
4	Size of copper bonded rod	17.2 mm / 25 mm	
5	Copper coating thickness	250 micron	
6	UL marking	Yes/No	



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TECHNICAL SPECIFICATIONS OF CHEMICAL EARTHING

TECHNICAL DATASHEET FOR EARTHING

S.No.	Parameter	BSES requirement	Vendor data
7	CPRI/ERDA Type tested		
6	Length of Pipe	3 mtr	
11	Earth enhancing material	25kg/bag	
12	Plyplastic cover	Yes/no	
13	Exothermic Joint	L,T and cross joint	
14	Exothermic accessories	Yes/no	
15	GI Nuts and bolts	Yes/no	
16	Make of steel	SAIL /ESSAR/ TATA	
17	Embossing details	Name/logo of manufacturer, PO No., ISI, Class of tube i.e. M for Medium, Color of band (PO no provided in stencil), UL marked	
18	Colour Coding	BLUE colour band at both ends	
	Details of Drawings submitted		
19	Chemical composition Test	As per IS 1239-1	
17	Test	As per IS 1239-1	

Technical Requirement

SI no	Descriptions		Bidders Data
A	Technical Requirement	1) Mesh resistance shall be less than 5 ohm	
		2) Fault current sustainability for Earthing rod shall be min 20 kA and 44 kA (1 sec) for 17.2 mm and 25 mm rod respectively.	
		3) Enhancing material shall be leaching free	
		4) All materials shall be corrosion free.	
		5) Warranty for maintaining pit resistance below 5 ohm- 10 years minimum. pit resistance shall be verified every 6 months by bidder.	

TECHNICAL SPECIFICATIONS OF CHEMICAL EARTHING

		6) Copper bonded rod and copper clad steel shall be CPRI/ERDA tested and UL marked	
B	Materials	1) Minimum dimension of copper bonded rod shall be 17.2 mm/25 mmX3 Mtr. copper coating 250 micron.UL mark is mandatory	
		2) Pit shall be filled completely by earth enhancement material. 25Kg chemical shall be packed per bag	
		3) Polyplastic pit cover shall be provided. test report to submitted for review.	
		4) Inspection joint to be provided.	
		5) Exothermic joint (L,T and Cross Joint)	
		6) Exothermic Accessories	
		7) 50x6/50x10 GI Strip	
C	Services	1) All the drawings and installation manual to be submitted to CES for approval.	
		2) All kind of activity including tools for pit installation, resistance measurement shall be in bidder scope.	
		3) Exothermic welding, welding accessories	
		4) Nuts and bolt for connection of GI strips with equipments	
		5) Each pit resistance shall be verified by BSES. record of resistance value to be maintained by bidder and same shall be submitted to CES.	
		6) Laying of 50X6/50x10 mm GI strip shall be in bidder scope- for connection of equipments	
		7) Laying of copper clad rod below 500mm depth for formation of mesh	
		8) Chemical earthing kit (copper bonded rod, chemical and polyplastic pit cover) installation	

11.0 SCOPE DEMARCATION**Supply:**

SI no	Descriptions	BSES	Vendor	Remarks
1	Chemical Earthing Kit (Copper Bonded Rod,	X	√	



BSES-TS-06-CHER-R0

TECHNICAL SPECIFICATIONS OF CHEMICAL EARTHING

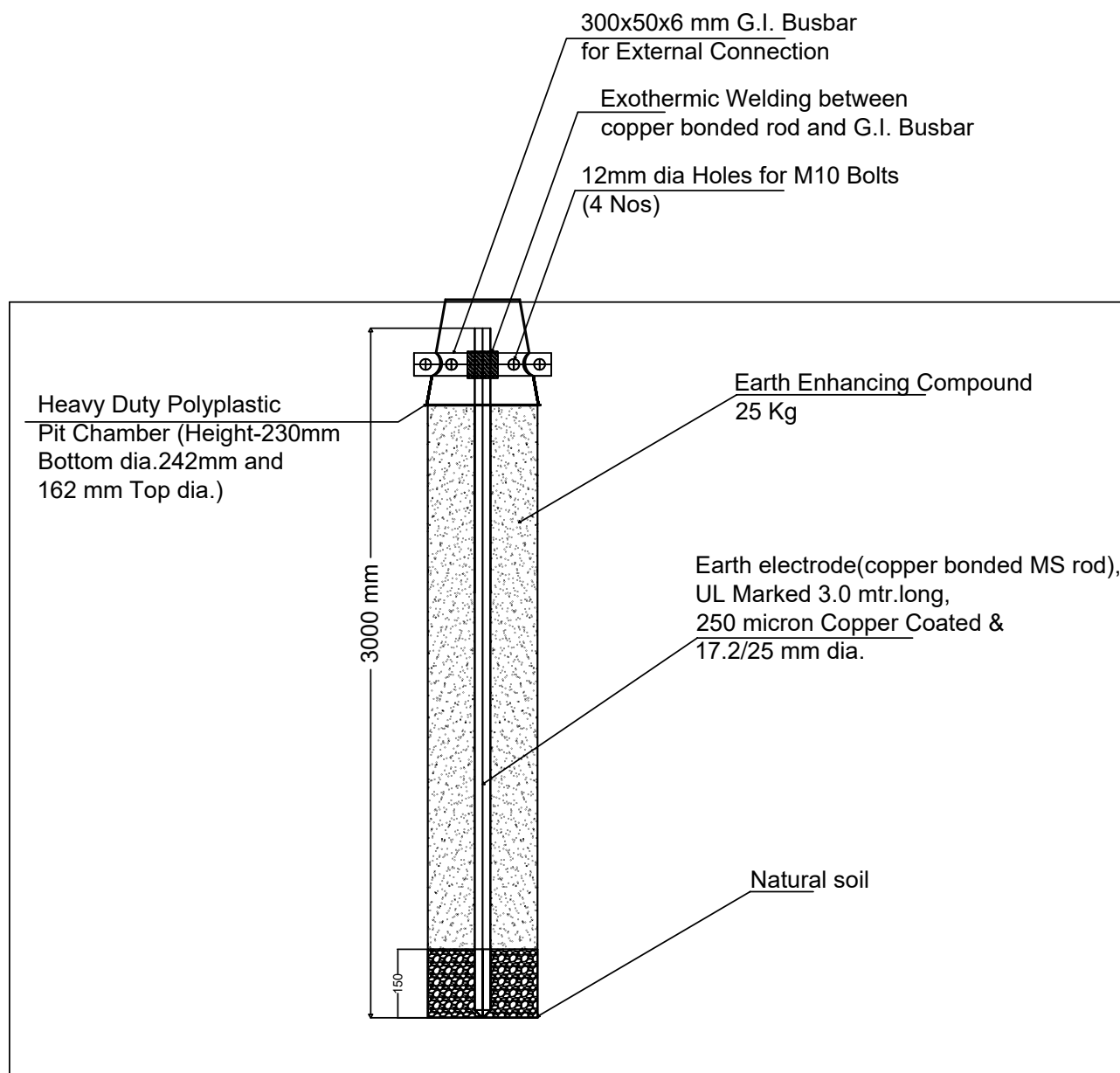
	25 kg chemical and Polyplastic Pit Cover)			
2	Copper Bonded Steel conductor for mesh formation	X	√	
3	Exothermic Joint	X	√	
4	Exothermic Joint Accessories	X	√	
5	50X6/50x10 GI Strip	√	x	
6	GI Bolt required for connecting the GI strip with equipment	X	√	

Services:

SI no	Descriptions	BSES	Vendor	Remarks
1	Transportation of all kind of materials from BSES store to site	X	√	
2	Vehicle arrange for material transport	X	√	
3	Digging of Pit	X	√	
4	Installation of pit	X	√	
5	Digging for laying of copper bonded steel at 500mm depth for mesh formation	X	√	
6	Laying of copper bonded rod	X	√	
7	Exothermic jointing	X	√	
8	Connecting of equipment to mesh by 50X6/50x10 GI strip	X	√	
9	GI Bolting	X	√	
10	Any kind of drilling, hole making, welding for the job	X	√	
11	Measurement of soil resistivity	X	√	
12	Measurement of mesh resistance after finishing of earthing work (mesh resistance must be less than 5 ohm)	X	√	
13	MOM after job finishing	X	√	
14.	All kind of instrument, equipment required for job execution and for finishing	X	√	
15	PPE for workers	X	√	
16	Returning of scrap to BSES store if any	X	√	
17	Backfilling of trench, pit etc.	X	√	
18	Filling material reservation slip (MRS) in SAP	√	x	
19	BOQ estimation for Earthing work (type, size and length of GI strip,)	√	x	
20	Dismantling of existing earthing if any	X	√	

ANNEXURE-B: GENERAL ARRANGEMENT DRAWING OF CHEMICAL EARTHING ROD

ANNEXURE - B



CHEMICAL EARTHING

Note:

1. Kit content

- a. 17.2/ 25 mm dia, 3mtr. long copper bonded rod (250 micron copper coated) with 300x50x6 G.I. Busbar T-connection (T-connection with Exothermic Welding)
- b. Earth enhancing compound.(25kg/bag).
- c. Heavy duty Poly plastic pit cover.

2. Following information shall be printed by laser / engrave method marked on Rod

- Manufacturer name
- Customer name
- Month / Year of manufacturing
- UL Mark
- P.O. No. & Date
- Dia- 17.2/25 mm, Length-3mtr., Thickness copper coated-250micron

3. Fault current carrying capacity shall be min 20kA/44kA for 1 sec

DRAWN		TITLE:-	BSES
CHECKED		CHEMICAL EARTHING	
REVIEWED			
APPD			
DATE			



Technical Specification

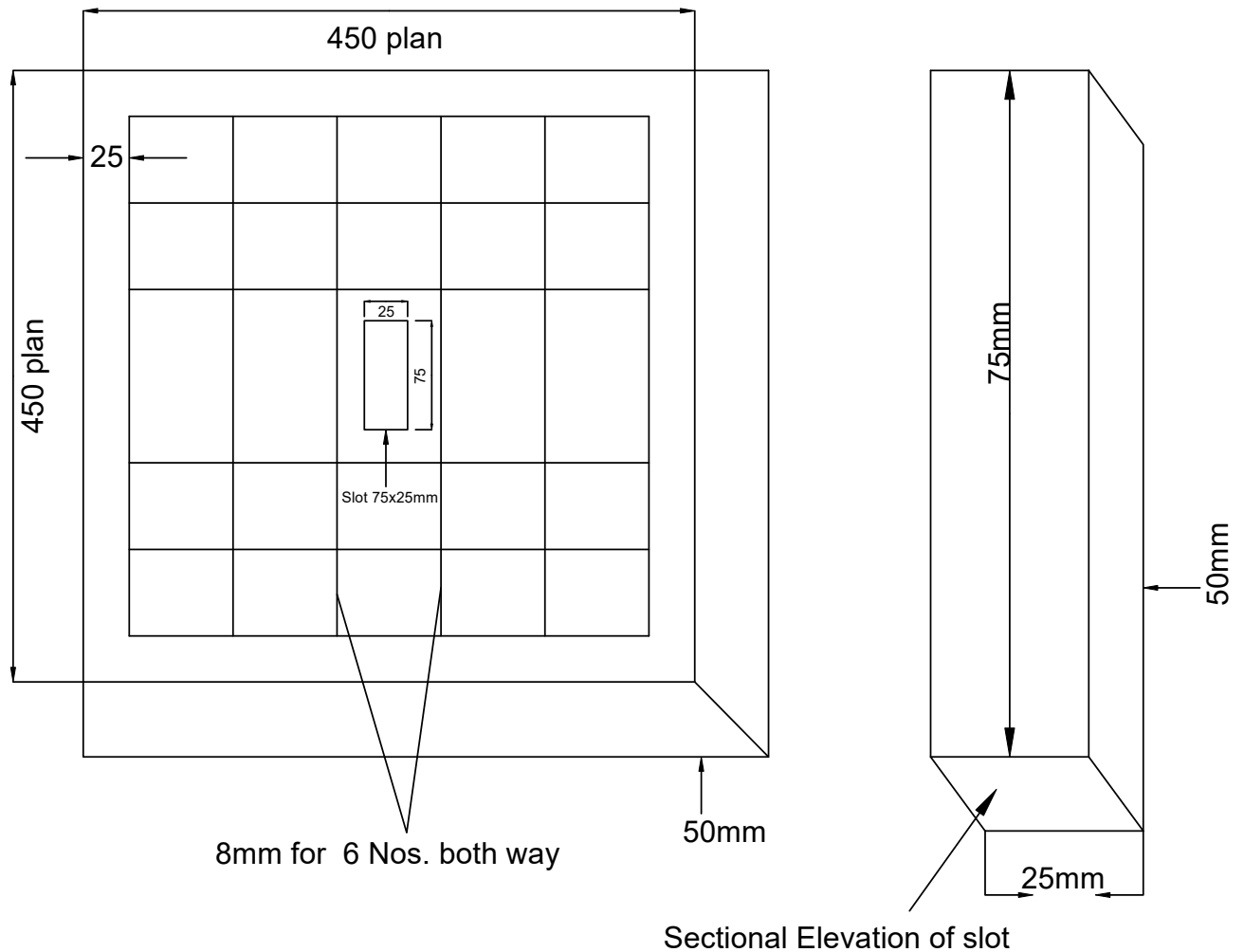
for

Drawings of Miscellaneous RCC Hardware Items

Specification no – BSES-TS-59-RCCH-R0

Rev:		0
Date:		20 Apr 2022
Pages:		5
Prepared by	Akhilesh Chaudhary	
	GautamDeka	<i>C. Deka</i> 20/4/22
Reviewed by	Srinivas Gopu	
	Amit Tomar	<i>Amit Tomar</i> 20/04/22
Approved by	Gaurav Sharma	
	Gopal Nariya	<i>Gopal Nariya</i>

RCC BASE PLATE SIZE 450X450X50mm



NOTES :-

1. Nominal Mix of concrete 1:2:4:M:20
2. Reinforcement shall be welded / Binded at Junctions.
3. Reinforcement :- 8mm dia for 6 nos. each side.
4. IS AND ITS LATEST AMMENDMENTS SHALL BE APPLICABLE.

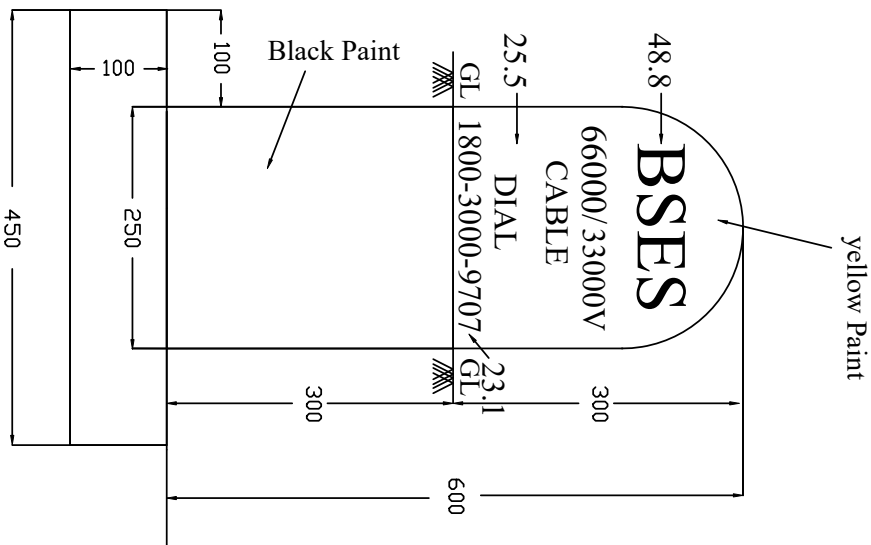
TITLE :-

**RCC BASE
PLATE**

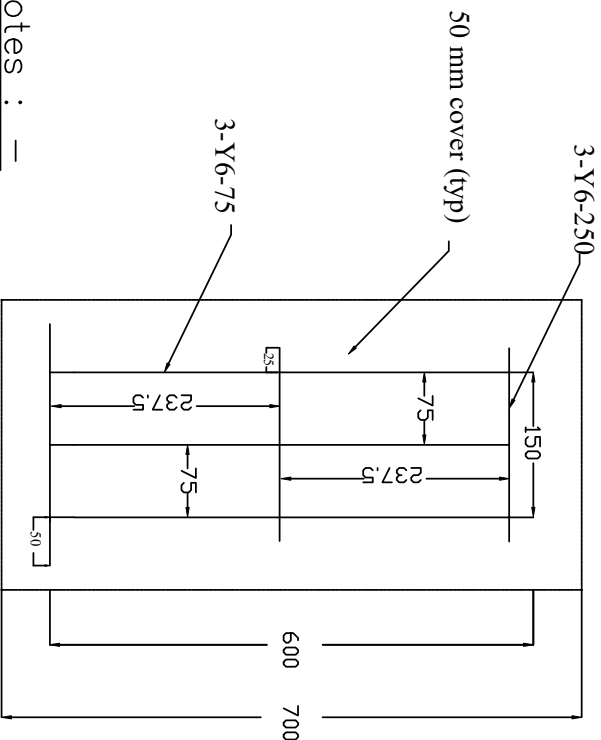
BSES

DRAWING NO.

DETAIL OF HIGH VOLTAGE CABLE ROUTE MARKER (RCC) -BSES



Reinforcement Detail



Notes : —

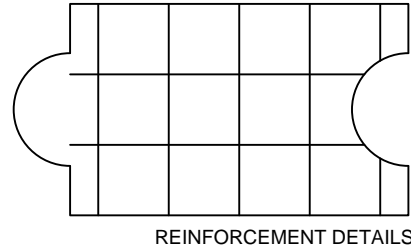
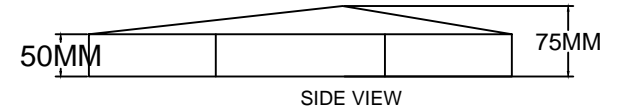
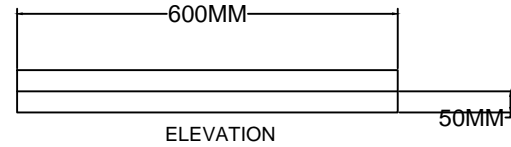
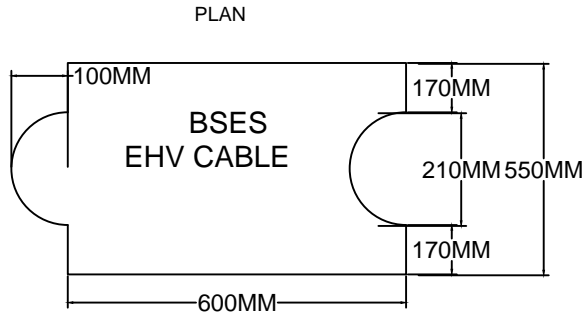
1	RCC cable route marker with 6mm Dia Rod and M25 concrete grade.
2	All the details shall be emgraved on both the sides of route maker
3	All dimentions are in mm, unless specified.
4	Thickness of RCC shall be 75mm.
5	Yellow colour shall be visible about ground level.
6	Eachcable joint marker to be placed at cable joints.
7	All kind of point on route marker shall be in the scope of manufacturer.
8	RCC Marker shall be painted with "Texture Paint" & quality shall be maintainted.

Title : —

BSES

DETAIL OF HIGH
VOLTAGE CABLE
ROUTE MARKER
(RCC)

DWG. NO.



NOTES:-

- 1.ALL DIMENSIONS ARE IN MM
- 2.CONCRETE MIX 1:2:4
- 3.MS ROD -6MM \varnothing
- 4.STEEL ROD -AS PER IS 423/1139

OWNER- BSES

TITLE-CABLE COVER (SLAB)

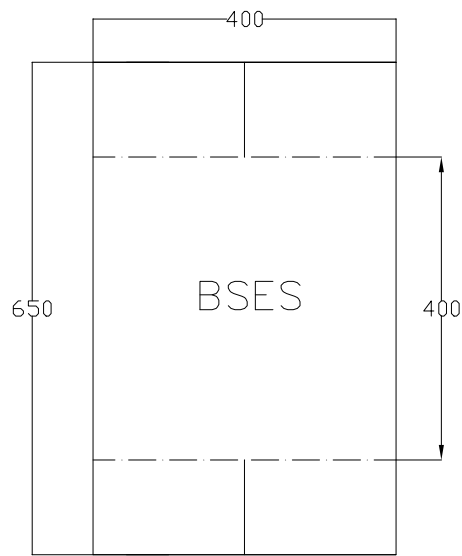
DATE-13.04.2022

DRAWN BY

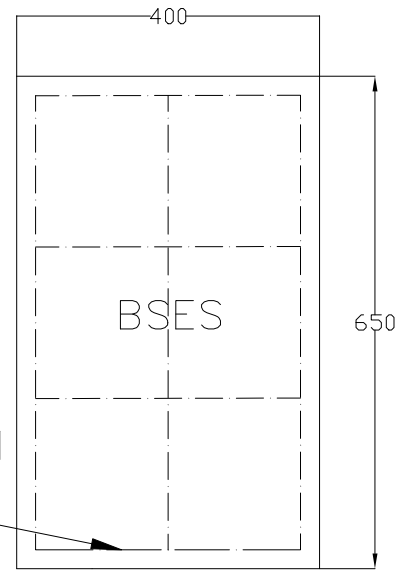
CHECKED BY

APPROVED BY

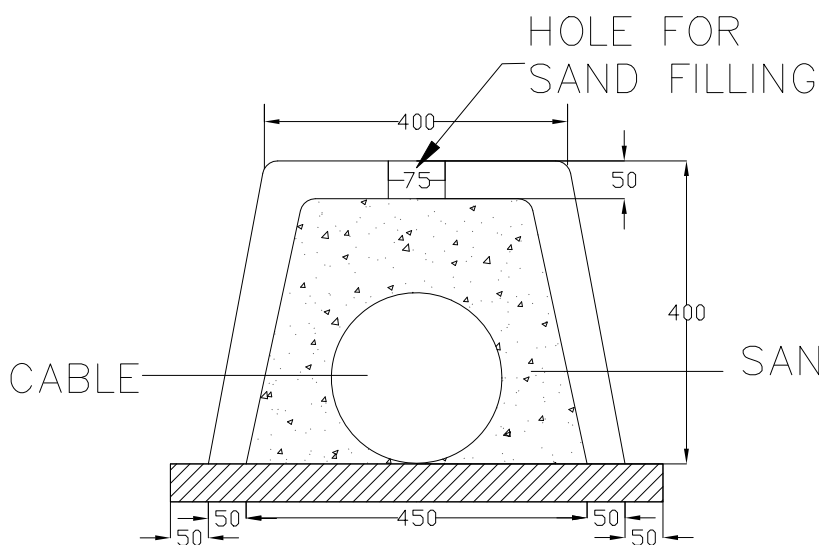
DRAWING OF COFFIN FOR JOINTS



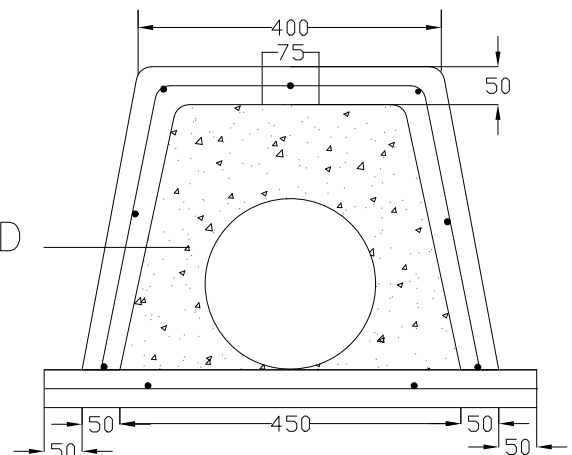
A. PLAN



B. REINFORCEMENT
DETAILS 300 MM
LENGTH RCC PLATE



D. ELEVATION



E. REINFORCEMENT
DETAILS

NOTES :-

1. ALL DIMENSIONS ARE IN MM
2. CONCRETE MIX 1:1.5:3

TITLE :-

DRAWING OF COFFIN
COVER AT CABLE
JOINTS

BSES

DRAWING NO.



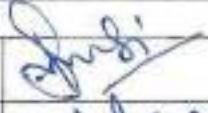
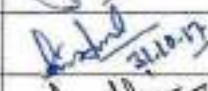

TECHNICAL SPECIFICATION

FOR

LAYING OF 66 kV / 33 kV / 11 kV / 1.1 kV GRADE
PVC / XLPE CABLES

Specification no: GN101-03-SP-06-03

BSES RAJDHANI POWER LTD

Prepared by	Pronab Bairagi		Rev : 03
Reviewed by	Amit Tomar	 31.10.17	Date : 31.10.2017
Approved by	Vijay Panpalia		Pages : 44
Registered Office: BSES Bhavan, Nehru Place, Delhi - 110019			

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General Specification**1.0 Codes & standards**

Materials, equipment and methods used in the Laying of 11/33/66KV Cable shall conform to the latest edition of following –

S. No.	Reference No.	Name of Standard
1		Indian Electricity Rules, 1956
2		Indian Electricity Act, 1910
3		Indian Electricity Supply Act, 1948
4		Electricity Laws Act, 1991
5		National Electrical Code (Indian standards Institution)
6	IS 1255	Code of practice for installation and maintenance of Power Cable upto and Including 33KV rating.
7	IS 1554	PVC Insulated Electrical Cables upto 11KV
8	IS 2274	Code of Practice for electrical wiring installation – system voltage exceeding 650V
9	IS 7098 Part II	Crosslinked Polyethylene Insulated PVC sheathed cables for working voltages from 3.3KV upto and including 33KV
10	IS 7098 Part III	Crosslinked Polyethylene Insulated PVC sheathed cables for working voltages from 66KV upto and including 220KV
11	IS 5820	Specification of precast concrete Cable cover.

2.0 Design guidelines and Parameter for cable laying-

S. No.	Parameter	Details
2.1	Selection of Cable 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: -The side of road which presents the least obstacles and the fewest roadways crossings. -The future consumers and existing cables in the route may influence the cable route. -Railway, road crossings, MCD and other government agencies may also influence in selection of cable route. -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	Site Preparation	a) Barricading: <ul style="list-style-type: none">• The identified cable route shall be barricaded continually before excavation.• Barricading shall be as drawing laid• Open Trench method shall be adopted as far as possible for trench preparation. b) Excavated Earth:

		<ul style="list-style-type: none"> The excavated earth shall be so stored at site, that it shall not cause trouble to running traffic All excavated earth shall be stored within the barricaded area. <p>c) 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. Same the way barricades protect the road users from the danger due to construction equipment and temporary structures.</p> <p>d) The structure dimensions of the barricades , material and composition, its colour scheme, BSES logo and details shall be in accordance with specification and drawing laid down in the tender documents.</p> <p>e) All the barricades shall be erected as per the design requirements of employer, numbered painted and maintained in good condition and also barricade in charge maintain a barricade register at site.</p> <p>f) All barricades shall be conspicuously seen in the dark/night time by the road users so that no vehicle hits the barricades. Conspicuity 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 should be placed at the top of each barricade.</p> <p>g) PPP to be provided by vendor to all workers and engineers.</p> <p>h) Also refer Annexure- 7: Barricading and Safety</p>
2.3	Clearance	<p>The desired minimum clearances are as follows –</p> <ul style="list-style-type: none"> - Power cable to power cable – A minimum clearance equal to diameter shall be maintained. Trench drawings shall be referred to for guidance. - Power Cable to control cables – 0.2 M - Power cable to communication cable – 0.3M - Power cable to gas/water main – 0.3 M
2.4	Depth of Cable Laying	<p>The desired minimum depth of laying from ground surface to the top of cable shall be:</p> <p>650 / 1100V grade XLPE Cables – 75 cm</p> <p>6.35 / 11KV grade XLPE Cables – 90 cm</p> <p>Low voltage and Control cable - 75 cm</p> <p>19 / 33KV grade XLPE Cables - 1.2 M</p> <p>38 / 66KV grade XLPE Cables - 1.5 M</p> <p>Cables at Road crossing - 1.0 M (min.)</p> <p>Cables at railways level crossings (measured from bottom of sleepers to the top of Pipe) - 1.0 M (min.)</p> <p>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.</p>
2.5	Width of Cable	The width and depth of Cable Trenches shall depend upon number of

	trenches	circuits and Voltage Grade. Annexure # 3 and drawings of this specification shall be followed.
2.6	Bending Radius of Cables	<p>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 –</p> <p>A) Single Core Cables (PVC & XLPE) Upto 1.1KV grade – 15 X D Above 11KV grade - 20 X D</p> <p>B) Multi Core Cables (PVC & XLPE) Upto 1.1KV grade - 12 X D Above 1.1KV grade – 15 X D</p> <p>Where 'D' is overall diameter of the cable.</p>
2.7	Maximum permissible Tensile Strength for Cables	<p>For cables pulled with Stocking PVC and XLPE SWA Armoured cables $P = 30 \times D$ PVC and XLPE AWA Armoured cables $P = 20 \times D$ Where P= pulling force in Kgrm, D= Diameter of Cable in mm</p> <p>For Cables pulled by Cable eyes Aluminium conductor – $30 \text{ N/mm}^2 = 3 \text{ Kg/sq. mm}$ Copper conductors - $50 \text{ N/mm}^2 = 5 \text{ Kg/sq. mm}$</p> <p>Permissible force is calculated by multiplying the above values by cross sectional area (CSA) of conductor of each core and then number of cores.</p>
2.8	Methods of Laying	<p>a) 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.</p> <p>b) HDPE (PN6,PE80) or RCC ducts 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 upto the edge of road, where there is no footpath, to permit smooth entry of cable without undue 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.</p> <p>c) The contractor shall lay cable by Horizontal direct drilling (HDD) in main roads and highway with heavy traffic, passage to public 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</p>

		<p>minimized so that it doesn't exceed by 12% of total route length. This is to avoid De-rating of Cables.</p> <p>d) 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.</p> <p>e) 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.</p> <p>f) 75 mm of the sand bed shall be placed at the bottom of cable trench.</p> <p>g) 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.</p> <p>h) To protect the cables against external mechanical damage, which may be caused by other agencies, the cable shall be protected by suitable cover. (for drawing of RCC cable cover refer annexure VI).</p> <p>i) The type of the covers shall be as under</p> <ul style="list-style-type: none"> - 1.1KV Cables – Single layer of brick thickness not less than 75 mm (3 inch) - 11KV Cables – sand stone of thickness not less than 75mm (3 inch). - 33KV Cables shall be protected by reinforced concrete cover of width 300 mm as per attached drawing with thickness not less than 50mm. - 66KV Cables shall be protected by reinforced concrete cover as per attached drawing with thickness not less than 50mm. <p>The RCC cable cover shall be embossed as "BSES EHV CABLE".</p> <p>j) 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.</p> <p>k) The trench shall be filled-up by loose soft soil (300mm) and Excavated soil as indicated in drawings.</p>
2.9	Cable over	On Bridges the cables are generally supported on wooden cleats and

	Bridges	clamped on steel supports at regular intervals. The cables laid on bridges shall be provided with Sun shield. Approval from appropriate authorities (PWD/railways) as applicable shall be taken by contractor.
2.10	Laying of Single Core Cables	<ul style="list-style-type: none"> a) The single core cables shall be laid in trefoil formation. Single core cables can be laid individually in HDPE pipe in case of HDD only. (Details of HDPE Pipe as per Annexure-9) 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 balance the inductance, the phase sequence in trefoil format shall be maintained by vendor (for double circuit) d) To prevent magnetic losses (eddy current and hysteresis losses), the base plate of the panels or the terminal box of the equipments, shall have aluminium plate. In case 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.
2.11	Earthing of Single Core Cables	<ul style="list-style-type: none"> a) 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. b) For feeder length more than 2 KM, mid point earthing shall be provided.
2.12	Violation of barricading guideline and safety norms	On violation of barricading guideline and safety norms, a fine of Rs.5000 /day shall be imposed. BRPL inspector/engineer in-charge shall be empowered to impose the above penalty.

3.0 General guidelines for Laying Cables

S. No.	Parameter	Details
3.1	General	<ul style="list-style-type: none"> a) 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. b) The contractor shall be responsible for all the route survey, establishment of the position of the joints as per the site exigencies 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 c) The contractor shall submit a drawing for the complete scheme

		<p>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, these drawings shall be approved by BSES, prior to commencement of work.</p> <p>d) BSES 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. All civil works, structural work, clamping and earthing shall be carried out by the contractor, so that the cables and accessories perform satisfactorily during the entire life time.</p> <p>e) 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.</p>
3.2	Handling and Storage of Cable drums (All empty drums are returnable)	<p>a) 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.</p> <p>b) 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.</p> <p>c) 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.</p> <p>d) After cable laying, empty cable drums shall be taken return back by vendor from site at their own risk and cost. Cost of empty drums shall be deducted from vendor account during final settlement.</p>
3.3	Cable Laying	<p>a) The ground over which the drum is positioned at site should be</p>

		<p>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.</p> <p>b) The cable should always be paved 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.</p> <p>c) 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.</p> <p>d) The pulling method to be used shall be approved by BSES. Cable supplier's recommended maximum pulling tension shall not be exceeded.</p> <p>e) 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 side wall friction. The contractor shall ensure that PVC/HDPE sheath of cable is free from damage due to abrasion.</p> <p>f) 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.</p> <p>g) 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.</p>
3.4	Excavation of the Trenches	<p>a) The excavation of the trenches shall be commenced, with proper co-ordination with BSES, so that all the necessary clearances for the route are already obtained from the competent authorities, well in time.</p> <p>b) 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.</p> <p>c) 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 adequately shored by wooden planks and bracing to avoid trench cave-ins which would cause injury to the persons and also damage the cables laid.</p> <p>d) 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.</p> <p>e) The trench excavation and filling in shall be so executed that all</p>

		<p>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.</p> <p>f) 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.</p> <p>g) 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.</p> <p>h) 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.</p>
3.5	Excavated material	<p>a) 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.</p> <p>b) 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.</p>
3.6	Pipes and Ducts	<p>a) 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.</p> <p>b) 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)</p> <p>c) 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).</p> <p>d) 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.</p> <p>e) 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.</p>

		<p>f) 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 and ducts shall be cleaned again immediately before the cables are drawn in.</p> <p>g) 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.</p>
3.7	Joint Bays	The contractor shall provide all help so as to enable jointers to carry out their work efficiently and expeditiously. The method of securing and supporting cable joints and cables also the bonding and earthing thereof, shall be detailed on the drawing. The details shall be approved by BSES prior to commencement of work. The joint position should be staggered.
3.8	Back filling of trenches	<p>a) Filling in of trenches shall not be commenced until BSES has inspected and approved the cables and accessories at site. The inspection should be got done on daily basis so that the trenches do not remain open unnecessarily, to avoid inconvenience to public.</p> <p>b) The trench shall be backfilled after putting all protections for cables.</p> <p>c) Soft soil shall be backfilled for 300 mm above the cable protection cover.</p> <p>d) Caution Tape shall be laid all along the cable route above the soft soil filling.</p> <p>e) Complete backfilling shall be done above the caution tape.</p>
3.9	temporary Reinstatement	<p>a) 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.</p> <p>b) 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.</p> <p>c) 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.</p>
3.10	Permanent Reinstatement of Public Road,	<p>a) 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.</p> <p>b) 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.</p>

3.11	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.
3.12	Cable Route Markers	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.
3.13	Cable supports / Clamps	<ul style="list-style-type: none"> a) 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 b) Every cable shall be supported at a point not more than 500 mm from its termination.
3.14	Installation of Cables in tunnels / basement / below the panels etc	<ul style="list-style-type: none"> a) 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. b) 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. c) 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. d) 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.

3.15	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 if required to be installed shall be provided as free issue item to the contractor, however the erection and steel structure required shall be in scope of the contractor.
3.16	Sun Shades	All cables shall be protected from direct solar radiation by ventilated sun shields as approved by BSES.
3.17	Route Plan	<ul style="list-style-type: none"> a) BSES intends to show all the cable routes, location of joints and other underground obstructions on a GPS map. b) During the progress of the contract works the contractor shall record on a set of route plans and cross section drawings of an approved 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. The final bill shall not be processed by BSES unless this activity has been completed to the entire satisfaction of BSES
3.18	Site Facilities to be maintained by the Contractor	<ul style="list-style-type: none"> a) The contractor shall arrange for all the tools and tackles required for cable laying as per this specification. BSES shall arrange for all the material and manpower required for jointing and end termination. b) Illumination and Power supply shall be arranged by the contractor so that the work can be carried out round the clock. c) 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 d) The contractor shall make arrangement to provide suitable scaffolding arrangement to carry out the termination work e) 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 f) Also refer Annexure-7: Barricading and Safety.
3.19	Type of Roads and guidelines for road restoration	<p>The typical section of type of Roads (based on width) under PWD and MCD are :-</p> <ul style="list-style-type: none"> - 20 Feet Wide road - 30 Feet wide road - 40 to 60 Feet Road - Other (which include Kota stone, Agra stone, Cement concrete, interlocking paving tiles, brick road, chequered tiles

		<p>and asphalted road)</p> <p>The drawing are shown in annexure IV</p> <p>The guidelines for road restoration for various type of roads and surfaces are indicated in annexure V as :-</p> <ul style="list-style-type: none"> - Bituminous road Type I (category I & II) - Bituminous road Type II (category III) - Cement concrete road - Kota/Rajasthan stone Road - Brick Road - Interlocking paving tiles. - Agra stone road - Chequered tiles road - Asphalted road
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4.0 Testing

S. No.	Parameter	Details
4.1	Tests to be carried out during and after completion of Cable Laying	<p>Testing of cable before jointing –</p> <ul style="list-style-type: none"> - Cable shall be tested for Insulation Resistance prior to laying by opening the end and resealing end properly. <p>Testing on complete Cable Installation –</p> <ol style="list-style-type: none"> 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) DC High voltage. For old cables test voltage shall be 1.5 times rated voltage or less depending on age of cable.(refer annexure # 2 for values) d) Charging of Cable at No-Load at Nominal working voltage for 24 Hours. e) After laying and before termination of cable a sheath test shall be conducted for 66KV Single core Cable as under :- <p>At both ends the cable shall be raised from ground. From the end graphite coat applied 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 jacket shall be measured between the aluminium wire armour and the spike with a 500/1000V insulation tester. Measured resistance shall not be less than 2.5M OHM per 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.</p>
4.2	Statutory	<ol style="list-style-type: none"> a) Road cutting permission

	clearance	Road cutting permission shall be taken from competent authority by vendor. How ever official fees shall be paid by BRPL. b) Electrical inspector clearance Electrical Inspector clearance shall be in vendor scope. How ever official fees shall be paid by BRPL.
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5.0 Progress Reporting:

S. No.	Parameter	Details
5.1	Detailed Progress report	Progress report to be submitted by Contractor to BSES once in a Week containing i) Excavation status ii) Cable laying status iii) Status of preparedness for Jointing iv) Reason for any delay in total programme v) Details of damage to cable during laying. vi) Progress on final completion / Constraints / Forward path

6.0 Drawing, Data & Manuals:

S. No.	Parameter	Details
6.1	To be submitted After Completion of the Job	As the works is completed the following reports in quadruplicate shall be submitted to BSES for record purpose and shall be incorporated in the 'As constructed Records'. a) Feeder details (sending end, receiving end, SAP number of project etc) - Type of cables, cross section area, rated voltage. Details of construction, cable number & drum number. - Year and month of laying. - Actual total route length, cable length, length between joint to joints or end. - Location of cables and joints in relation to certain fixed reference points, for example buildings, hydrant, boundary stones etc. - Jointing reports detailing the date, weather conditions, jointers and supervising Engineers names, details of type of cable and type of joint or termination, location and joint bay number, ambient temperature. - Results of original electrical measurements and testing on cable installation. - Full written reports will be required of any damage occurring to cable or equipment together with remedial action proposed which will be subject to the approval of BSES.
6.2	Drawing and document sizes	Standard size paper A0, A1, A2, A3, A4

7.0.0 Deviations

Deviations from this Specification shall be stated in writing by the contractor. Written approval shall be obtained from BSES by the contractor. In absence of such a statement, it will be assumed by BSES that the Contractor complies fully with this specification during execution of the job.

Deviation mentioned in any other submitted tender docs like in GTP, QAP, Old PO, old WO, BRPL Standard, vendor standards etc. shall not be considered as a deviation at any stage of contract.

The format for approval of deviation attached in annexure # 1

Annexure # 1 – DEVIATION REPORT FORMAT

S. NO.	Clause No. of Specification	Details about deviation	Reason for deviation	Approved by (Sign & Name)

Annexure # 2 – DC HIGH VOLTAGE TEST

Rated Voltage of cable in KV	Test Voltage Between		Duration in Min.
	Any conductor and metallic sheath / Screen / armour	Conductor to conductor (for unscreened Cables)	
0.65 / 1.1	3	3	15 Min
6.35 / 11	18	30	
19 / 33	60	----	
38 / 66	90	----	

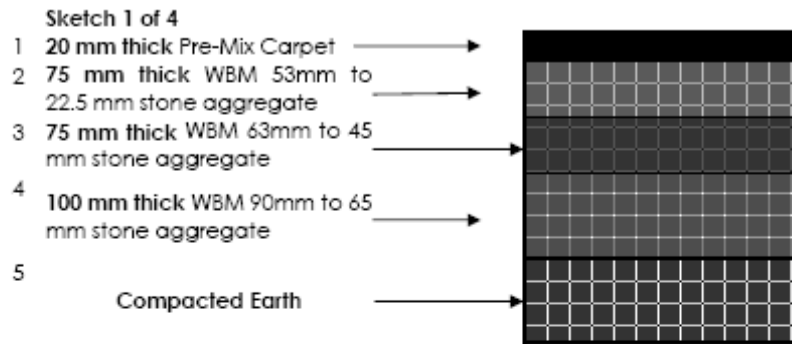
Reference value for DC High voltage Test.

Annexure # 3 – CABLE TRENCH DETAILS

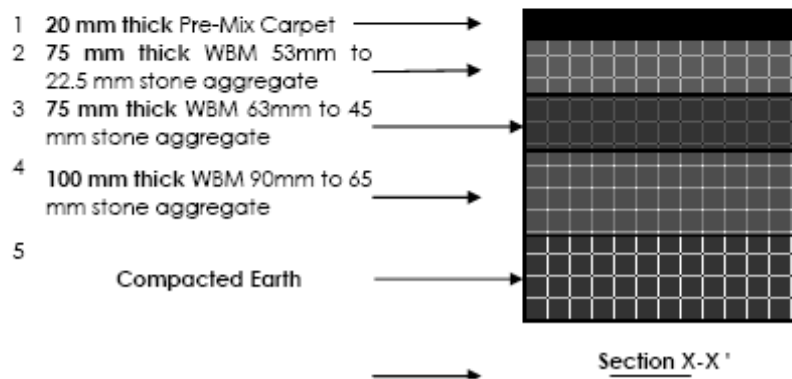
S. No.	Cable Size	Trench		Cable Trench drawing reference
		Width (mm)	Depth (mm)	
1	1.1 kV LT Cables			
a	3.5Cx150 mm ² - Single Circuit	400	875	A – 1 (Drg. # 9)
b	3.5Cx150 mm ² - Double Circuit	400	875	A – 1 (Drg. # 9)
c	3.5Cx150 mm ² - Triple Circuit	400	875	A – 1 (Drg. # 9)
d	3.5Cx300 mm ² - Single Circuit	400	875	A – 1 (Drg. # 8)
e	3.5Cx300 mm ² - Double Circuit	400	875	A – 1 (Drg. # 8)
f	3.5Cx300 mm ² - Triple Circuit	400	875	A – 1 (Drg. # 8)
2	11 KV Cables			
a	3Cx150 / 300 mm ² - Single Circuit	400	1055	A – 2 (Drg. # 6)
b	3Cx150 / 300 mm ² -Double Circuit	650	1055	B – 1 (Drg. # 7)
3	33 kV Cables			
a	3Cx400 mm ² - Single Circuit	400	1235	A – 3 (Drg. # 3)
b	3Cx400 mm ² - Double Circuit	650	1235	B – 2 (Drg. # 4)
c	3Cx400 mm ² - Quadruple Circuit	650	1235	B – 2 (Drg. # 5A)
d	3Cx400 mm ² - Quadruple Circuit	650	1545	B – 3 (Drg. # 5B)
e	3Cx400 mm ² - Quadruple Circuit	1200	1235	C – 1 (Drg. # 5C)
4	66 kV Cables			
a	1Cx630/1000 mm ² - Single Circuit	650	1445	B – 4 (Drg. # 1)
b	1Cx630/1000 mm ² - Double circuit	1200	1445	C – 2 (Drg. # 2)
c	3Cx300 mm ² - Double circuit	1200	1445	C – 2 (Drg. # 2A)

Annexure # 4 – Standard Road Profile

STANDARD ROAD PROFILE
20' - 00" FEET WIDE ROAD (Road type 1)

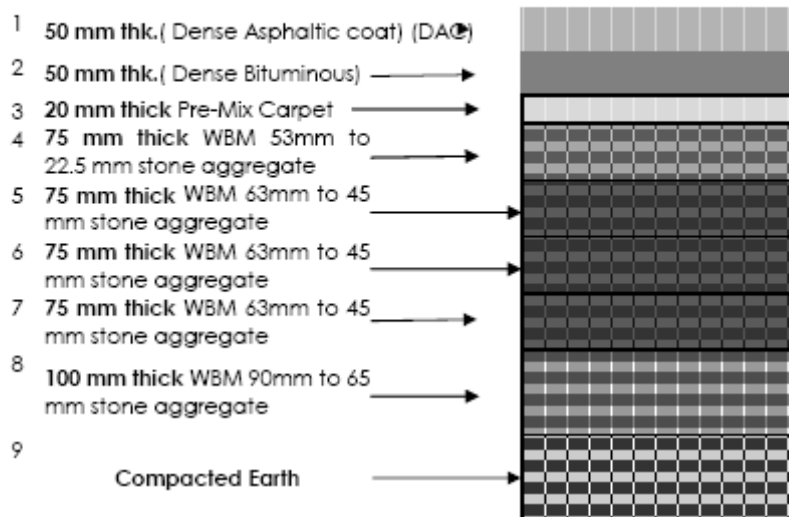


Sketch 2 of 4 30' - 00" FEET WIDE ROAD (ROAD TYPE II)



Sketch 3 of 4

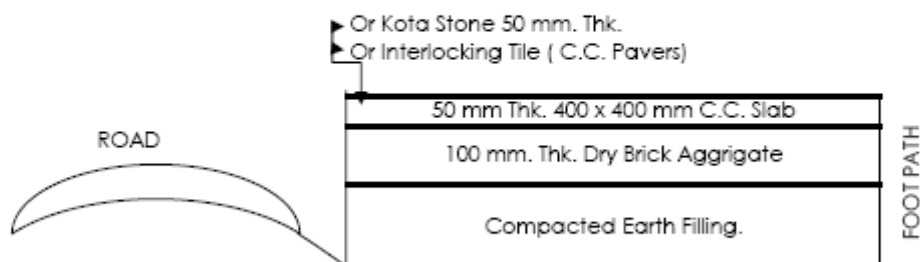
40'-00" TO 60'-00" FEET WIDE ROAD



Section A-A'

Sketch 4 of 4

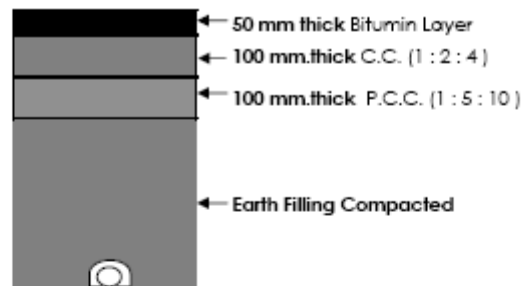
General drawing for cases other than roads.



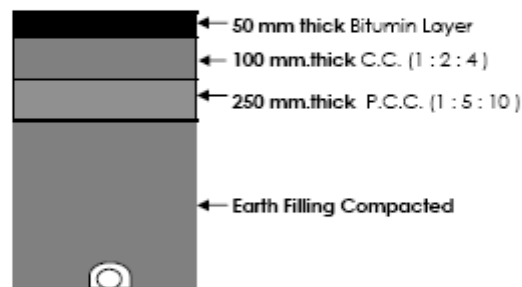
Details of Foot Path Along roads under PWD & MCD.

Annexure # 5 – Road Restoration Sectional Drawing

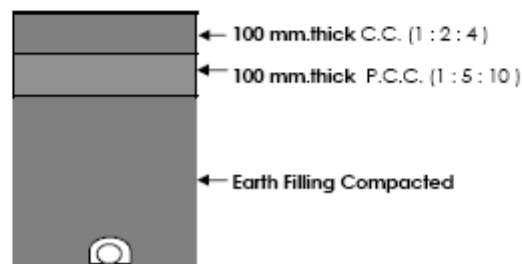
ROAD RESTORATION SECTIONAL DRAWINGS



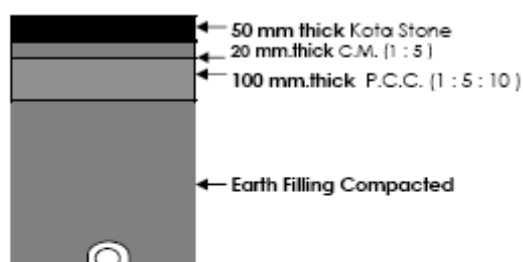
Bituminous Road Type - I (Category 1 & 2) Road width 20 to 30 feet and 30 to 40 feet.



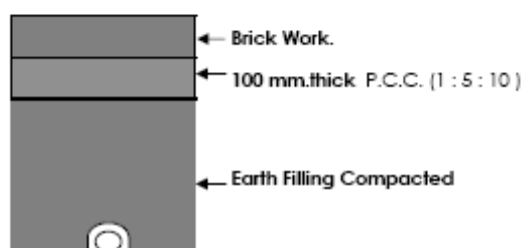
Bituminous Road Type - II (Category 3)



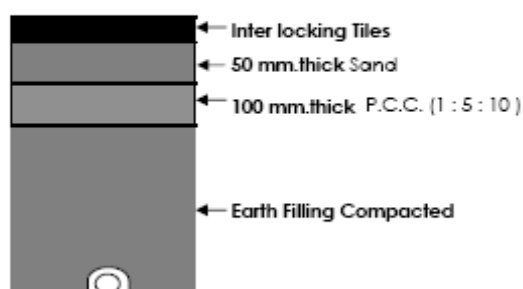
Cement Concrete Road



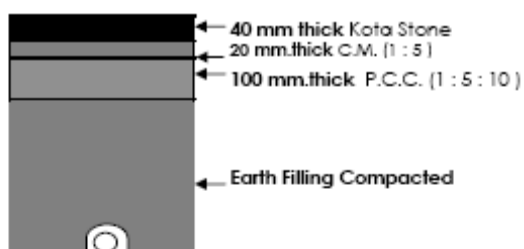
Kota / Rajasthan stone Road



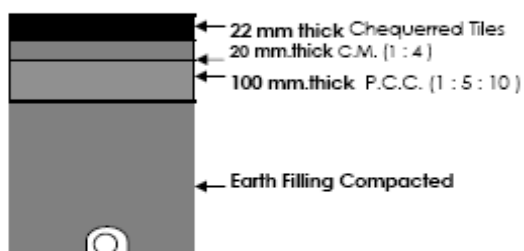
Brick Road



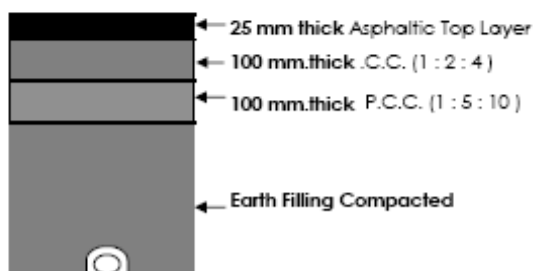
Interlocking Paving Tiles



Agra stone Road .



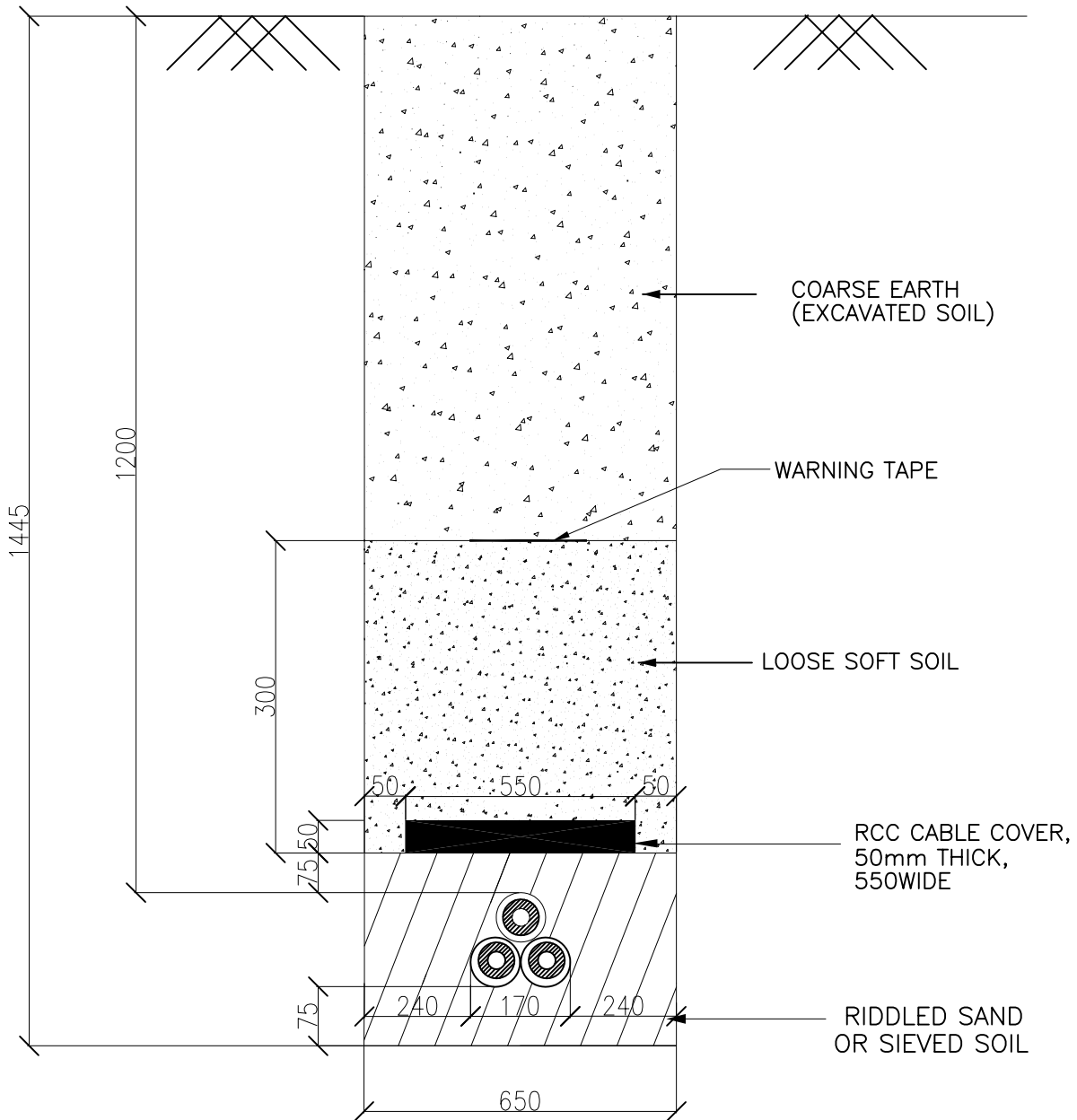
Chequerred Tiles .



Asphaltic Road .

Annexure # 6 – DRAWINGS (CABLE TRENCH AND RCC CABLE COVER)

DRAWING # 1



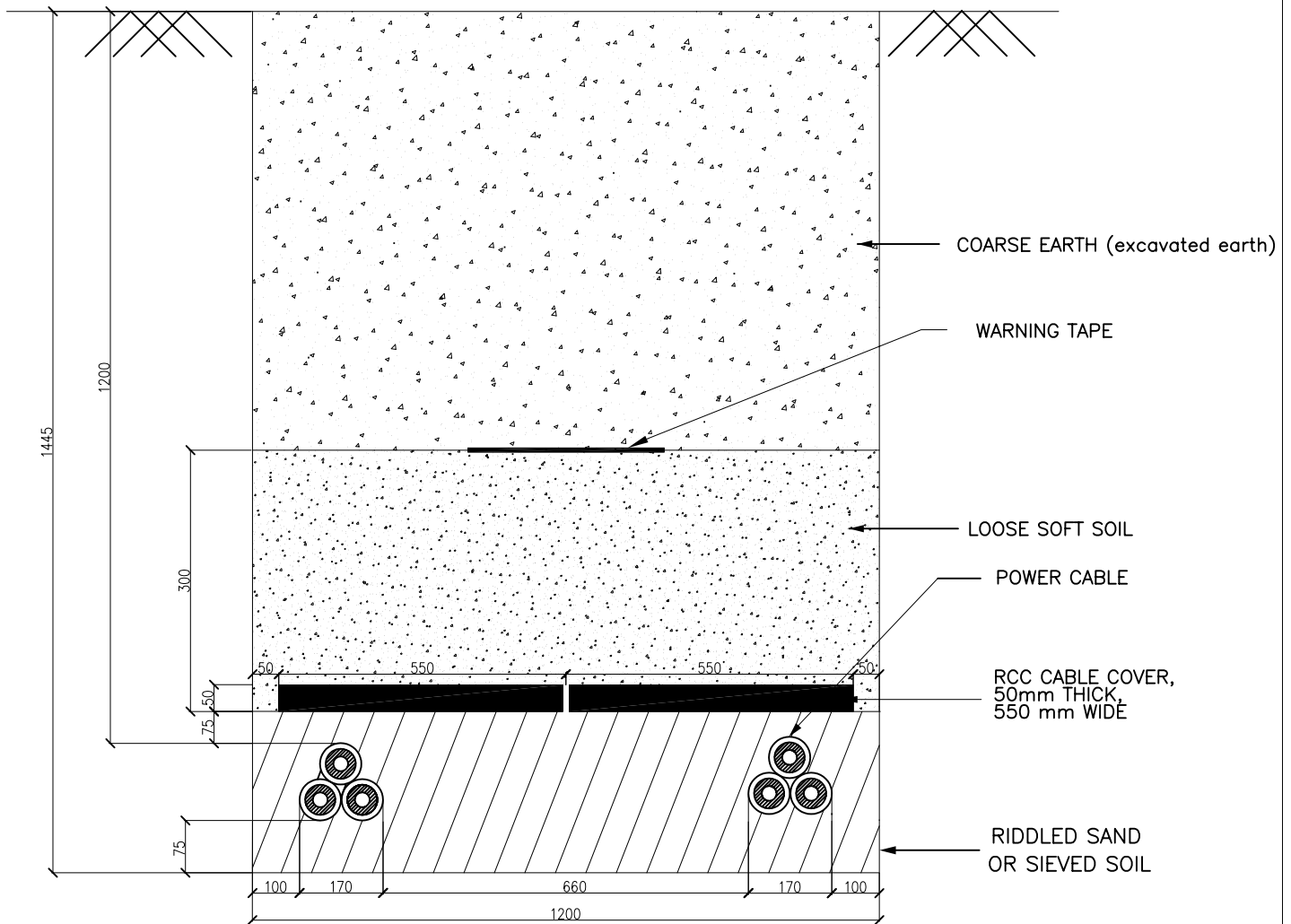
TYPICAL DETAILS FOR 66KV BURIED CABLE FOR SINGLE CIRCUIT
TYPE – B 4

DRAWN	DS	TITLE:—
CHECKED	SGD	TRENCH DRAWING FOR
APPD.	D.GUHA	1C X 630 Sq. mm
DATE		66KV SINGLE CIRCUIT
SCALE		XLPE CABLE

BSES

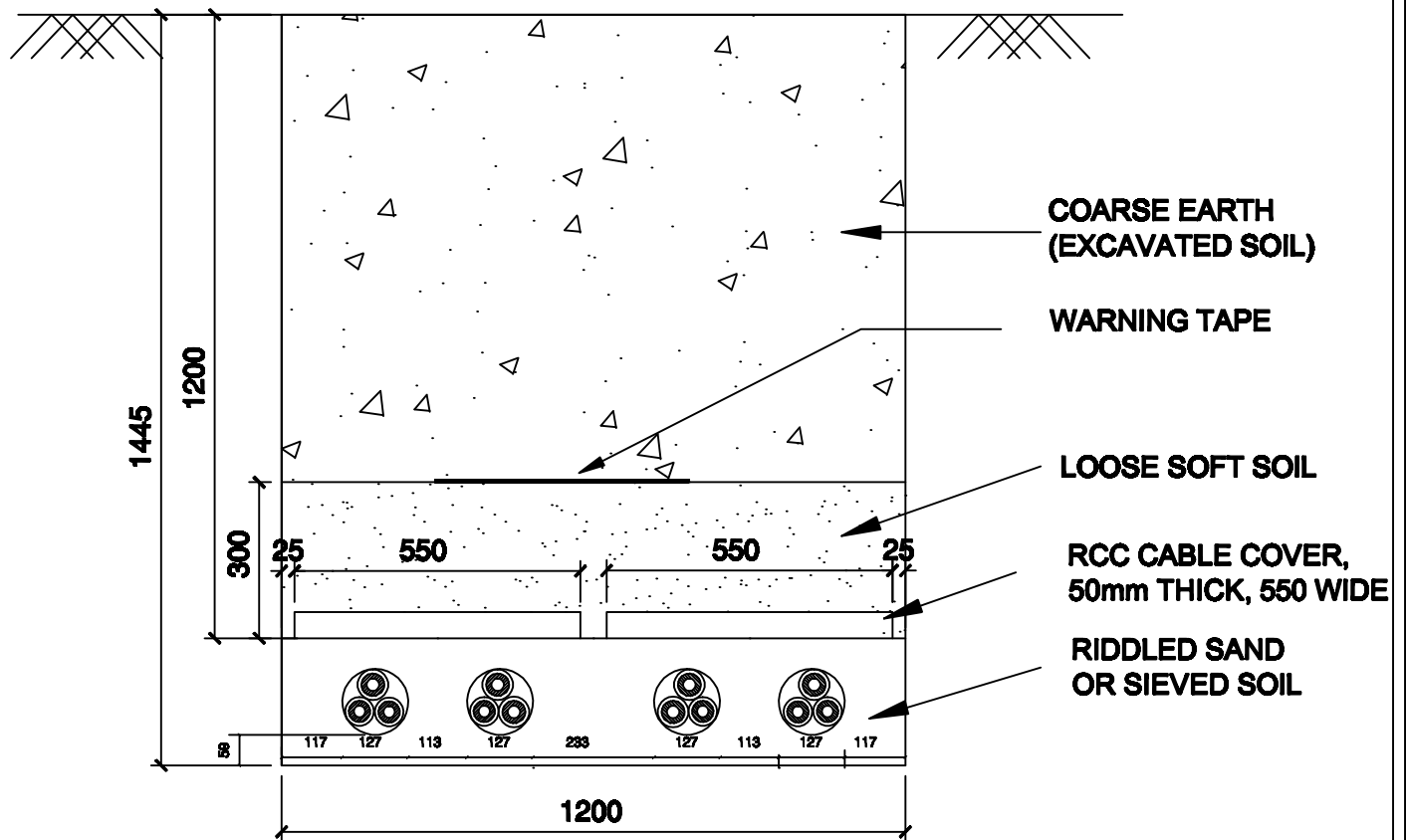
REV.
00

DRAWING # 2




DRAWN	DS	TITLE:—	<h1 style="margin: 0;">BSES</h1>
CHECKED	SGD	TRENCH DRAWING FOR	
APPD.	D.GUHA	1C X 630 Sq. mm	
DATE		66KV DOUBLE CIRCUIT	
SCALE		XLPE CABLE	
			REV. 00

DRAWING # 2 A

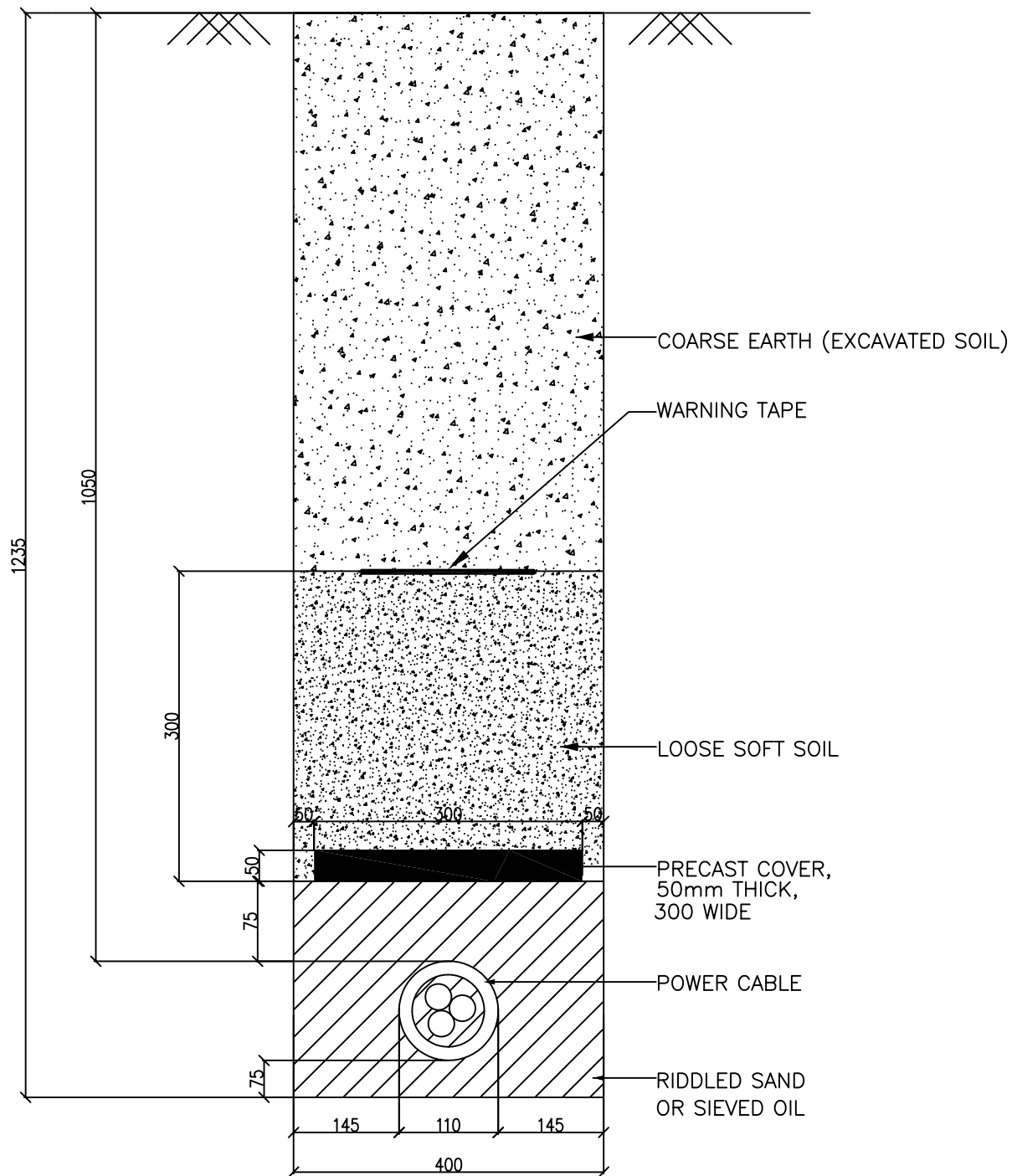


**TYPICAL TRENCH SECTION DETAILS FOR 66KV SINGLE
CORE 300 Sq. mm. BURIED CABLE FOR DOUBLE CIRCUIT**

TYPE - C 2

DRAWN	SAURABH	TITLE:--		BSES Rajdhani Power Limited
CHECKED	A.S	TYPICAL TRENCH SECTION DETAILS FOR 66KV SINGLE CORE 200 mm BURIED CABLE FOR DOUBLE CIRCUIT		
APPD.	K.S			
DATE	09.01.15			
SCALE				
				REV. 00

DRAWING # 3



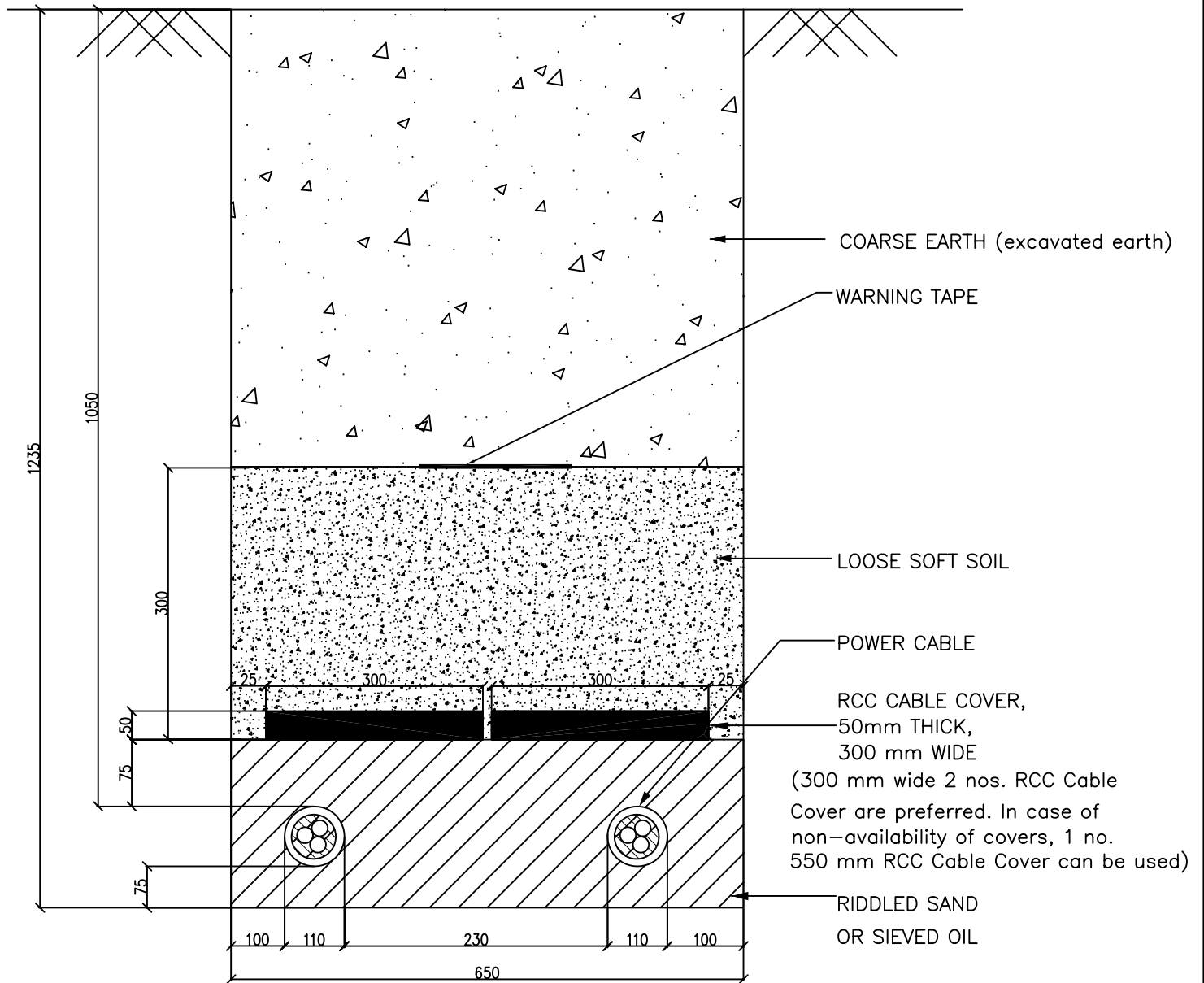
TYPICAL DETAILS FOR 33KV BURIED CABLE FOR SINGLE CIRCUIT
TYPE - A 3

DRAWN	DS	TITLE:- TRENCH DRAWING FOR 33KV 3CX 400 mm sq. SINGLE CIRCUIT XLPE CABLE
CHECKED	SGD	
APPD.	D.GUHA	
DATE		
SCALE		

BSES

REV.
00

DRAWING # 4



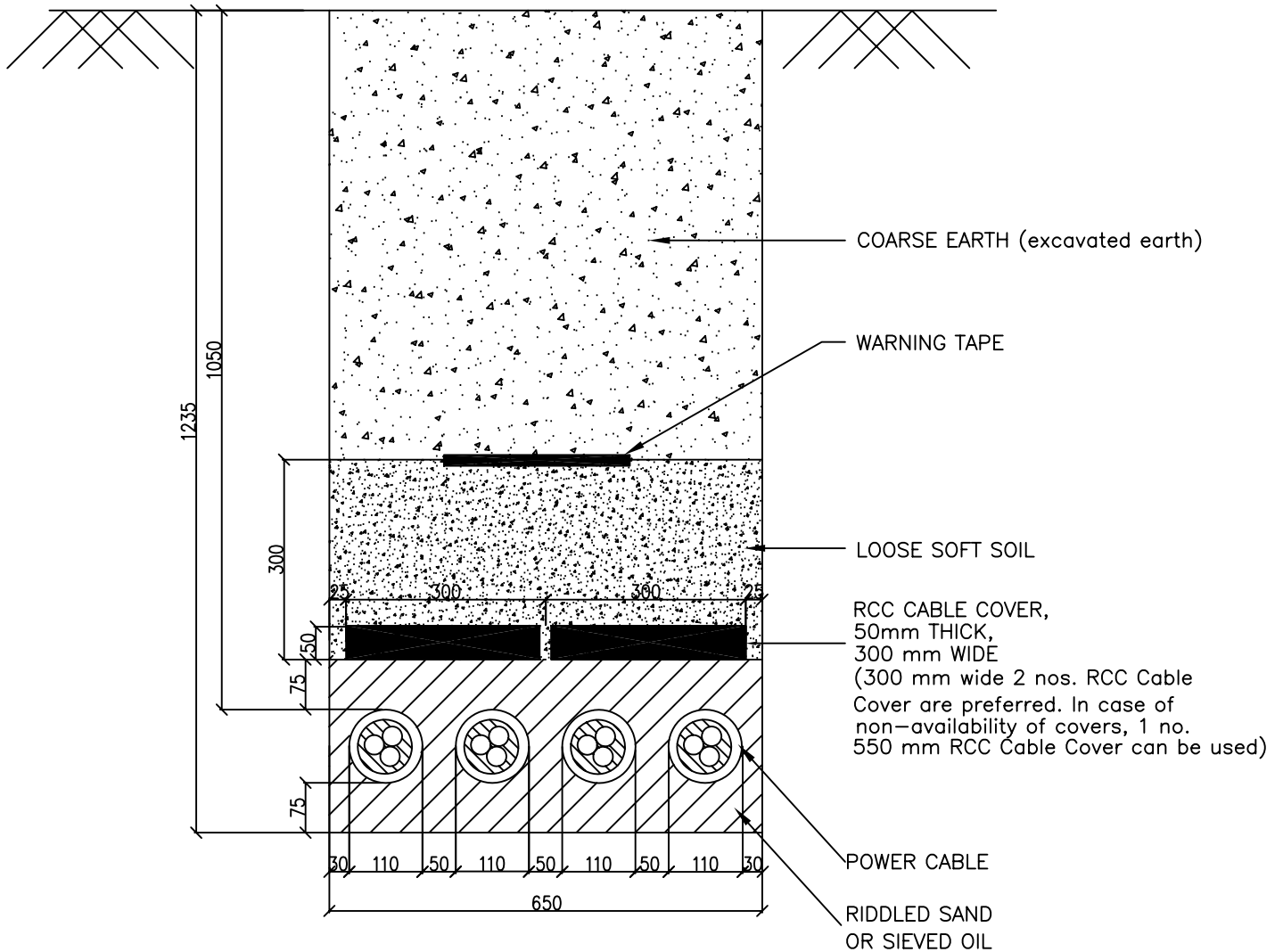
TYPICAL DETAILS FOR 33KV BURIED CABLE FOR TWO CIRCUIT
TYPE – B-2

DRAWN	DS	TITLE:--
CHECKED	SGD	TRENCH DRAWING FOR
APPD.	D.GUHA	3C X 400MM2, 33KV
DATE		DOUBLE CIRCUIT
SCALE		XLPE CABLE

BSES

REV.
00

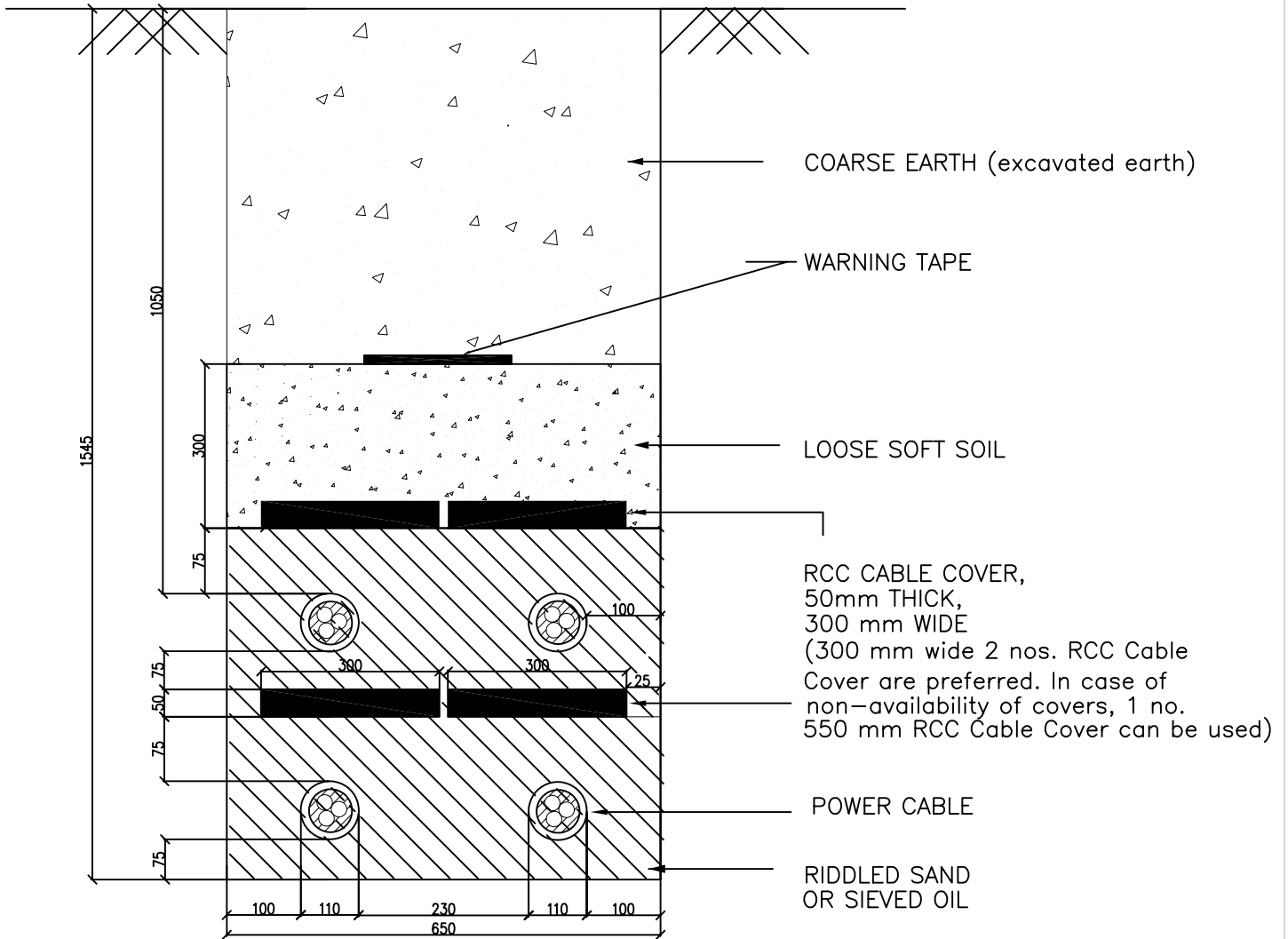
DRAWING # 5 A



TYPICAL DETAILS FOR 33KV BURIED CABLE FOR FOUR CIRCUIT
TYPE – B 2

DRAWN	DS	TITLE:–	BSES	REV. 00
CHECKED	SGD	TRENCH DRAWING FOR		
APPD.	D.GUHA	3C X 400MM ² , 33KV		
DATE		FOUR CIRCUIT		
SCALE		XLPE CABLE		

DRAWING # 5 B



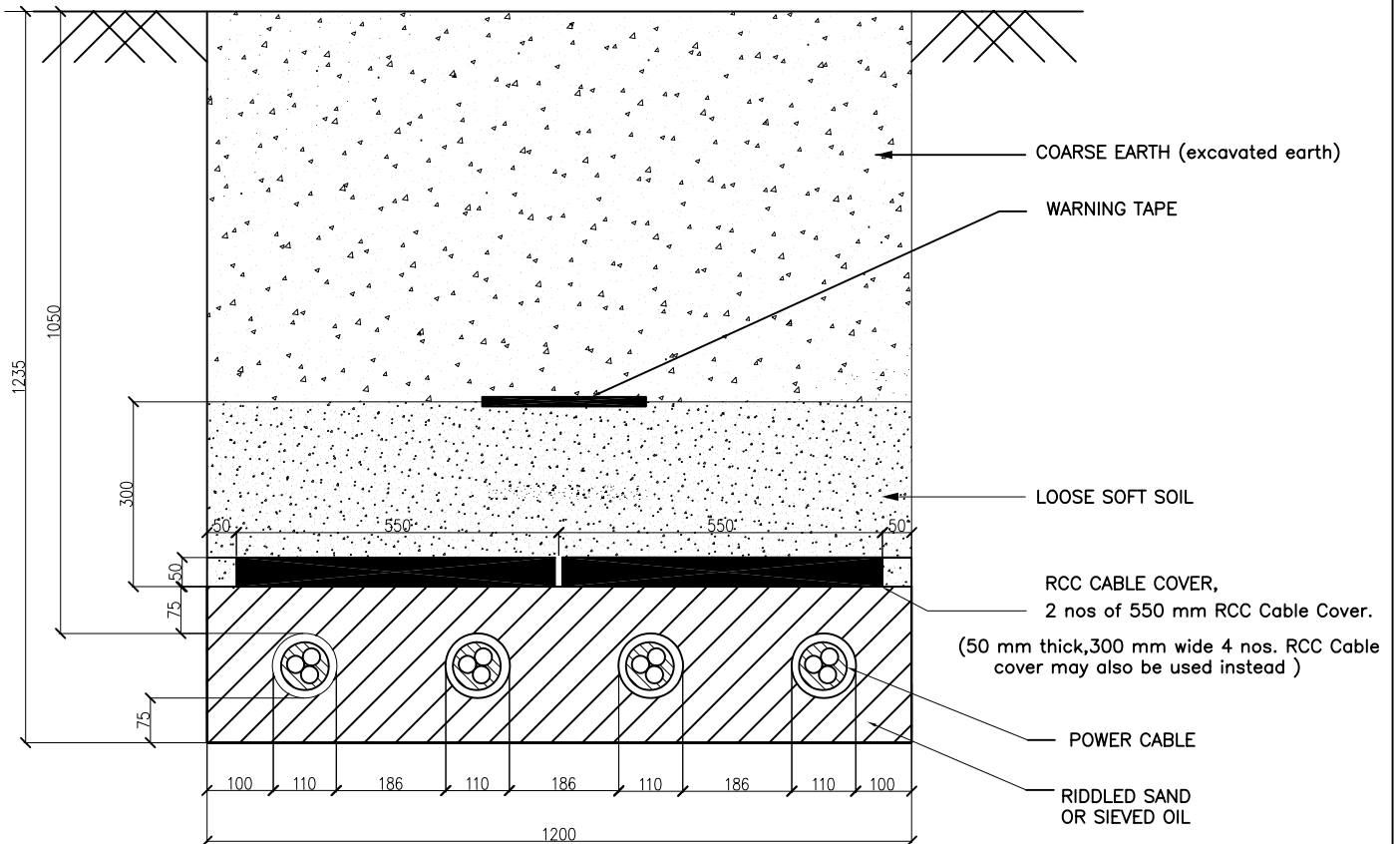
TYPICAL DETAILS FOR 33KV BURRIED CABLE FOR FOUR CIRCUIT
TYPE – B 3

DRAWN	DS	TITLE:–
CHECKED	SGD	TRENCH DRAWING FOR
APPD.	D.GUHA	3C X 400MM2, 33KV
DATE		FOUR CIRCUIT
SCALE		XLPE CABLE

BSES

REV.
00

DRAWING # 5 C



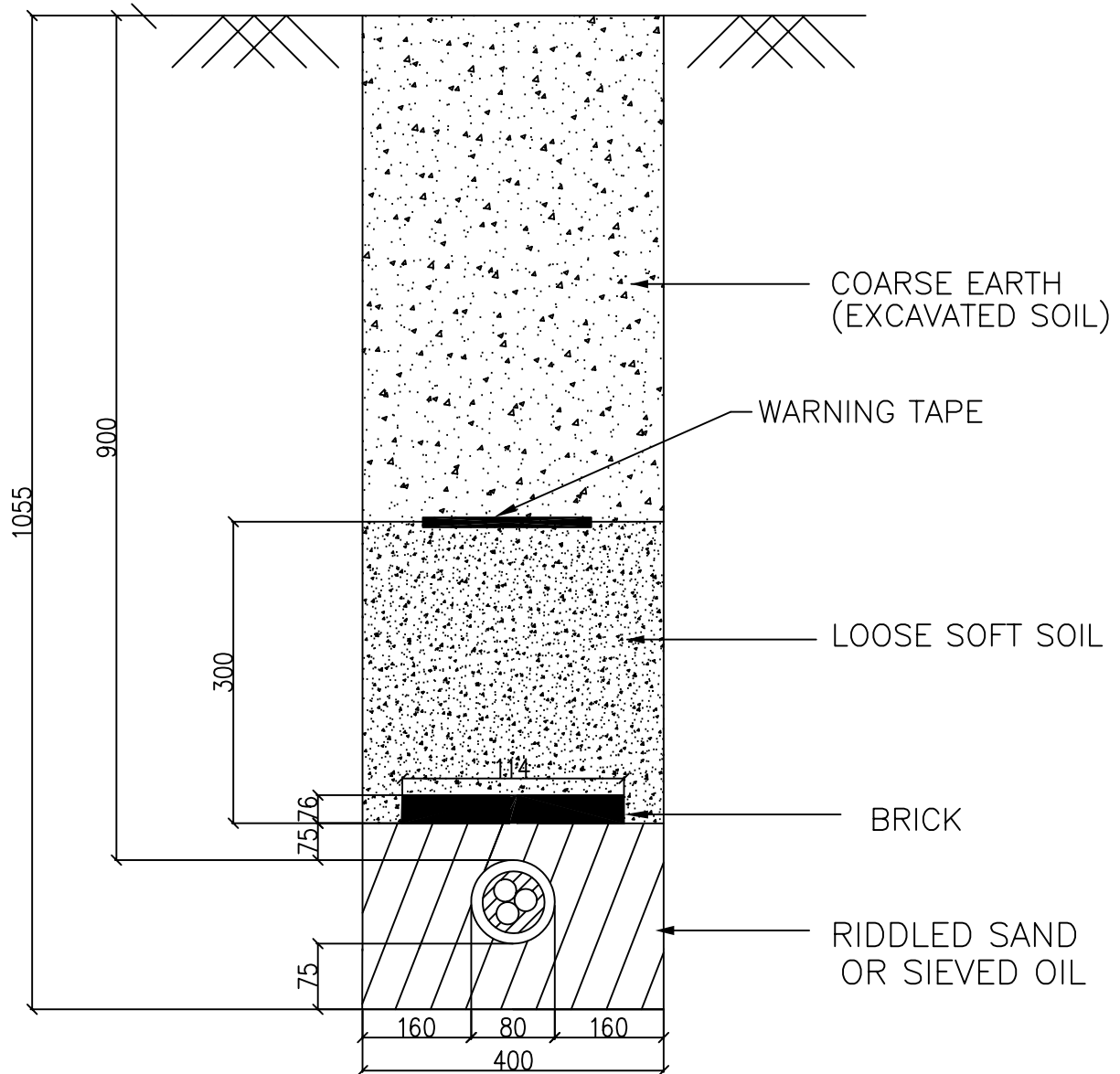
TYPICAL DETAILS FOR 33KV BURIED CABLE FOR FOUR CIRCUIT
TYPE – C 1

DRAWN	DS	TITLE:–
CHECKED	SGD	TRENCH DRAWING FOR
APPD.	D.GUHA	3C X 400MM2, 33KV
DATE		FOUR CIRCUIT
SCALE		XLPE CABLE

BSES

REV.
00

DRAWING # 6



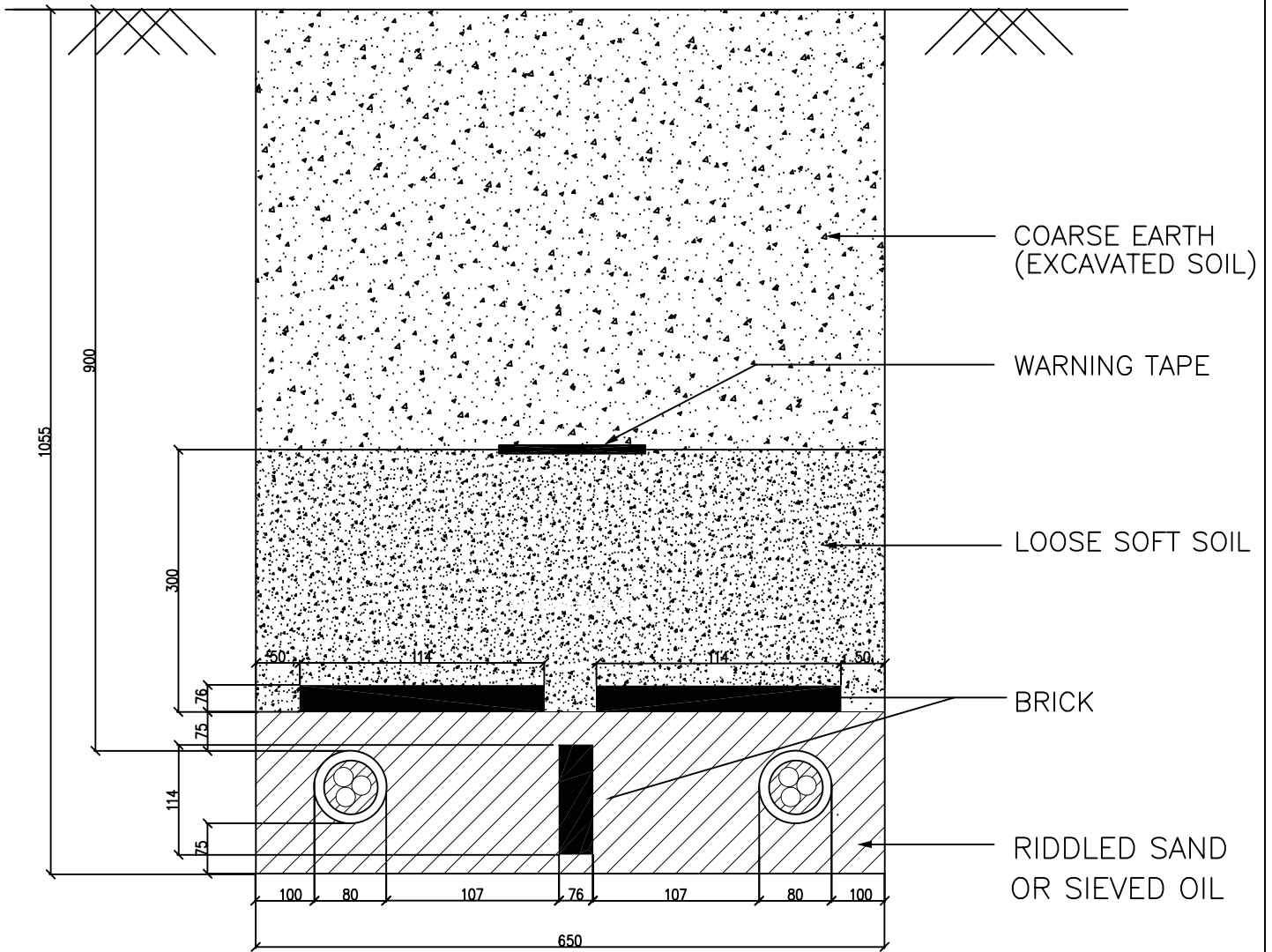
TYPICAL DETAILS FOR 11KV BURRIED CABLE FOR SINGLE CIRCUIT
TYPE – A 2

DRAWN	DS	TITLE:-
CHECKED	SGD	TRENCH DRAWING FOR
APPD.	D.GUHA	3C X 300 Sq. mm
DATE		11KV SINGLE CIRCUIT
SCALE		XLPE CABLE

BSES

REV.
00

DRAWING # 7



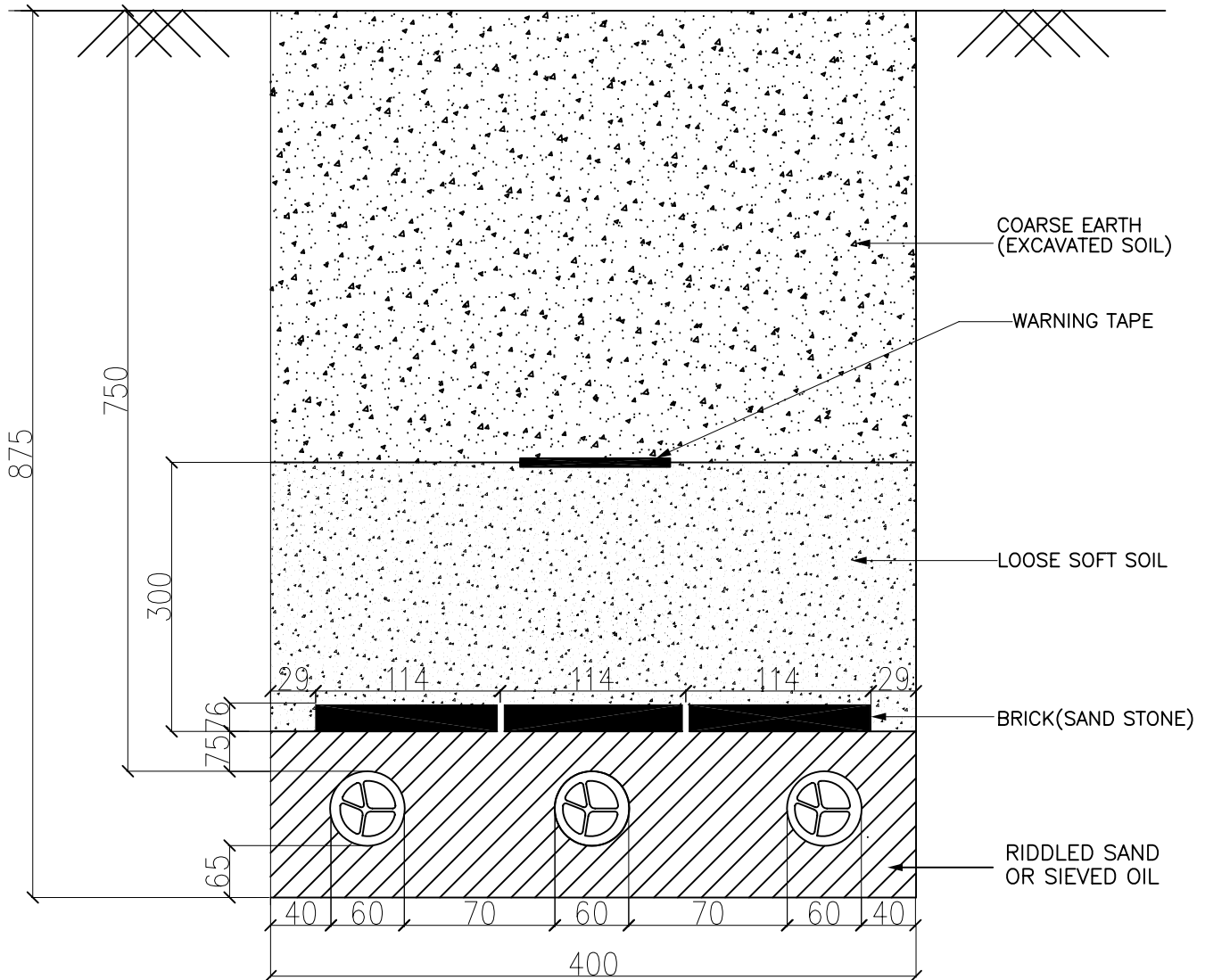
TYPICAL DETAILS FOR 11KV BURIED CABLE FOR TWO CIRCUIT
TYPE – B 1

DRAWN	DS	TITLE:-
CHECKED	SGD	TRENCH DRAWING FOR
APPD.	D.GUHA	3C X 300 mm Sq. or
DATE		3C X 150 mm sq
SCALE		11 KV DOUBLE CIRCUIT
		XLPE CABLE

BSES

REV.
00

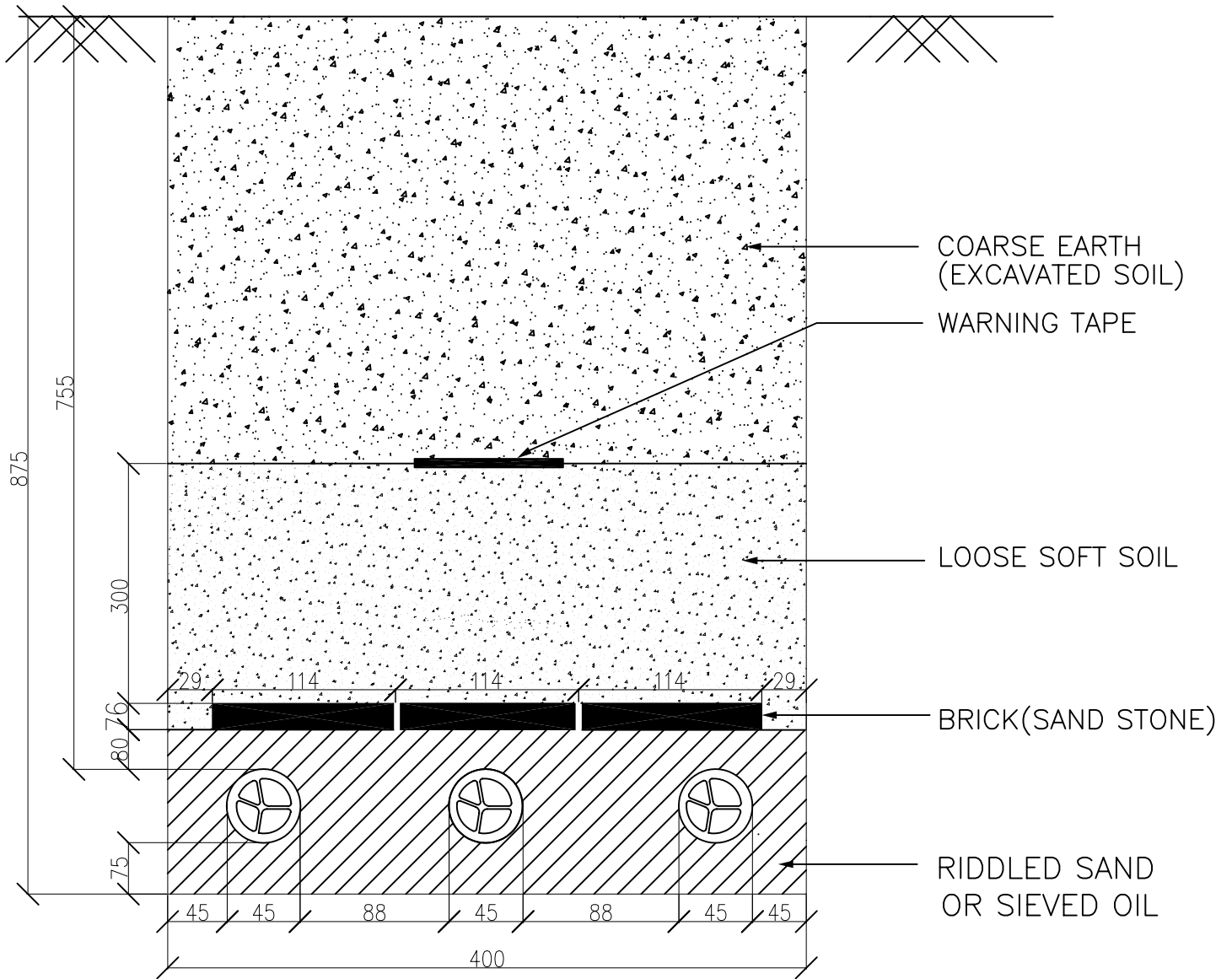
DRAWING # 8



TYPICAL DETAILS FOR 1.1KV BURIED CABLE
TYPE – A 1

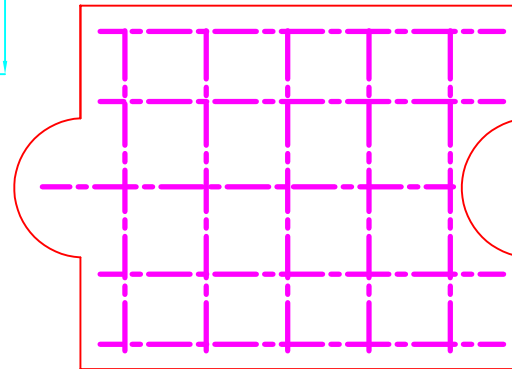
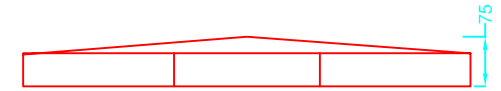
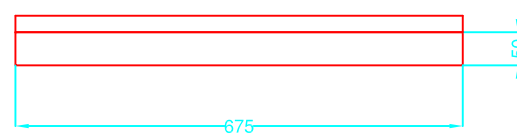
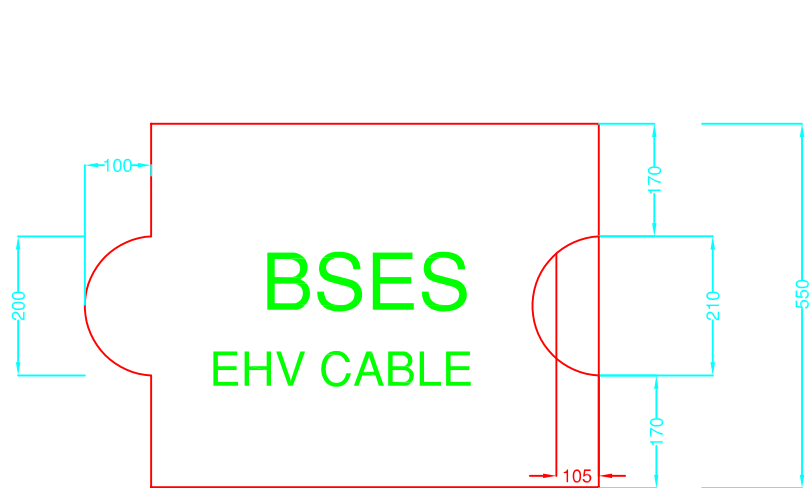
DRAWN	DS	TITLE:–	<div>BSES</div> <div>REV. 00</div>
CHECKED	SGD	TRENCH DRAWING FOR	
APPD.	D.GUHA	3.5Cx300Sqmm 1.1 KV	
DATE		XLPE CABLE	
SCALE			

DRAWING # 9



TYPICAL DETAILS FOR 1.1KV BURRIED CABLE
TYPE – A 1

DRAWN	DS	TITLE:–	<div>BSES</div> <div>REV. 00</div>
CHECKED	SGD	TRENCH DRAWING FOR	
APPD.	D.GUHA	3.5Cx150Sqmm 1.1 KV	
DATE		XLPE CABLE	
SCALE			

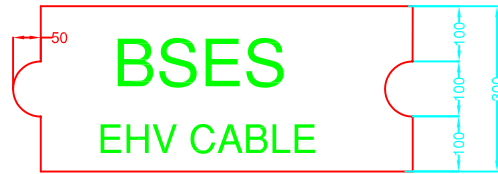


NOTE -

- (i) All dimensions are in MM.
- (ii) Concrete Mix 1 : 2 : 4
- (iii) MS rod - 6 MM Ø

CABLE COVER FOR EHV CABLES TYPE - A.

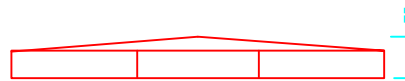
1. STEEL ROD - AS PER IS 432/1139
2. CONCRETE MIX SHALL BE NOT LESS THAN M200 GRADE AS PER IS 456.
3. MOULDING SHALL BE WITH COMPACTION NOT LESS THAN 7 MN/Sq.m.(70 kgf/Sqcm)



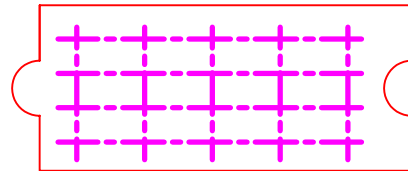
PLAN



ELEVATION



SIDE VIEW



NOTE -

- (i) All dimensions are in MM.
- (ii) Concrete Mix 1 : 2 : 4
- (iii) MS rod - 6 MM Ø

- 1. STEEL ROD - AS PER IS 432/1139
- 2. CONCRETE MIX SHALL BE NOT LESS THAN M200 GRADE AS PER IS 456.
- 3. MOULDING SHALL BE WITH COMPACTION NOT LESS THAN 7 MN/Sq.m.(70 kgf/Sqcm)

CABLE COVER FOR EHV CABLES TYPE B.

Annexure-7: Barricading and Safety

1. Dimensions of barricading- Height- 2 mtr, Length- 1.5 mtr. Refer drawing enclosed with tech spec for more details.
2. There shall not have any gap in between two barricades. Edge to edge shall be intact.
3. LED Bacon light shall be placed at 1st and 4th barricade and same shall be continue
4. Name, painting, colour, clean ness etc. shall be done on regular basis.
5. 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 and encroachment of existing roads by the contactor applying the excuse of work execution.
6. 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. Same the way barricades protect the road users from the danger due to construction equipment and temporary structures.
7. The structure dimensions of the barricades , material and composition, its colour scheme, BSES logo and details shall be in accordance with specification and drawing laid down in the tender documents.
8. All the barricades shall be erected as per the design requirements of employer, numbered painted and maintained in good condition and also barricade in charge maintain a barricade register at site
9. All barricades shall be conspicuously seen in the dark/night time by the road users so that no vehicle hits the barricades. Conspicuity 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 should be placed at the top of each barricade.
10. No dust deposit at the front side of barricades.
11. Cable drum shall be returnable and vendor shall take it back (by bye back process) from site at their own risk and cost.
12. Once cable lying complete of a drum, within two days empty drum shall be removed from site by bye back process.
13. Trained traffic marshal with all PPE and traffic control light (Red and Green) shall be placed at site for 24x7.
14. No excuse of theft (beyond 6 hrs. of FIR) shall be acceptable.
15. 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 recover, repair etc.
16. 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 with in 24 hrs. after completion of job.
17. During non working hrs. vendor to ensure presence of supervisor for controlling any event from locals.
18. PPEs

- Helmets

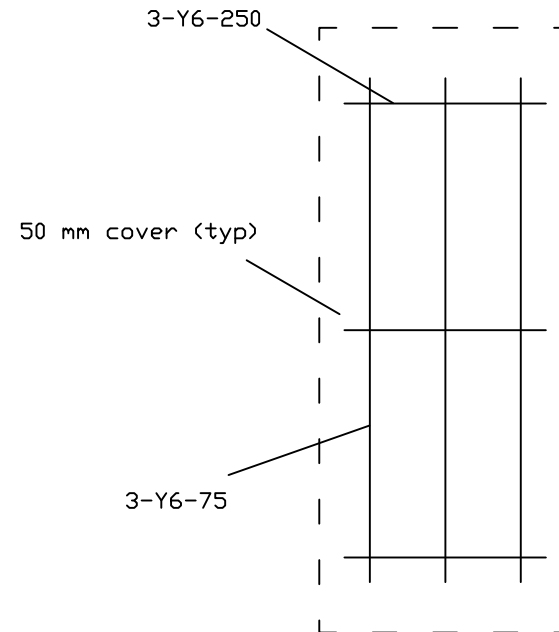
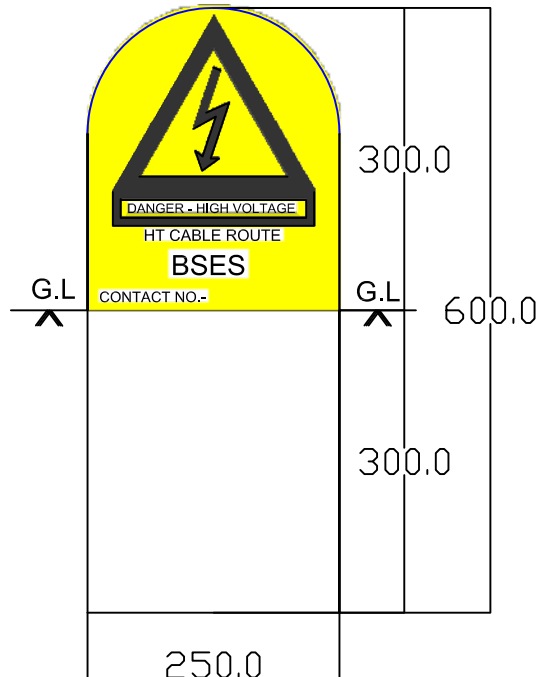
- Mask
- Jacket
- Shoes
- First Aid Box etc.

Shall be available at site 24x7. Zero tolerance on absence of PPEs to the working personnel. No excuse shall be acceptable in this regards.

19. GPR/Scanning shall be done by vendor of whole the route and same shall be submitted to BRPL. This work shall be done by vendor before execution of job.
20. Jointing TAT- Jointing to start within 48 hrs. and shall be completed by 96 hrs.+1 day.
21. Lifting of cable drums with hydraulic machine, pulling of cable from top end of drum with pulling machine (hydraulic winch) is mandatory.
22. Violation on barricading guideline and safety norms, a fine of Rs.5000 /day shall be imposed. BRPL inspector/engineer in-charge shall be empowered to impose the above penalty.


Annexure # 8 – ROUTE MARKER AND BARRICADING DRAWING

DETAIL OF HT CABLE ROUTE MARKER (RCC) - BSES



Notes:-

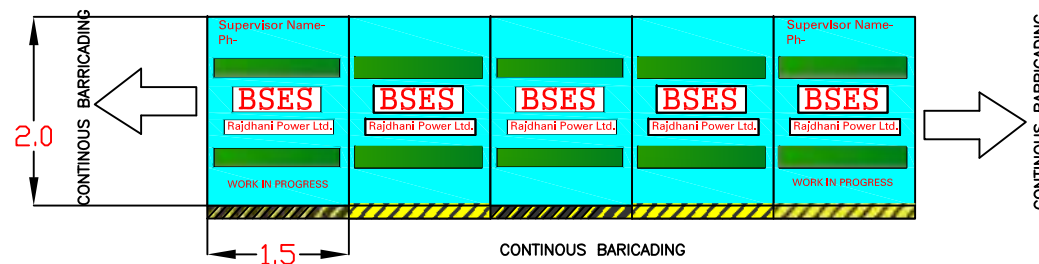
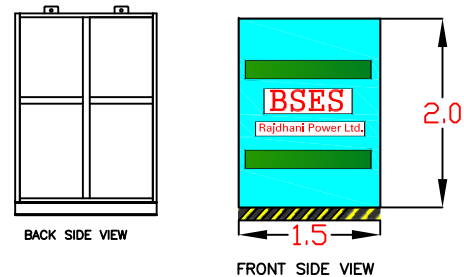
1	RCC Cable route marker with 6 mm Dia. Road and M25 concrete grade.
2	The litter/number shall be engraved on both the side route marker.
3	All dimentions are in mm unless specified.
4	Thickness of RCC shall be 75mm.
5	Yellow colour shall be visible above ground level.
6	Each route marker to be placed at an internal 50 mtr. and at every turn of route.
7	All kind of paint on route marker shall be in the scope of manufacturer.


DRAWN	R.K.JANA	TITLE:- DETAIL OF HT CABLE ROUTE MAKER (RCC).	 BSES Rajdhani Power Ltd
CHECKED	P.B		
REVIEWED	M.B		
APPO.	K.A		
DATE	16.08.16		
			DWG. NO. BSES-RM-RCC-01, R0

BARRICADING FOR CABLE LAYING WORK

NOTE:

1. Barricading shall provided through out the route length as well as project location.
2. Plate shall be MS
3. Supervisor name, ph no, work in progress, shall be mentioned at every 1st and 4th plate of barricading through out the route.
4. Beacon Light shall be provided through out the length.
5. Traffic marshal shall be Provided for traffic control by vendor.
6. Violation of safety norms and barricading shall be reviewed by BRPL and shall impose fine of Rs.5000/day as well as termination of work and short close of award.
7. After finishing of job vendor shall take return all the plate at their own risk and cost.
8. PPE's like Helmet, Mask, Jacket, safety boot etc. shall be provided vendor to all worker.



DRAWN	R.K.JANA	TITLE:— DRAWING—BARRICADING FOR CABLE LAYING WORK	 BSES Rajdhani Power Limited	
CHECKED	P.B.			
REVIEWED	A.S.			
APPD.	V.P.			
DATE	29.06.17			

Annexure#9-Note for HDPE Pipe Diameter in Cable Laying

- 1) Primarily our intent for laying cable will be through open trench only.
- 2) Trench dimensions shall be as per the standards which mentioned as below table

Sl. no.	Cable	Trench Details (mm)		
		Depth (single and double run)	Width (Single Run)	Width (Double Run)
1	LT Cable	875	400	400
2	11 kv	1055	400	650
3	33 kv	1235	400	650
4	66 Kv	1445	650	1200

- 3) QC team will do stage inspection after completion of digging to validate the depth of trench and will give approval for issuing of cable.
- 4) Execution in charge to ensure the cable laying work.
- 5) QC team will also inspection the laying work to validate the laying as per standards before back filling.
- 6) In case of site constraints, trench less cable laying shall be allowed as per the followings-
 - a) Cable laying up to 50 mtr through trenchless will be allowed with approval of circle head (O&M) for road crossing or site constraints. Site photos of constraints shall be reviewed before approval by circle head.
 - b) Absence of permission for digging- written disapproval by road owing agency and appropriate approval by circle head (for O&M Jobs), by O&M head (for 11kV, P&C job) and by EHV head (for EHV Jobs)
 - c) The size of HDPE (PN6, PE80) pipe shall be as per the guidelines of IS-1255, 1983, clause no-6.3.4.3. Details mentioned below in below table-

Sl. No	Cable	Recommended Dia of HDPE pipe (mm)
1	66kV, 3CX300	225
2	66kV, 1CX630	180
3	66kV, 1CX1000	180
4	33kV, 3CX400	180
5	11kV, 3CX300	160
6	11kV, 3CX150	160



- d) In-case of using lower size of HDPE pipe due to site conditions, the deviation for using lower HDPE pipe from above table, written approval must be taken through technical committee. Photos of the challenges while apparently the same will be reviewed by technical committee.

(However, HDPE pipe size with less than 1.5XOD of cable shall not be allowed at any stage)



**Technical Specification for
Nut, Bolts & Washers**

Specification no – GN101-03-SP-80-00

Prepared By		Reviewed By		Approved By		Rev	Date
Name	Sign	Name	Sign	Name	Sign		
SY		AT		VP		R0	23.05.17

TECHNICAL SPECIFICATION OF NUT, BOLTS & WASHERS

INDEX

1. SCOPE OF SUPPLY	3
2. CLIMATIC CONDITION	3
3. CODES & STANDARDS	3
4. TESTS	3
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11. INSPECTION TESTING CRITERIA	7

TECHNICAL SPECIFICATION OF NUT, BOLTS & WASHERS**1. SCOPE OF SUPPLY**

The specification covers the manufacturing, testing and inspection of Nut, Bolts & Washers.

2. CLIMATIC CONDITION

The material to be supplied against this specification shall be suitable for satisfactory operation under following climatic condition

Location	At various location in the Delhi
Maximum ambient temperature (°C)	50
Minimum ambient temperature (°C)	0
Maximum altitude above mean sea level (m)	1000
Relative Humidity (%)	100
Rainy month	June to October
Maximum Rainfall (mm)	1450
Wind Pressure (Kg/Sq.m)	195
Seismic Zone	Zone IV as per IS : 1893

3. CODES & STANDARDS

The Nut & bolt shall be designed, manufactured and tested in Accordance with the following Indian standards.

IS- 12427	Specification for Transmission Tower Bolts
IS-4072	Steel for Spring Washer
IS-3063	Single Coil Rectangular section Spring Washer for bolt, nut & Screw
IS-1586	Methods for Rockwell Hardness test for steel
IS-2016	Plain Washer
ISO 898/1-1988	Metric Bolts, Screws and Studs
IS-2633	Methods of testing of uniformity of coating of zinc coated articles
IS-6745	Method of determining of mass zinc coating on zinc coated iron & steel articles
IS-1363 (All parts)	Hexagonal bolts & nuts
IS-1367 (Part-iii)	Technical supply condition for threaded steel Fastner
IS-4759	Hot dip Zinc coating on structural Steel & other allied Products
DIN 127 A	Spring Lock Washers

4. TESTS

All types of test including routine test shall be carried out according to IS : 1367-1967 or its latest amendment.

TECHNICAL SPECIFICATION OF NUT, BOLTS & WASHERS

5. INSPECTION:

The material shall be inspected and tested before dispatch by an authorized representative of the BSES in respect of quality. In case the supplier is not in position to get these tests carried out at his work, such test may get be carried out by him at any NABL accredited lab at his own expenses.

6. TEST CERTIFICATES:

The supplier shall supply one set of test certificates from any NABL accredited lab in respect of quality as per IS: 1363-1967 with latest amendment for approval of the purchaser.

7. INSPECTION AFTER RECEIPT AT STORE:

BSES inspector will inspect the material received at BSES Store and shall have right to reject if found different from the reports of pre-dispatch inspection.

8. MARKING:

The material shall be marked with the ISI certification mark.

- I. Manufacture's name or trade mark.
- II. Place of manufacturers.
- III. The name & designation of consignee
- IV. Ultimate destination as required by the purchaser.
- V. Net weight with description of material.
- VI. The marking shall be stencilled in delible link on gunny bag.
- VII. The manufacturer's identification symbol.
- VIII. The hexagonal head bolts shall be marked with the following symbols on the top surface of the bolt head either embossed or identified as given below. The manufacturer's identification symbol.
- IX. Minimum height of marking shall be 3.0 mm. When embossed, marking shall project not less than 0.3 mm above the surface of the head and total head height (Head plus marking) shall not exceed the specified maximum head height plus 0.4 mm.

9. PACKING:

The supplier shall be responsible for suitable packing of all the material and marking on the consignment, so as to avoid any damage during transport and storage and to ensure correct dispatch

TECHNICAL SPECIFICATION OF NUT, BOLTS & WASHERS

to the destination. The packing shall be conforming to the requirement laid down in IS : 3256-1965 or its latest amendment.

Electro galvanized spring washers shall be packed in cartons of 500 or 1000 numbers.

Each carton containing the spring washers shall be marked with the manufacturer's name

Or trade mark, type, nominal size and quantity of the washers.

10. GTP FOR NUT, BOLTS & WASHERS :

S. No.	Technical particular	Hot Dip galvanized Hexagonal bolt
1	Mechanical Properties/ particular to which the Bolt will confirm IS 1367 (Part -2)-1979 product grade –C	
i	Tensile Strength	N/mm ² (Strength under wedge loading)
ii	Rockwell hardness	HRB
iii	Yield Stress	N/mm ²
iv	Stress under proof load	N/mm ²
v	Strength under wedge loading	Kg/mm ²
vi	Wt of Zinc Coating	g/mm ²
vii	Shear strength	N/mm ²
2.	Specification & standards for M.S. Bolts & Nuts(Black)	As per IS 1363(part 1 & 3) IS: 1367(part 3 & 6) IS: 1367 (part 17) & other Relevant standards with latest amendments
3.	Property class: a. Bolts b. Nuts	a. I) M10 to M16, length 40 mm to 80 mm min HT 4.8 grade ii)For others min 4.6 grade b. Min 5
4.	Size	Assorted size
5.	Tolerance	As per IS
6.	Raw material: a) Grade b) Type of steel used	As per IS :2062 Low Carbon Steel(Grade C) as per IS : 2062

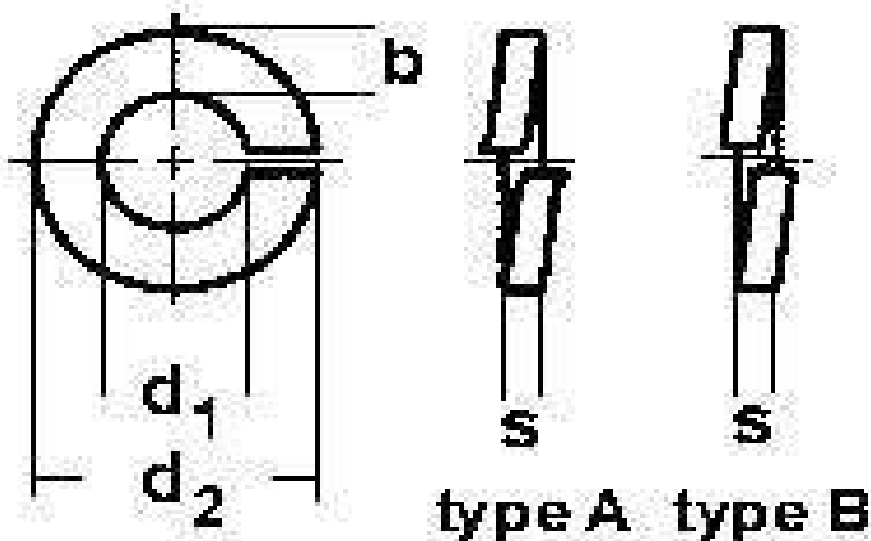
TECHNICAL SPECIFICATION OF NUT, BOLTS & WASHERS

7.	Chemical composition (%) a) For Hexagonal bolts: i) Carbon (Max.) ii) Phosphorous (Maxm.) iii) Sulphur (Maxm.) b) For Hexagonal nuts: i) Carbon (Maxm.) ii) Phosphorous(Maxm.) iii) Sulphur (Maxm.)	 0.55% 0.05% 0.06% 0.50% 0.06% 0.15%
8	Mechanical properties: i) For Hexagonal bolts: a) Tensile strength N/mm Sq. Minm. b) Stress under proof load N/mm Sq.Minm. c) Brinell Hardness HB d) Rockwell Hard HRB e) Vickers Hardness HV f) Elongation after fracture g) Strength under wedg. Loading N/mm Sq.Minm. h) Head soundness ii) For Hexagonal nuts a) Proof stress N/mm Sq.min. b) Vicker Hardness HV-HV-Minm/Maxm	As per IS: 1367(Pt. 3) 400 225 114 Min. to 258 Maxm. 67 Min. to 99.5 Max. 120 Min. to 250 Maxm. 22% 400 No Fracture As per IS: 1367 (Pt.6) 610 130 Min. to 302 Max.
9	Sampling procedure	As per IS :2614/1969 with latest amendments.
10	Packing details	Material to be supplied in double gunny bag of 50Kg

PLAIN WASHERS:

The plain washers shall be Hot dip Galvanized in accordance with the requirements of IS:4759-1984 "Specification for Hot-Dip Zinc coating on structural steel and other allied products" (Second-revision) except that the minimum value of the average mass of coating shall be 300 g/m², shall be conforming to IS: 1363-1967. Plain washers shall be conforming to IS: 2016-1967.

SPRING WASHERS:



TECHNICAL SPECIFICATION OF NUT, BOLTS & WASHERS

d₁	used for	d₂	b	s
2.1	M 2	4.4	0.9	0.5
2.4	M 2.3	4.9	1	0.6
2.6	M 2.5	5.1	1	0.6
3.1	M 3	6.2	1.3	0.8
3.6	M 3.5	6.7	1.3	0.8
4.1	M 4	7.6	1.5	0.9
5.1	M 5	9.2	1.8	1.2
6.1	M 6	11.8	2.5	1.6
7.1	M 7	12.8	2.5	1.6
8.1	M 8	14.8	3	2
10.2	M 10	18.1	3.5	2.2
12.2	M 12	21.1	4	2.5
14.2	M 14	24.1	4.5	3
16.2	M 16	27.4	5	3.5
18.2	M 18	29.4	5	3.5
20.2	M 20	33.6	6	4

11. INSPECTION TESTING CRITERIA :

Sr No.	Requirement	Product	Testing Standards	Lot Size (Manufacturers)	BSES lot Size
1	Chemical Composition	NBW	IS : 228	Each Consignment	Every 20 th Consignment
2	Dimension	NBW	IS : 2141 - 2000	Each Consignment	Every 20 th Consignment I
3	Tensile Strength	NBW	As per relevant IS	Every Fifth Consignment	Every 20 th Consignment
4	Proof load Test	NBW	IS : 898-2 1992	Every Fifth Consignment	Every 20 th Consignment
5	Coating Test	NBW			
5.1	Wt of of Zinc Coating	NBW	IS : 6745 - 1972	Every Fifth Consignment	Every Fifth Consignment
5.2	Uniformity of Zinc Coating	NBW	IS : 2633 - 1986	Every Fifth Consignment	Every Fifth Consignment
5.3	Adhesion of Zinc Coating	NBW	IS : 4826 - 1979	Every Fifth Consignment	Every Fifth Consignment

TECHNICAL SPECIFICATION OF NUT, BOLTS & WASHERS

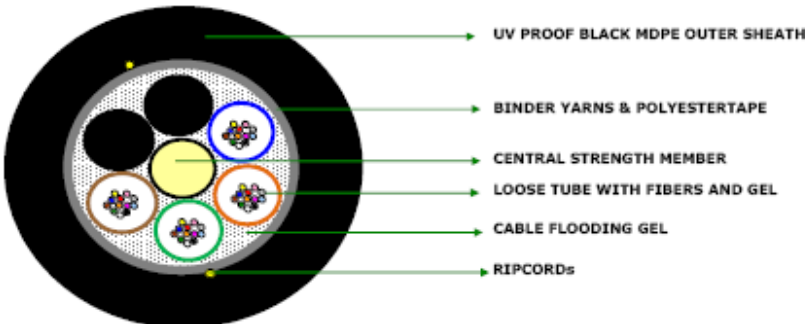
Note: -

- Corrosion Protection (all items shall be hot-dip galvanised in accordance with AS 4680 or AS1214)
- Hot dip Galvanized Bolt with one Nut, two Plain Washer and one Spring Washer which is electro galvanised
- Nickel chromium plated bolts with one Nut, two Plain Washer and one Spring Washer which is electro galvanised
- Full threading is required for bolts sizes up to length 100mm and minimum thread length of 38mm for bolts sizes having length more than 100mm
- All electrical connection hardware (M10 to M16, length 40 mm to 80 mm) shall be minimum HT 4.8 grade for other size 4.6 grade.

S.No	Description
	Bolt (G.I)
1	BLT,HEX,M16X150MM;GI
2	BLT,HEX,M16;175MM;GI
3	BLT,HEX,M16;225MM;GI
4	BLT,HEX,M16;250MM;GI
5	BLT,HEX,M16X300MM;GI
6	BLT,HEX,M16;350MM;GI
7	BLT,HEX,M16;125MM;GI
8	BLT,HEX,M10;40MM;GI;4.8
9	BLT,HEX,M12X40MM;GR 4.8
10	BLT,HEX,M16;100MM;GI
11	BLT,HEX,M16;75MM;GI GR 4.8
12	BLT,HEX,M6X20MM;GI
13	BLT,HEX,M16;200MM;GI
14	BLT,HEX,M16;400MM;GI
15	BLT,HEX,M16;25MM;GI GR 4.8
16	BLT,HEX,M12X60MM;GI;FULL THRD GR 4.8
17	BLT,HEX,M16X40MM;GI GR 4.8
18	BLT,HEX,M8X130MM;GI;MET
19	BLT,HEX,M12;60MM;GI; GR 4.8
20	BLT,HEX,M6X35MM;GI;GR 4.6;FULL THRD
	Bolt (Nickel Chromium)
21	BLT,HEX,M16X100MM;NKL CHROMIUM
22	BLT,HEX,M12X50MM;NKL CHROMIUM GR 4.8
23	BLT,HEX,M16X 50MM;NKL CHROMIUM GR 4.8
24	BLT,HEX,M10X75MM;NKL CHROMIUM GR 4.8
25	BLT,HEX,M12X75 MM;NKL CHROMIUM GR 4.8
26	BLT,HEX,M16X75MM;NKL CHROMIUM GR 4.8
	Bolt (MS)
27	BLT,HEX,M16MM;80MM;MS; GR 4.8 MET

TECHNICAL SPECIFICATION OF NUT, BOLTS & WASHERS

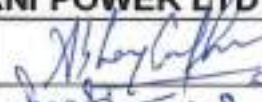


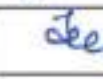
28	NUT,HEX,M10X40MM;MS;NUT BLT WSHR
29	BLT HEX MS -- MC 150MM M16
30	NUT,HEX,M10X40MM;MS;NUT BLT WSHR
31	BLT,HEX,M8X75MM;GALVANIZED ZN COATED MS
	Eye Bolt
32	BLT,EYE,25MM;240MM;M12
33	OEM,EYE BLT OPERTG RD;1HYN400075P1
	Washer (Spring)
34	WSHR,SPRNG,21MM;13MM;2.5MM;GALVANIZED MS
35	WSHR,SPRNG,11MM;17MM;2.5MM;GALVANIZED MS
	Washer (Flat)
36	WSHR,FLT,37MM;13MM;3MM;NKL CHROMIUM
37	WSHR,FLT,50MM;17MM;3MM;NKL CHROMIUM
38	WSHR,FLT,24MM;13MM;2MM;GALVANIZED MS
39	WSHR,FLT,21MM;11MM;2.35MM;GALVANIZED MS
40	WSHR,FLT,30MM;10.5MM;2.5MM;NKL CHROMIUM
41	WSHR,FLT,23.8MM;8.4MM;2MM;NI CHROMIUM
	Washer (Sling)
42	WSHR,SLNG,NEOPRENE;FOR M12STM
43	WSHR,SLNG,NEOPRENE;10MM;14MM;2MM
	Washer (Teflon)
44	WSHR,TEFLON;22X32X5MM
45	WSHR,TEFLON;12X20X5MM
46	WSHR,TEFLON;18X22X5MM
47	WSHR,TEFLON;15X30X5MM
48	WSHR,TEFLON;20X30X5MM
49	WSHR,TEFLON;35X22X5MM
50	WSHR,TEFLON;46X32X5MM
51	WSHR,TEFLON;25X15X5MM
	Washer (Brass)
52	WSHR,BRASS;LV FOR 990KVA XMER
53	WSHR,HEX;LV BRASS;FOR 630KVA TRAFO
54	WSHR,PLN;LV BRASS WSHR FOR 100KVA XMER
55	WSHR,CLAMPING MEMBER;AL;FOR HV BSHG
56	WSHR,BRASS;FOR HV SIDE TRNSF
	Hex Nut (MS)
57	NUT,HEX,M10X40MM;MS;NUT BLT WSHR
58	NUT,LOCK,SHEARING;M6X25MM;5;SHEA;MS;A
59	NUT,HEX,M16;GALVANIZED MS

48F Composite Fiber Multitube (MDPE) Single Sheath Duct Lite Optical Fiber Cable			
PRODUCT INFORMATION			
Fiber			
Single Mode Optical Fiber	36 Nos.	Fiber ITU.T - G.657A1	
Maximum Cabled Fiber Attenuation dB/Km		1310nm : 0.36 & 1550nm : 0.23 & 1625nm : 0.26	
Multi Mode Optical Fiber	12 Nos.	Fiber OM2 : 50/125	
Maximum Cabled Fiber Attenuation dB/Km		8500nm : 3.5 & 1300nm : 1.5	
Loose Tube			
Filling Gel		Thixotropic gel to prevent water ingress in loose tube (ITCO T 250)	
Fiber Per Tube	12 Nos.		
Tube	4 Nos.	Thermoplastic Material (PBT)	
Core			
Central Strength Member		Fibre Reinforced Plastic (FRP) to provide tensile strength and antibuckling properties.	
Filler	2 Nos.	Polyethylene Black	
Water blocking elements		Cable flooding gel is added in interstices of core to prevent water ingress in the cable core (ITCO C 480)	
Core Covering		Binder and Polyester Tape	
Cable			
Rip Cord	2 Nos.	Polyester Based Twisted Yarn	Applied below Outer Sheath
Outer Sheathing		UV Proof Black MDPE (ME 6052/ME 6056)	2.2 mm Nominal Thickness
CONSTRUCTIONAL DETAILS			
			
Typical construction Diagram - Not to Scale			
OPTICAL FIBER CABLE PERFORMANCE			
MECHANICAL		ENVIRONMENTAL	
Max. Tensile strength	2500 N	Crush Resistance	2000 N / 100x100 mm
Minimum Bend Radius	20 D	Impact strength	25 Nm.
Repeated Bending Test	20 D,30Cycle	Torsion	±180°
Water Penetration		Temp. Performance	
1m head, 3m samples, 24 Hr		Installation	
		Service	
		Storage	
		Drip Test	
		30 cm, 70°C, 24 hr	
Tests shall be carried out as per IEC 60793 & IEC 60794-1-2/GR 20 Standards. Change in attenuations shall be ≤ 0.05 dB.			
COLOR DETAILS			
Optical Fibre Colour	Blue, Orange, Green, Brown, Slate, White, Red, Black, Yellow, Violet, Pink, Aqua.		
Loose Tube Colour	For G657A1 : Blue, Orange, Green & For OM2 : Brown.		
Outer Sheath Colour	Black		
PHYSICAL PARAMETERS			
Cable Diameter (mm)	11.75 ± 0.25	Cable Wt. (Kg/Km)	114 ± 10%
		Cable Length:	2 Km ± 5%
PRINTING DETAILS			
Cable Printing details (White - Hot Foil Emb.)	48F TELEPHONE SYMBOL LASER SYMBOL MONTH & YEAR OF MANUFACTURE LENGTH CODE METER MARKING		
The accuracy of marking shall be ± 0.5%. Occasional loss of printing & remarking shall be as per Bell core GR 20 and this supercedes the earlier markings.			



**TECHNICAL SPECIFICATION
FOR
RFID ACTIVE & PASSIVE BALL / RING**

Specification No: GN101-03-SP-148-00

BSES RAJDHANI POWER LTD			
Prepared By	Abhay Gupta		R0
	Pronab Bairagi	 05/11/18	
Reviewed By	Amit Tomar	 05.11.18	2-Nov-18
Approved By	K. Sheshadri	 05/11/18	Page 1 of 13
Registered Office: BSES Bhawan, Nehru Place, Delhi - 110019			

TECHNICAL SPECIFICATIONS OF RFID ACTIVE & PASSIVE BALL / RING**CONTENTS**

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BSES**BSES Rajdhani Power Ltd****GN101-03-SP-148-00****TECHNICAL SPECIFICATIONS OF RFID ACTIVE & PASSIVE BALL / RING****REVISION RECORD**

Rev. No.	Revision Date	Item/ clause no:	Page No.	Nature of Change	Approved by

TECHNICAL SPECIFICATIONS OF RFID ACTIVE & PASSIVE BALL / RING**1. SCOPE**

The specification provides technical requirements and usage of RFID Active & Passive Ball / Ring. It shall be traced with a portable route tracer device specified herein to quickly pinpoint the location of buried facilities like cable runs, cable joints, aplices, vaults, conduits etc. during the construction, installation or maintenance work across BSES Rajdhani Power Ltd, network, New Delhi.

The portable route tracer device shall be able to find the location of ball / ring and define the place and depth's position. In addition, the RFID route tracer device shall have the capability to save RFID serial number of Ball / Ring being installed on site during installation with an inbuilt GPS module that should allow the RFID route tracer to allow navigation back to the RFID route tracer.

2. CLIMATIC CONDITIONS

2.1	Average grade atmospheric condition	Heavily polluted, dry
2.2	Maximum altitude above sea level	1000m
2.3	Ambient Air temperature	Highest : 50°C Average: 30°C Minimum : 0°C
2.4	Relative Humidity	100% max
2.5	Thermal resistivity of soil	160°C cm/Wt (max)
2.6	Seismic Zone	4
2.7	Reinfall	750mm concentrated in four months

TECHNICAL SPECIFICATIONS OF RFID ACTIVE & PASSIVE BALL / RING**3. GENERAL TECHNICAL REQUIREMENT**

- Every RFID ball / ring shall have a unique Hexadecimal code
- The data fed in the active electronic ball / ring shall be accessible from computer and mobile from anywhere which can be saved in the computer or mobile also
- The Identification code of passive electronic ball/ring shall be accessible from computer and mobile from anywhere which can be saved in computer and mobile also
- While assessing the data of RFID active ball/ring from computer or mobile, the user shall be able to:
 - See the location of the electronic Ball / Ring
 - See the Hexadecimal code of the electronic Ball / Ring
 - Shall be able to see the Ball / Ring and feeder details
 - Further details shall be as per Clause 4.1 of this technical specification
- The ball / ring shall be detectable if placed horizontally / vertically or at any angle inside the ground
- The Route Tracer (with GPS module) shall have USB accessibility to allow data transfer to computer/mobile
- Google mapping facility of feeder by using active and passive RFID ringball.

3.1 ACTIVE BALL / RING

- The Active Ball / Ring shall have facility to feed data by tracer or by computer/mobile as per the BRPL requirement
- Following are the technical requirements of the active ball / ring-

S. No	Specification	BRPL Requirement
1	Data Storage	Ability to write, read and lock programmed information into the Ball / Ring using locator or by computer/mobile for accessing feeder information.

TECHNICAL SPECIFICATIONS OF RFID ACTIVE & PASSIVE BALL / RING

S. No	Specification	BRPL Requirement
2	Data	<p>Below data shall be feed inside the active Ball / Ring or locator-</p> <ul style="list-style-type: none">• BRPL Vendor Name Feeder Details• BRPL site supervisor Vendor's supervisor at site• Joining details – Make of joining kit Cable grade and type Joint type• PO No. of joining kit• Date of installation of ball Joiner name
3	Design and shape	Ball / Ring
4	Free floating coil	Free floating coil for self leveling, horizontal position (floating coil will always be horizontal and provide accurate location of joint)/ Ring capable of being detectable from all directions.
5	Temperature effect	Non freezing fluid/ Other
7	Material	Made of High dense plastic
8	Frequency range	169.8 kHz standard / As per manufacturer's standard for power utility
9	Colour	Red/orange
10	Diameter	Outer Dia- 150mm max for ball, 250 mm for ring
11	Minimum Depth range	As per the table mentioned in the clause 4.1
12	Weight	0.4 kg max for both ring and ball
13	Power Source	Self generated, no batteries required for signal transmission

TECHNICAL SPECIFICATIONS OF RFID ACTIVE & PASSIVE BALL / RING**3.2 PASSIVE BALL / RING**

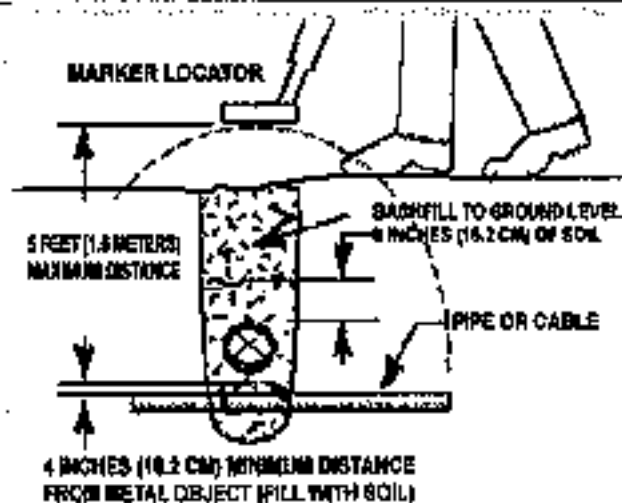
The Passive ball / Rings shall be buried at every 50m on the cable route from the point of starting of circuit.

Following are the technical requirements:-

S. No	Specification	BRPL Requirement
1	Design and Shape	Ball / Ring
2	Free Floating Coil	Free floating coil for self levelling, horizontal position (floating coil will always be horizontal and provide accurate location of cable route)/ Or ring coil should be detectable from all direction.
3	Temperature effect	Non freezing liquid/ Other
4	Application	To trace cable route
5	Material	Made of high density plastic
6	Frequency Range	169.8 kHz standard / As per manufacturer's standard
7	Colour	Red/orange
8	Diameter	Outer dia- 150 mm max for ball, 250 mm max for ring.
9	Depth Range	Applicable as mentioned in the clause no-4.1
10	Weight	0.4 kg for both ball and ring
11	Power Source	Self generated, no batteries required for signal transmission

4. INSTALLATION OF BALL / RING

- During Backfill of trench in which pipe or cable is being laid.
- Continue Backfilling by sand or earth

TECHNICAL SPECIFICATIONS OF RFID ACTIVE & PASSIVE BALL / RING**4.1 CABLE TRENCH DETAILS**

A	11 kV Cables	Width (mm)	Depth (mm)
a	3Cx150 / 300 mm ² - Single Circuit	400	1065
b	3Cx150 / 300 mm ² - Double Circuit	650	1065
B	33 kV Cables	Width (mm)	Depth (mm)
a	3Cx400 mm ² - Single Circuit	400	1235
b	3Cx400 mm ² - Double Circuit	650	1235
c	3Cx400 mm ² - Quadruple Circuit	650	1235
d	3Cx400 mm ² - Quadruple Circuit	650	1545
e	3Cx400 mm ² - Quadruple Circuit	1200	1235
C	66 kV Cables	Width (mm)	Depth (mm)
a	1Cx630/1000 mm ² - Single Circuit	650	1445
b	1Cx630/1000 mm ² - Double circuit	1200	1445
c	3Cx300 mm ² - Double circuit	1200	1445

TECHNICAL SPECIFICATIONS OF RFID ACTIVE & PASSIVE BALL / RING**5. GUARANTEE PERIOD**

A guarantee period for RFID Ball / Ring of 25 years shall be provided the manufacturer.

6. TESTS**6.1 ACCEPTANCE TESTS RFID ACTIVE BALL**

Sr. no.	Specification	Manufacturer to provide	Inspection Method by BRPL
1	Data Storage	Ability to write, read and lock programmed information into the Marker	Perform
2	Design and shape	Ball shape	Visual inspection
3	Free floating Coil	a free floating Coil for self leveling, Horizontal position	Visual inspection
4	Temperature effect	Non freezing fluid	Sample shall be sealed for NABL lab testing
5	Design and Shape	Made of high dense plastic	Visual inspection
6	Frequency Range	169.8 KHz	Review of document/Test Certificates
7	Colour	Red/Orange	Visual inspection
8	Dimension	As mentioned above	Perform and Measurement
9	Depth range	As per the table mentioned in the clause no-4.1	Perform
10	Weight	As mentioned above	Perform and Measurement

TECHNICAL SPECIFICATIONS OF RFID ACTIVE & PASSIVE BALL / RING**6.2 ACCEPTANCE TESTS RFID PASSIVE BALL**

Sr. no.	Specification	Manufacturer to provide	Inspection Method by BRPL
1	Design and shape	Ball/ring shape	Visual inspection
2	Free floating Coil	A free floating Coil for self leveling, Horizontal position	Visual inspection
3	Temperature effect	Non freezing fluid	Sample shall be sealed for NABL lab testing
4	Design and Shape	Made of high dense plastic	Visual inspection
5	Frequency Range	169.8 KHz	Review of document/Test Certificates
6	Colour	Red/Orange	Visual inspection
7	Dimension	As per the requirement	Perform and Measurement
8	Depth range	As per the table mentioned in the clause no-4.1	Perform
9	Weight	As per the requirement	Perform and Measurement

7. INSPECTION

8.1	BRPL representative shall at all times be entitled to have access to the works and all places of the manufacturer/ distributor where RFID Active / Passive ball / ring shall be manufactured and the representative shall have full facilities for unrestricted inspection of the Manufacturer's works/ distributors place, raw materials, store process and process of manufacture and conducting necessary tests as may be deemed fit, for certifying the quality of product.
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TECHNICAL SPECIFICATIONS OF RFID ACTIVE & PASSIVE BALL / RING

8.2	The Manufacturer shall keep BRPL informed in advance of the time of starting and of the progress of manufacturing of RFID active and passive ball / ring and route tracer in its various stages so that arrangements can be made for inspection.
8.3	No material shall be dispatched from its point of manufacture and works before it has been satisfactorily inspected, tested, and necessary dispatch instructions are issued in writing, except for the cases where waiver of inspection is granted by BRPL, and even in this case also, written dispatch instructions will be issued. Any dispatches before the issue of Dispatch Instructions in writing will be liable for rejection and non acceptance by the consignee.
8.4	The acceptance of any quantity of material shall in no way relieve the Manufacturer of any of his responsibilities for meeting all requirements of the specification, and shall not prevent subsequent rejection if such material is later found to be defective.
8.5	Only soft copy of inspection report shall be furnished by manufacturer through mail. BRPL shall not receive any hard copy of report for their office record.

8. DOCUMENTATION

Submission of drawings, calculations, catalogues, manuals, test reports shall be as mentioned below:

8.1 DRAWING, DATA AND MANUALS

Cross-Sectional drawing shall show every feature of construction. This drawing shall also state the hexadecimal code to be printed on the ball / ring.

8.2 DOCUMENTS TO BE SUBMITTED ALONG WITH BID FOR TECHNICAL JUSTIFICATION

The vendor shall submit-

- Cross sectional drawing
- GTP (all data to appear)
- Type test certificates if any

Document Submission

- Submission of drawings, calculations, catalogues, manuals, test reports shall be as follows.

Legend:

TECHNICAL SPECIFICATIONS OF RFID ACTIVE & PASSIVE BALL / RING

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

	Documents Along with offer	After award of contract- for Approval	Final documents(after Approval)
GTP	1 copies	** 1 soft copy	** 1 soft copy + CD
Drawings	1 copies	** 1 soft copy	** 1 soft copy + CD
Calculations	1copies	** 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

- The manufacturing of the RFID Ball/ Ring shall be strictly in accordance with the approved drawings and no deviation shall be permitted without the written approval of the BRPL. All manufacturing and fabrication work in connection with the RFID Ball/ Ring prior to the approval of the drawing shall be at manufacturer's risk.
- Approval of drawing etc. by the BRPL shall not relieve the Manufacturer of his responsibility and liability for ensuring correctness and correct interpretation of the latest revision of applicable standards, rules and codes of practices. The RFID Ball/ Ring shall conform in all respects to high standards of engineering, design, workmanship and latest revisions of relevant standards at the time of ordering and BRPL shall have the power to reject any work or material which in his judgment is not in full accordance therewith.

BSES

BSES Rajdhani Power Ltd

GN101-03-SP-148-00

TECHNICAL SPECIFICATIONS OF RFID ACTIVE & PASSIVE BALL / RING**E. DELIVERY SCHEDULE**

- Delivery period Start Date : From date of LOI / LOA
- Delivery period End Date : As agreed with manufacturer
- Material dispatch Clearance : After inspection, shall be issued by BRPL.

10. DEVIATION

- Deviations from this specification shall be listed separately by bidder clause wise (format given below) along with optional offer and has to submit the list along with bid/quotation. BRPL will review the deviations and if BRPL is agreed with the deviation, seller has to take written confirmation from BRPL on deviation during tender evaluation.
- In the absence of any separate list of deviations from the bidders with bid as well as written confirmation from BRPL on deviations, it will be assumed by the Buyer that the Seller complies with the Specification fully.
- Any deviations mentioned in any other submitted bid documents (i.e. in filled GTP, Catalog, BRPL old approval, buyer's/seller's standards etc) by seller without separate deviation sheets will not consider as a deviation from this tech spec at any stage of contract.

Deviation sheet format—

Sino	Document Name	Clause No.	Deviation	Reason	Merits to BRPL



TECHNICAL SPECIFICATION
OF
EHV Connectors (C Wedge, Palm & Paddle)

Specification No.- GN101-03-SP-102-00

BSES RAJDHANI POWER LTD

Prepared by	Abhay Gupta		Rev : 00
Checked by	Seema Shekhawat		
Reviewed by	Amit Tomar		Date : 07.12.2017
Approved by	Vijay Panpalia		Page : 1 of 13
Registered Office: BSES Bhawan, Nehru Place, Delhi - 110019			

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1.0 Scope

The specification covers the design, manufacture, testing, supply and installation of EHV connectors (C-Wedge, Palm & Paddle) which are to be used for line jumpers, cut-points, T-connections, making connection to the equipment's like isolators, circuit breakers, CTs and PTs, Lightning Arresters, Busbars etc.

The connectors shall have maximum contact surface with the conductor, extremely low and stable contact resistance, resulting proven minimum power loss. These shall maintain constant force within the connection for the life of connector while compensating for thermal expansion and increased life span.

2.0 Codes and Standards

Unless otherwise specified elsewhere in this specification, the rating as well as performance and testing of the EHV overhead line connectors shall conform to the latest revisions available at the

S. no	Standards	Title
2.1	IS-5561/ 1970-1996	Meets specification for electric power connectors
2.2	ANSI C 119.4-2004	Meets specification for electric connector for use between Aluminium to Aluminium or Aluminium to Copper bare Overhead conductor
2.3	IS – 6009 (1970 updated)	Meets specific test methods for evaluation of results of accelerated corrosion tests.
2.4	ASTM-D-117 updated	Meets specification for electrical insulating oils of petroleum origin

time of placement of order of all the relevant standards as listed below:

3.0 Service Conditions

Device/Equipments to be supplied against this specification shall be suitable for satisfactory continuous operation under the following tropical conditions.

S.No	Climatic conditions in Delhi	UOM	
3.1	Maximum ambient temperature	°C	50
3.2	Relative Humidity	%	100
3.3	Maximum annual rainfall	mm	1450
3.4	Maximum wind pressure	Kg/m ²	150
3.5	Maximum altitude above mean sea level	m	1000
3.6	Seismic level (Horizontal Acceleration)		0.30
3.7	Climatic Conditions		Moderately Hot and humid tropical climate conducive to rust and fungus growth
3.8	Ref Ambient Temperature for Temperature	°C	50

4.0 General Technical Requirements for EHV Connectors

4.1	The connector shall confirm to Indian Standard IS 5561 for all type of type test & electrically to extra heavy duty, class AA and mechanically to class 3 as per ANSI C 119.4-2004
4.2	It consists of a spring ' C ' member and a Wedge, both made from a special Aluminium alloy of high ductility and electrical conductivity. The ' C ' member and a Wedge shall be coated with a conductive inhibitor containing abrasive particles to help in cleaning the contact surface during installation. This coating shall be done at factory itself
4.3	The connector shall be useful for the Zebra and Wolf conductor. For EHV connector special tool is to be used for proper & ensured locking
4.4	During the assembly, the wedge shall be inserted at a speed of about 35-40 m/s using the specified tool. This is also needed to eliminate operator dependency. High-speed insertion with the specified inhibitor shall be very effective in abrading all sliding surfaces and in disrupting surface oxide film to generate large number of contact spot in the electrical surfaces provided
4.5	During disassembly of connector, the same specified tool shall be used. Upon disassembly, the conductor & connector shall be reused at least once
4.6	At the end of Wedge Notch type locking facility shall be provided. This will ensure once the wedge is fixed it will not loosen and come back
4.7	When connected, this tap shall provide a reliable electrical and mechanical connection for solid, stranded or compressed conductor combinations including AAC, AAAC and ACSR. These shall maintain constant force within the connection for the life of connector while compensating for thermal expansion or Creep
4.8	The connectors shall have maximum contact surface with conductor and extremely low & stable contact resistance and minimum power loss. This shall be with proven track record for Connector Performance. These shall maintain constant force within the connection for the life of the connector/clamp while compensating for thermal expansion or creep and increased life span
4.9	The mechanical stresses generated during the wedge insertion shall cause plastic deformation of the C-clamp and shall increase the geometrical confirmation of the clamp to the conductor.

5.0 Connector Components

5.1	" C " Member	The C member shall be formed from extruded Aluminium alloy so that the grain (extrusion direction) runs perpendicular to the conductor (e.g. from C-groove end to C-groove end). The material used shall be specially designed with tighter tolerances on the chemical composition to ensure consistency of the C-member production regarding dimensions and mechanical properties
5.2	Wedge	The dimensions for the wedges shall be manufactured to close tolerances to ensure repeatability and reliability of the connection.
5.3	Inhibitor	An oxidation inhibitor shall be applied to the surface there by elimination of oxidation of metallic surface. The chemical composition of the inhibitor shall be synthetic and compatible with the rubber gloves used by the utilities. This inhibitor shall contain special Aluminium abrasive particles, optimized in size and quantity, to ensure repeatability and reliability of the electrical contact made in every connection
5.4	Installation Tool	The tool is having 4 moving parts: the ram, the power unit, the breech cap and the gas release knob. The gas produced by the power booster during the installation is captive inside the power unit. This allows the tool to remain self-supporting on the lines during installations until the gas release knob is turned counterclockwise. This allows the gas produced by the power-booster to be released and the tool to be removed
5.5	Paddle	Paddles shall be used to connect Boltless Connector to equipment or any other suitable application. These paddles are made up of special Al Alloy
5.6	Palm	Palm shall be used to connect Paddle to it. These palms are made up of Copper Alloy (Brass 60/40)
5.7	Power-Booster	Power charge repeatability (PCR) is critical to the supply of a reliable product, which can be applied safely and consistently every time. These power-boosters are designed with the primer cap enclosed to ensure that it can only be used with the specified tool and to ensure that there is no incorrect installations

6.0 Freedom from Defects

6.1	The wedge type connectors shall be smooth and free from cavities, blowholes, and such other defects, which would likely cause them to be unsatisfactory in service.
6.2	The wedge type connectors shall be so designed and proportioned that they are capable of safely withstanding stresses to which they may be subjected (including those due to short circuit and climatic conditions) and that the effects of vibration both on conductor and connector are minimized. They shall be designed, manufactured, and finished so as to avoid sharp radius of curvature, ridges and excrescences, which might lead to, localized pressure on or damage to the conductor in service.

7.0 Tests

7.1	Type Tests	
	The following Type Tests shall be carried out as specified in respective standard as per ANSI C -119.4	
	i	Current Cycle Test (CCT) or Current Cycle Submersion Test (CCST)
	ii	Mechanical test/ Wire pull-out test
	Tests as per IS 5561	
	i	Tensile Test
	ii	Resistance Test
	iii	Temperature Rise Test
	iv	Short Time Current Test
		i As per electrical fault system requirements
	v	Dimensional check
	Special Tests	
	i	Corona RIV test on one of size for following combination, "Conductor to Paddle" and "Conductor to Conductor"
	ii	Corrosion Test / Salt spray test (IS-6009 (1970 updated) / ASTM-D-117 (Annexure-A updated)
	iii	Thermal shock test
7.2	Acceptance Tests	
	The acceptance tests are to be carried out in presence of Company's representative. The supplier shall, therefore, give sufficient advance notice to the Company for arranging witnessing of the tests.	
	i	Tensile Test
	ii	Resistance Test
	iii	Dimensional check
	iv	Chemical composition test on one sample from each lot from NABL

7.3	Routine Test	
	i	Visual inspection
	ii	Dimensional Checks
7.4	Testing Equipments/facilities	The supplier / bidder shall clearly state as to what testing facilities are available in the works of manufacturer and whether the facilities are adequate to carry out type, routine and acceptance tests as per specification. The bidder shall provide the facilities to purchaser's representative for witnessing the tests in the manufacturer's works. If any test cannot be carried out at manufacturer's works reason should be clearly stated in the tender
7.5	Testing Certificates	The bidder shall furnish detailed type test reports of the offered Wedge Type Connector for the tests as per this specification. All the above Type Tests shall be carried out as per the relevant standards at National Labs & at International labs, if required capable of carrying out specified tests. These type tests should have been carried out as per respective standards of IS 5561/1970-1996, IS 6009 (1970 updated), ASTM-D-117 (updated) & ANSI C 119.4-2004. Testing for family of connectors shall be as per standard, if applicable. The bidder shall also submit Chemical composition test along with tender documents at the time of bid documents submission

8.0 Drawing

The bidder's drawing shall be as per Annexure-D, E & F.

9.0 Guaranteed Technical Particulars

GTP of EHV Connectors shall be as per Specification (Annexure-A, B & C). Any deviation w.r.t. this specification shall be clearly mentioned.

10.0 Marking

Each C-member and wedge shall be marked as per the following details:

10.1 Manufacturer's name or trade mark

10.2 Year of manufacture

10.3 BSES-BRPL, PO number & date

11.0 Packing

For packing, suitable materials shall be used. The packing shall be fit to withstand rough handling during transit and storage at destination. The heads and threaded portion of fasteners fitting if any should be properly protected against damage. The gross weight of the packing shall not be exceeded 50 kg per box or case. All different fitting components shall be packed in different cases and shall be completed with minor accessories fitted in places. The bidder should get the approval of packing list before dispatching the material.

ANNEXURE-A

Guaranteed technical Particulars for C Wedge Connectors					
S.No.	Description		Unit	BRPL requirements	Bidder's offer
1	Name of the manufacturer			-	
2	Place of Manufacture			-	
3	Product Designation			Yes	Yes/ No
4	Brand Name				
5	Applicable Standards			ANSI 119.4 & IS 5561	
6	Metallic Material of Connector				
	I	"C' Member		As per specification	
	li	Wedge Member		As per specification	
	iii	Inhibitor		As per specification	
7	Non-Metallic Material of Connector				
8	Suitable connector for Main & Tap			Mention Conductor name, type and diameter	
8a	Tooling for connector installation			Yes	Yes/No
8b	Speed of wedge during installation		m/s	35-40	
8c	Notch at the end of wedge after installation (Wedge locking provision)			Yes	Yes/No
9	Installation & Application tooling				
	9.1	Tooling for connector Installation			
	9.2	Speed of wedge during installation			
	9.3	Notch at the end of wedge after installation (Wedge locking provision)			
10	Rated Voltage		kV		

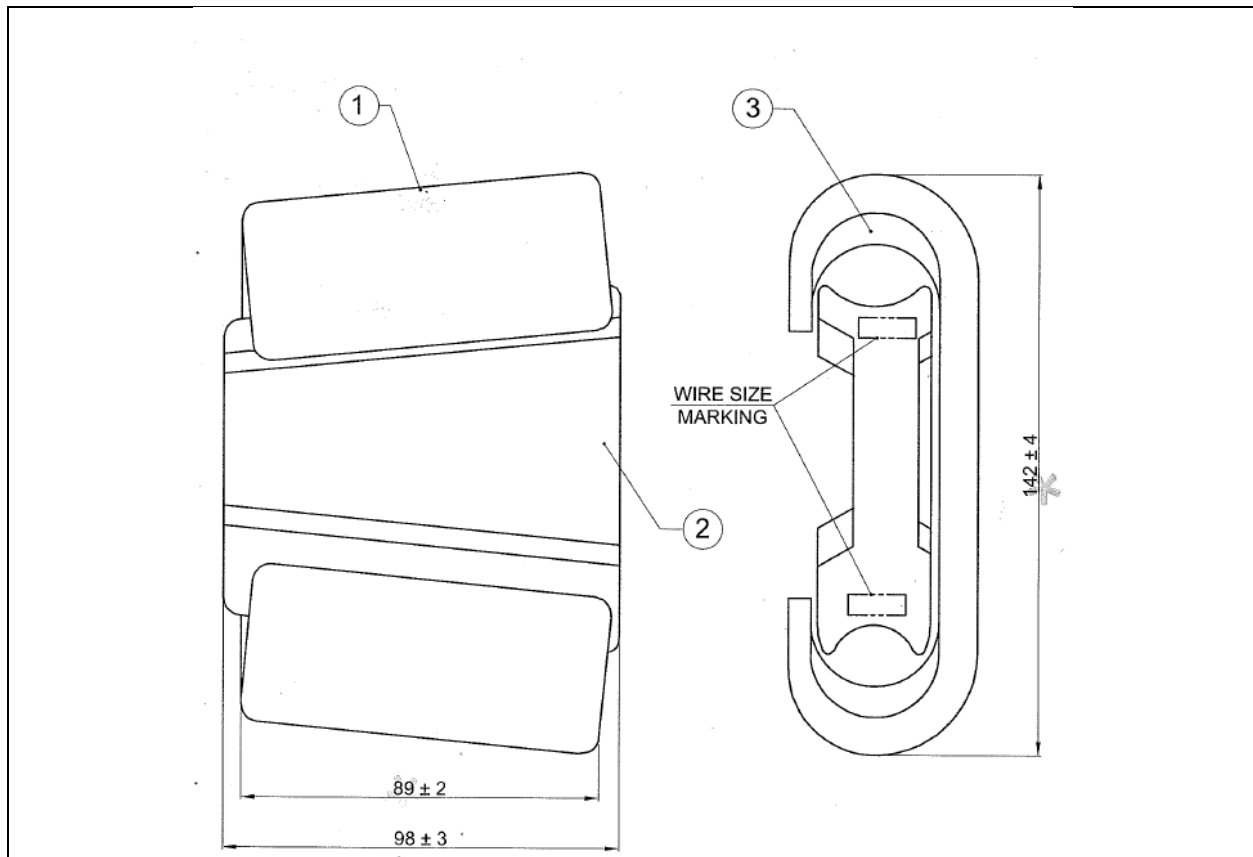
11	Short Time Current Rating	kA		
12	Rated Current	Amp		
13	Ampacity			
14	Rated Tensile Strength	kgf	-	
15	Type Test Reports			Yes/ No
	15.1	Current Cycle Test (Class AA)	As per ANSI C 119.4	Yes/ No
	15.2	Mechanical Test (Class 3)	As per ANSI C 119.5	Yes/ No
16	Type Test Reports		As per IS 5561	Yes/ No
17	Dimension	mm	As per drawing	

ANNEXURE-B

Guaranteed technical Particular for Paddle Connector			
S. No	Description	BRPL Requirement	Bidder's Offer
1	Name of the Manufacturer		
2	Place of Manufacture		
3	Type of Connector	Bolted Type	
4	Type of Material	Al Alloy	
5	Dimensions	As per drawing	

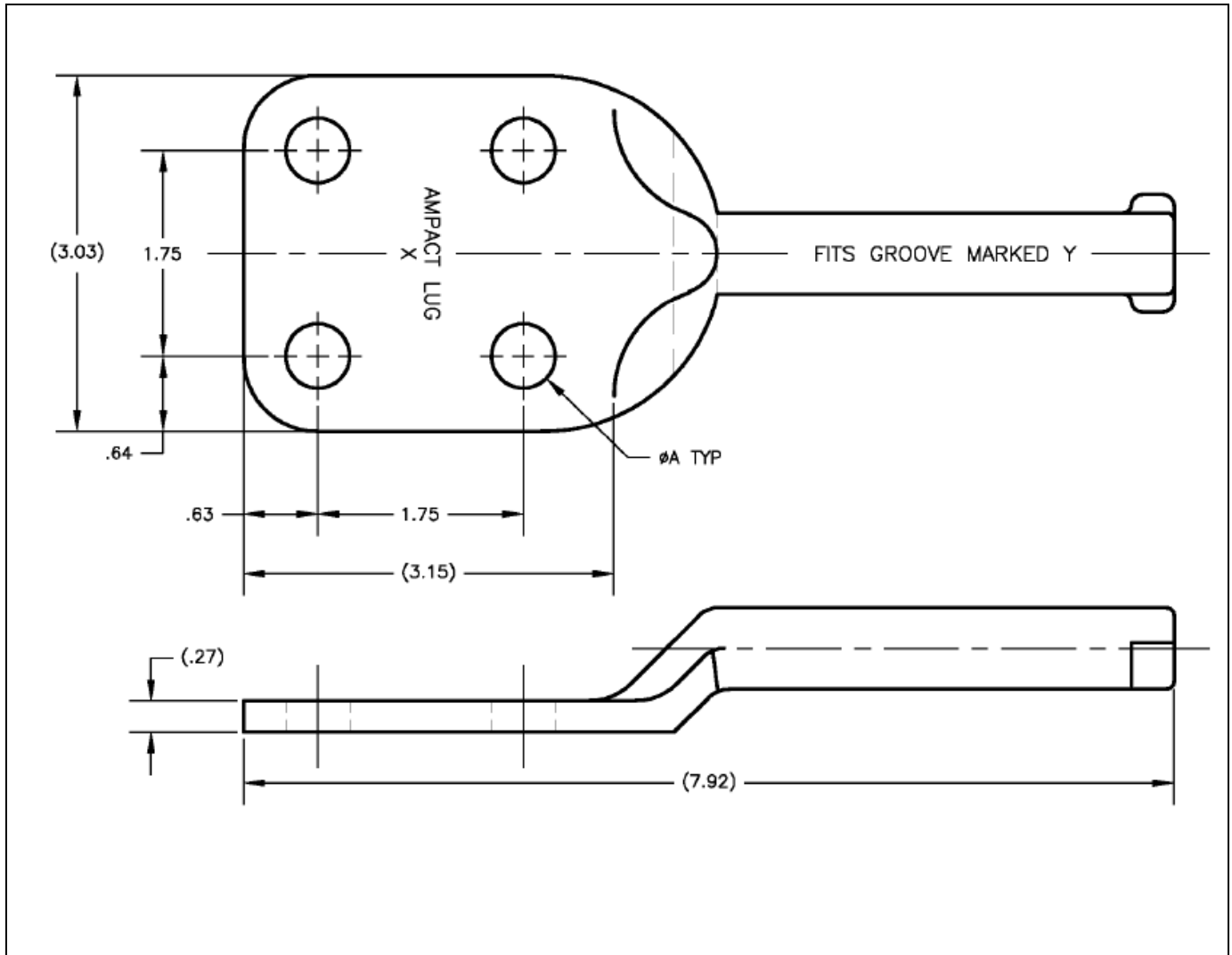
ANNEXURE-C

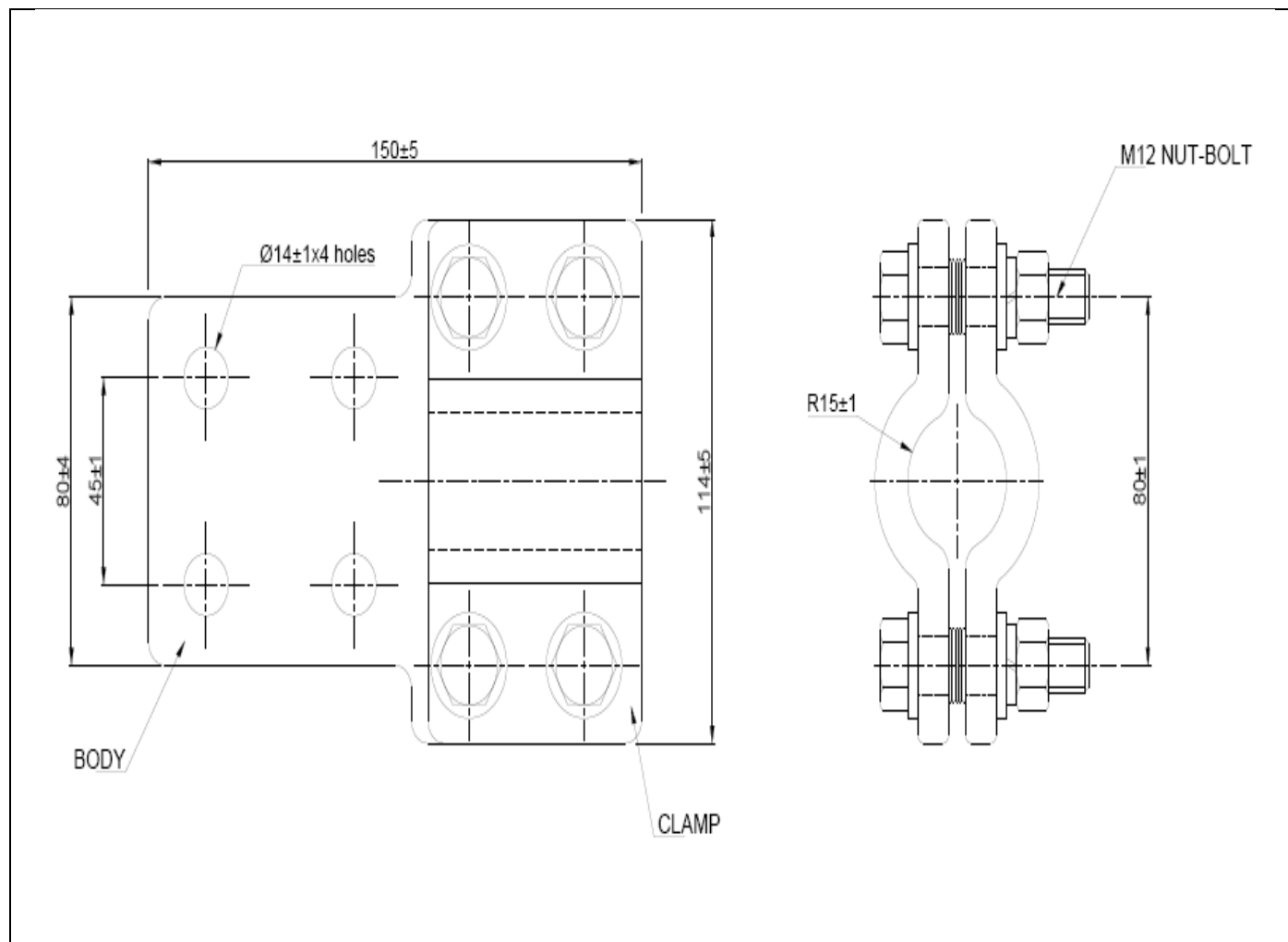
Guaranteed technical Particular for Palm Connector			
S. No	Description	BRPL Requirement	Bidder's Offer
1	Name of the Manufacturer		
2	Place of Manufacture		
3	Type of Connector	Bolted Type	
4	Type of Material	Copper Alloy (Brass 60/40)	
5	Connector suitable for Stud Dia.	30mm	
6	Dimensions	As per drawing	

ANNEXURE-D**Drawing of C-Wedge Connector**

ANNEXURE-E

Drawing of Paddle Connector



ANNEXURE-F**Drawing of Palm Connector**

TECHNICAL SPECIFICATIONS OF PPES ITEMS

TECHNICAL SPECIFICATIONS

OF

PPES ITEMS

(CABLE CUTTER,
LONG NOSE PLIER,
ENGINEERING PLIER,
ELECTRICIAN SCISSORS,
TAPE MEASUREMENT,
SAFETY BESLEY / FULL BODY HARNER,
FRP LADDER,
PVC CONE,
CAUTION TAPE,
FIRE EXTINGUISHER,
SHOCK TREATMENT CHART)

BSES RAJDHANI POWER LTD.

Prepared by	Naved Ahmad	<i>Naved Ahmad</i> 27/10/18	Date:	08.10.2018
Reviewed by	Amit Tomar	<i>Amit Tomar</i> 10/10/18	Revision	R1
Approved by	K. Sheshadri		No of Pages:	8

TECHNICAL SPECIFICATIONS OF PPES ITEMS

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TECHNICAL SPECIFICATIONS OF PPES ITEMS**1.0 Scope of Supply**

1.1 The specification covers the design, manufacturing, inspection, testing & supply of PPES Items

1.2 Design, Engineering, Manufacturer, Assembly, Inspection, testing at manufacturer works before dispatch Packing, delivery of material to BRPL stores and submission of documents to purchaser.

2.0 Service Condition

The items to be supplied against this specification shall be suitable for satisfactory continuous operation under outdoor environment. Following are the climatic condition:

Sl.no	Parameters	Requirements
i.	Peak ambient temp.	55°C
ii.	Min ambient temp. In shade	45°C
iii.	Max average ambient temp in 24 hours period in shade	40°C
iv	Min ambient temp.	(-5°C
v	Max. Temp. attainable by an object exposed to sun	70°C
vi	Max. relative humidity	95%
vii	Average number of thunder storm days per annum	40
viii	Average number of rainy storm days per annum	120
ix	Average annual rainfall	1250mm
x	No of months of tropical monsoon condition	4 months
xi	Max. wind pressure	150kg/m ²
xii	Altitudes	Not exceeding 1000mlrs

TECHNICAL SPECIFICATIONS OF PPES ITEMS**3.0 Material List**

Sl.no	Ppes Items
3.0.1	CABLE CUTTER
3.0.2	LONG NOSE PLIER
3.0.3	ENGINEERING PLIER
3.0.4	ELECTRICIAN SCISSORS
3.0.5	TAPE MASUREMENT
3.0.6	SAFETY BESLEY / FULL BODY HARNE
3.0.7	FRP LADDER
3.0.8	PVC CONE
3.0.9	CAUTION TAPE
3.0.10	FIRE EXTINGUISHER
3.0.11	SHOCK TREATMENT CHART)

3.0.1 Cable cutter

- Fully Insulated Combination Plier: Suitable for working voltage up to 1000 Volts conforming to EN 60900 (certificate to be supplied)
- Length: 200 mm or more
- Insulation moulded directly on to the metal
- Blade material: Chrome vanadium steel
- Hand shall stay clear of the metal
- Operating Temperature: 0 to 50 degree centigrade
- Vendor has to provide full technical specifications while submitting the offer in bid
- Max cutting capacity 60mm

3.0.2 Long Nose plier

- Fully insulated Combination Plier: Suitable for working voltage up to 1000 Volts conforming to EN/IEC 60900 (certificate to be supplied)
- Length: 160 mm or more
- Insulation moulded directly on to the metal
- Blade material: Chrome vanadium steel

TECHNICAL SPECIFICATIONS OF PPES ITEMS

- ♦ Hand shall stay clear of the metal
- ♦ Operating Temperature: 0 to 50 degree centigrade
- ♦ Vendor has to provide full technical specifications while submitting the offer in bid

3.0.3 Engineering plier

- ♦ Fully insulated Combination Plier: Suitable for working voltage up to 1000 Volts conforming to EN 60900 (certificate to be supplied)
- ♦ Length: 180 mm or more
- ♦ Insulation moulded directly on to the metal
- ♦ Blade material: Chrome vanadium steel
- ♦ Hand shall stay clear of the metal
- ♦ Operating Temperature: 0 to 50 degree centigrade
- ♦ Vendor has to provide full technical specifications while submitting the offer in bid

3.0.4 Electrician scissors

- ♦ Fully insulated Combination Plier: Suitable for working voltage up to 1000 Volts conforming to EN 60900 (certificate to be supplied)
- ♦ Length: 180 mm or more
- ♦ Insulation moulded directly on to the metal
- ♦ Blade material: Chrome vanadium steel
- ♦ Hand shall stay clear of the metal
- ♦ Operating Temperature: 0 to 50 degree centigrade
- ♦ Vendor has to provide full technical specifications while submitting the offer in bid

3.0.5 Tape measurement

- ♦ Steel / Plastic body
- ♦ Folding type, Compact design
- ♦ Length- 5 meter
- ♦ Width-19mm

3.0.6 Safety besley / full body harner

1. Type –II of IS 3521-1989 safety belt made of nylon webbing 45mm width hoisting a man provided with special electroplated 5 buckles and one "D" ring at back for one safety line of Dia

TECHNICAL SPECIFICATIONS OF PPES ITEMS

12 mm poly propylene rope of min length 2 meter. With one end directly spliced to the back & other end left thimble and spliced with the special electroplated hook separately. Belt shall have uniform thickness.

2. All the load bearing components must confirm to IS 3521-1989 along with the performance test of whole unit of Safety belt. Marking on belt & harnesses should be as per clause B.2 of IS 3521-1989

3. Load test certificate shall be produced along with the supply.

4. Sample required along with offer to assess the technical suitability.

3.0.7 FRP ladder

- Material- FRP channel non-conductive side rails with smooth surface finish, Pully- Nylon, Rope- Polypropylene
- Fire Retardant - Class 1 Rating as per ASTM E84
- Locking for extension- Aluminium casted gravity type locking arrangement
- Safety shoe- Aluminium shoe with rubber sleeves
- Foot plates shall be provided with holes & the nails be attached to the ladder.
- Colour = Yellow
- Width- 293mm
- Steps- 30mm Dia Fluted FRP Tube
- Rung space- 300mm
- Working load- 150kg
- Working height- Extended 9.14 meter, fold 5.22 meter
- Weight 40 to 45 kg

3.0.8 PVC cone**Features**

- Painted in fluorescent orange coating that provides for optimum daytime/nighttime visibility and reflective collar support.
- Cones are easy to move and handle thus making it easier to deploy at preferred locations
- Provision of holes for fixing plastic chain
- Bright colour UV stabilised
- Reflective sleeve useful for day-night visibility
- Excellent Flexibility strength
- Good weather resistant property
- Easy of handling, storage and stackability.

TECHNICAL SPECIFICATIONS OF PPES ITEMS

Sl.no.	Item description	Parameter
1	Material	Poly Vinyl Chloride (PVC)
2	Height	750mm
3	Weight	2.5kg
4	Base size	385x385mm
5	Reflective tape size	150+100mm
6	Colour	Red

3.0.9 Caution tape

Effective way to restrict entry into hazardous area. Printed with Bright bold type words caution, danger and appropriate symbol

- Colour of tape : Yellow
- Easy to use
- Light weight
- Fine quality

Sl.no.	Values	Particulars
1	Material	Polyethylene
2	Thickness	0.04 mm
3	Width	75mm (3 inch)
4	Length	250mtr
5	Weight	1030g
6	Colour	White
7	Wording	DANGER
8	Print colour	Red
9	Packaging	24 nos in one cartoon box

3.0.10 Fire extinguisher

Sl.no.	Values	Particulars
1	DCP Type Fire Extinguisher (Stored Pressure Type)-09 Kg. capacity	Filled with BC dry chemical powder complete with squeeze grip type valve as a controllable discharge mechanism, braided PVC/rubber discharge hose with metallic nozzle, locking arrangement, bracket with two screw and sleeve.
1.1	BiS Standard	Conforming to IS: 15683:2006 and ISI marked.
1.2	Working Pressure & Expelling Media	Charged with dry nitrogen gas at 12-15 Bar.

TECHNICAL SPECIFICATIONS OF PPES ITEMS

S.No	Values	Particulars
1.3	Dry Chemical Powder (DCP)	BC type DCP conforming to IS-14609: latest revision
1.4	Body of Fire Extinguisher	Cylindrical body made of Mild Steel Sheet 1.5conforming to IS 513: latest revision
1.5	Siphon Tube & discharge hose rest holder	Sip1.6hon tube shall be made of metal & discharge hose rest holder shall be of good quality & suitable type
1.6	Provision	Wall mounting facility.
1.7	Manufacturing date	Manufacturing date shall be punched at bottom ring of the extinguisher
1.8	Certificates to be supplied with materials	1) A certified copy of BIS: 15683:2006 license certificate of the manufacturer, 2) Cast analysis certificate for cylinder material, 3) Hydraulic Test certificate of the extinguishers, 4) Testing certificate for BC type DCP conforming to IS-14609: latest revision, and 4) Guarantee certificate at least for 01 years etc
1.9	Type	CO2,Dry powder, Foam, water & vaporizing liquid
2.0	Inspection	PDI of the materials will be carried out at vendor site.

3.0.1.1 Shock treatment chart**Features**

- Display of Electric shock and its treatment
- Laminated on both sides with hot seal polyester film, fitted with plastic rollers at top and bottom
- Available in English-Hindi combined or English only
- Lamination

S.No	Item description	Parameter
1	Size of chart	50x75cm
2	Pattern	Printed
3	Colour	Multicolour
4	Shape	Rectangular



Technical Specification for

33 kV 3Cx400 sq mm cable

Specification No: BSES-TS-09-33CBL-R0

Rev:	0
Date:	8 Apr 2022
Prepared by	Abhishek Vashistha
	Gautam Deka/Pronab Bairagi
Reviewed by	Puneet Duggal
	Amit Tomar
Approved by	Gaurav Sharma
	K. Sheshadri

Technical Specification for 33 kV 3Cx400 sq mm cable

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Technical Specification for 33 kV 3Cx400 sq mm cable

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 BSES network in Delhi Discom area, mostly under-ground (buried, with chances of flooding by water) or for laying on racks, in ducts, trenches, conduits, and so on.

Technical Specification for 33 kV 3Cx400 sq mm cable

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

Cable Code:

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.)

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
1.	33 kV, 3C x 400 sq. mm.	Al	A 2X W 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	a) Electrolytic Grade Stranded Aluminium Conductor b) Grade: H2 as per IS: 8130 / 1984 (For Al) c) Stranded, compacted and circular in shape
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Technical Specification for 33 kV 3Cx400 sq mm cable		
		<p>d) Class 2</p> <p>e) “Longitudinal Water-Blocking Arrangement” (or water-tight construction or water barrier protection) shall be provided within the Conductor by water swelling yarns/tapes in the interstices of the conductor. The fiber/yarn shall turn into jelly/swell, when in contact with water making the conductor water tight as per IEC 60502-2</p> <p>f) Semi-conducting water blocking tapes shall be applied over the conductor, suitable for continuous operating conductor temperature of 90 deg C.</p> <p>g) All detailed constructional features shall be shown in the cross-sectional drawing.</p>
2.1.2	Conductor Screen	<p>Extruded semi-conducting material.</p> <p>(Also refer Cl. 2.1.3.)</p> <p>(Tapes are not acceptable)</p>
2.1.3	Insulation	<p>a) Extruded XLPE (Cross-Linked Poly-Ethylene) Insulation, with water-tree retardant (WTR) property</p> <p>b) The required compound used shall be from BSES-approved sub-vendors and not from any other (refer Annexure – C).</p> <p>c) Uniform thickness of insulation shall be within the permissible values as per IEC Standards; eccentricity check shall be carried out to ensure this.</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.</p>

Technical Specification for 33 kV 3Cx400 sq mm cable		
		<p>(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.</p> <p>d) Compound used shall be suitable for the operating temperature of the Cable and shall be compatible with the insulation used.</p>
2.1.5	XLPE Process	
2.1.5.1	33 KV	Dry Cure and Dry Cooling process only.
2.1.5.2	Extrusion	The 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.
2.1.5.3	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 BSES, prior to sourcing the compounds and taking up manufacturing of cable.
2.1.6	Water-Swellable Tape	<p>a) Semi-Conducting Water-Sellable Tape shall be provided, under the copper tape, on each core.</p> <p>b) Nominal thickness : 0.3 mm</p> <p>c) Weight: 118 gm / sq. m apprx.</p> <p>d) Swell height: ≥ 12 mm in 1 min.</p> <p>e) Compatible to strippable / non-strippable semi-con, over which it is applied.</p>
2.1.7	Core Identification	a) For 3-core cables, cores shall be identified by coloured strips (Red, Yellow, Blue), applied

Technical Specification for 33 kV 3Cx400 sq mm cable		
		<p>helically / longitudinally below the copper tape.</p> <p>The coloured strips shall carry the name of manufacturer permanently printed at 1 meter intervals; this is to provide additional identification of manufacturer of the cable.</p>
2.1.8	Copper Tape	<p>Copper Tape of minimum thickness 0.1 mm shall be applied helically over the layer formed after application of insulation screen, water-swellaable tape and identification strip.</p> <p>Zero Negative tolerance in thickness of copper tape</p>
2.1.9	Filler	<p>a) All interstices, including center interstices shall be filled by PP filler.</p> <p>b) PP Filler shall be non-hygrosopic, not having any effect on other compounds used, stable at cable temperatures, etc.</p> <p>c) PVC filler is not acceptable.</p> <p>d) Filler is not applicable for single-core cables.</p>
2.1.10	Binder Tape	As per manufacturer's standard
2.1.11	Inner Sheath	Extruded Inner Sheath of Black PVC type ST-2 (IS 5831)
2.1.12	Armour	<p>a) For 3-core Cables :</p> <p>Galvanised Steel round wire armour</p> <p>b) Minimum area of coverage of armouring shall be 90 % (min.). At any time, the gap between any two adjacent armour wires shall not be more than the diameter of wire.</p> <p>c) Zero negative tolerance is for :</p> <ul style="list-style-type: none"> Diameter of armour wire

Technical Specification for 33 kV 3Cx400 sq mm cable		
2.1.13	Binder Tape	Rubberised cotton tape
2.1.14	Outer Sheath	<p>a) Extruded outer sheath of PVC (ST-2 as per IS 5831) with termite-repellant and anti-rodent properties. Color - Blue (Outer Sheath shall be FRLS-type, if chosen by purchaser.)</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.</p> <p>c) The Outer Sheath shall be embossed as well as laser printed with following minimum text at a interval of 1 mtr:</p> <ol style="list-style-type: none"> 1. The voltage designation 2. Type of construction / cable code (e.g. A2XWY) 3. Manufacturer's Name and Trade-mark 4. Number of cores and nominal cross-sectional area of conductor 5. Name of buyer / purchaser, 6. Month & Year of manufacturing 7. IS reference, i.e. IS : 7098 8. 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.) 9. Purchase Order Number & date 10. Word ' FRLSH ', in case the cable is of FRLSH type. <p>Note:</p> <ul style="list-style-type: none"> ○ Drum no and Progressive length marking

Technical Specification for 33 kV 3Cx400 sq mm cable		
		<p>shall be provided by Laser printing at every meter with proper contrast in colouring</p> <ul style="list-style-type: none"> Progressive (sequential) length marking of cable shall be at every meter, starting from zero for every drum
2.1.15	Pulling-eye Assembly and Sealing-end Cap (for Cables)	<p>a) A cable pulling-eye assembly Drg. No. MISC/E/4-1131/1699 (see Annexure-F) 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/4-1131/1698 (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	<p><u>1) To Qualify in Tender:</u></p> <p>Cables must be of type tested quality. Type Test Reports shall be submitted for the type, size and voltage rating of cable offered in the bid.</p> <p>For participation in the tender Type Test report shall be submitted from CPRI/ERDA only and shall not be more than 5 years old from the date of tender. If the report is more than 5 years and</p>

Technical Specification for 33 kV 3Cx400 sq mm cable		
		<p>but less than 10 years old than bidder to submit undertaking that there is no design changes from the Type test conducted.</p> <p>2) <u>Type Test Required After Award of PO:</u></p> <p>Type test on one cable drum of each type/rating from any lot shall be conducted at CPRI/ERDA on sample basis as per relevant IS/IEC. Sample shall be sealed by BSES during inspection of cable. This type test is applicable subject to BSES requirement and cost shall be borne by BSES.</p>
	b) BSES QAP (Typical)	In general, all tests mentioned in the BSES QAP (Characteristics – Typical) mentioned in Annexure-G shall be included in the Routine Tests, Type Tests and Acceptance Tests stated above.
	c) Routine Tests	<ol style="list-style-type: none"> 1. Measurement of Electrical Resistance 2. HV Test with power frequency AC voltage 3. PD test 4. “Strippability Test” at both the ends of cable for each drum, to check the freely-strippable property of the Insulation Screen (outer semi-con). 5. Impulse voltage test of one drum 6. Armour coverage measurement 7. Physical test-Dimensions of each and every layer and components. <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"> 1. The Buyer reserves the right to witness all tests specified on completed cables. 2. The Buyer reserves the right to inspect cables at Sellers works at any time prior to dispatch, to verify compliance with the specifications. 3. In-process (stage inspection) and final

Technical Specification for 33 kV 3Cx400 sq mm cable		
		<p>inspection call intimation shall be given sufficiently in advance to the purchaser.</p> <p>4. 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.</p>
	e) Acceptance Tests	<p>Acceptance Tests shall be conducted as per Cl. 18.2 of IS 7098 (Part-2) and the approved Quality Assurance Plan (QAP) in each lot of cables.</p> <p>Following tests shall also be carried out during the Acceptance Tests :</p> <p>a) "Wafer Boil Test" for checking integrity of semi-conducting layers.</p> <p>b) "Void-and-contamination Test" for the Insulation</p> <p>c) "Strippability Test" at both the ends of cable for each drum, to check freely-strippable property of the Insulation Screen (outer semi-con).</p> <p>d) "Water Penetration Test (WPT)", as per applicable IEC standards, to check adequacy of water-blocking arrangement provided inside the conductor.</p> <p>e) Heating cycle test along with potential shall be applicable on sample basis once in a PO. Jointing and Termination kits required for this test shall be in the scope of bidder.</p> <p>f) Impulse voltage test</p> <p>Internal type test shall be carried out once against each tender, on sample basis at manufacturer lab.</p>
	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</p>

Technical Specification for 33 kV 3Cx400 sq mm cable		
		<p>the Purchaser.</p> <p>Note :</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	<p>a) Refer Annexure-A regarding Document Submission.</p> <p>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.</p>
5.0.1	Documents to be submitted along with bid	<p>The vendor shall submit :</p> <ul style="list-style-type: none"> a) Cross-sectional drawing 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	<p>Within 15 days, the seller has to submit four sets of above-mentioned drawings, along with one soft copy</p>

Technical Specification for 33 kV 3Cx400 sq mm cable		
		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) 33 KV, Three core	a) 300 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, cables, minimum acceptable short length cable can be 150 meter 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	<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. Alternatively PP sheets can

Technical Specification for 33 kV 3Cx400 sq mm cable		
		<p>be put as protective covers.</p> <p>5. 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.</p>
	<p>b) Drum Identification Markings:</p>	<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.</p> <ol style="list-style-type: none"> 1. Drum identification number 2. Cable voltage grade 3. Cable code (e.g. A2XWY, 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	<p>Non Returnable Steel drums, as per relevant IS / IEC.</p> <p>(Steel drums shall be with M.S. spindle plate with nut-bolts)</p>
	f) Cable Drum handling	The drums shall be with M.S. spindle plate (with nut-

Technical Specification for 33 kV 3Cx400 sq mm cable		
		bolts) of adequate size to suit the spindle rods, normally required for handling the drums, according to expected weight of the cable drums.
8.0.0	Quality Assurance Plan (QAP)	
8.0.1	Vendor's QAP	Manufacturer shall submit QAP in line with BSES QAP format (Annexure-G) for purchaser's approval.
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: <ul style="list-style-type: none"> 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	<p>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.</p> <p>b) In the absence of any list of deviation, it will be</p>

Technical Specification for 33 kV 3Cx400 sq mm cable

		<p>assumed by the Buyer that the Seller complies fully with this specification.</p> <p>c) Any deviations mentioned in any other submitted bid documents (i.e.in filled GTP, Catalog, BSES old approval, buyer's/seller's standards etc) by seller without separate deviation sheets with BSES acceptance, will not be considered as a deviation from this tech spec at any stage of contract.</p>
--	--	---

Technical Specification for 33 kV 3Cx400 sq mm cable

Annexure – A**Scope, Documentation and Delivery schedule**

Document/Drawing submission shall be as per the matrix given below:

- a. All documents/drawings shall be provided in soft copy only in returnable Pen drives
- b. Language of the documents shall be English only.
- c. Incomplete submission shall be liable for rejection.
- d. Document check sheet compliance shall be the first sheet for each submission stage i.e. Technical bid, Drawing Approval, Pre Dispatch, Pre closure
- e. No submission is acceptable without check list compliance.
- f. Deficient/ improper document/ drawing submission shall be liable for rejection.
- g. Order of documents shall be strictly as per the check list.
- h. Any document 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	For Tender	For Approval/Review	Final Submission
1	Guaranteed Technical Particulars (GTP)	Required	Required	Required
2	Deviation Sheet, if any	Required	Required	Required
3	Detailed cross sectional drawing of cable and drum	Required	Required	Required
4	Installation Instructions		Required	Required
5	Manual/Catalogue	Required	Required	Required
6	Cable de-rating factors		Required	Required
7	Type test reports of offered type and rating of cable	Required	Required	Required
8	BIS certificate	Required		
9	Make of Raw Materials	Required	Required	Required
10	Inspection and test reports, carried out in manufacturer's works			Required
11	Routine Test Certificates			Required
12	Test certificates of all the raw materials			Required

Technical Specification for 33 kV 3Cx400 sq mm cable

Annexure - B**GUARANTEED TECHNICAL PARTICULARS
(GTP)****Note:**

- 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			
	a) 33 kV, 3c x 400 sq. mm.	A2XWY		
6.0	Voltage Grade			
	a) 33 kV, 3c	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		

Technical Specification for 33 kV 3Cx400 sq mm cable				
E	Dia. of wires in each conductor before compaction	Manufacturer Standard	mm	
F	Diameter over conductor		mm	
G	Maximum Conductor resistance at 20 ° C			
	c) 33 kV, 3c x 400 sq. mm.	0.0778	ohm/km	
H	Longitudinal Water Blocking Arrangement within conductor	Is it provided and shown in the cross-sectional drawing? (Yes / No)		
I	Semiconducting water blocking tape over conductor	Yes/No		
J	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)	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			
	33 kV, 3c	8.8	mm	
C	Minimum thickness			
	b) 33 kV, 3c	7.82	mm	
D	Diameter over Insulation (Approx.)		mm	
E	Make and grade of Insulation compound			
F	Eccentricity	As per IEC standards	%	
G	Water-tree retardant property	Required		
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	As per IEC Standards	%	

Technical Specification for 33 kV 3Cx400 sq mm cable				
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 BSES	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.			
11D.	Copper Tape			
	i) Dimensions	a) Thickness : $0.1 \pm 5\%$ b) Width : 50 mm C) Overlap: 20% d) No Negative tolerance on thickness of copper tape	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. 2.1.9 (Specify no. & size of filler at center & core interstices)		

Technical Specification for 33 kV 3Cx400 sq mm cable				
	a) 33 kV, 3c x 400 sq. mm.			
12A.0	Binder Tape	over laid-up cores		
13.0	Inner Sheath			
A	Material and type	As per Cl. 2.1.11		
B	Minimum thickness			
	a) 33 kV, 3c x 400 sq. mm.	0.7	mm	
C	Approx. dia. over inner sheath		mm	
14.0	Armour			
A	Material			
	33 kV, 3Cx400	G. I. Round wire	No.	
B	Armour – GI round wire a) Minimum Dia of wire b) Number of wire (min.)	a) 4.00 (zero negative tolerance) b) As per manufacturer calculation	mm nos.	
C	Approx. Equivalent Area		sq. mm.	
D	Area covered by armour	Min. 90 % Calculation shall be attached.	%	
E	Dia. over armour - apprx.		Mm	
F	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. 2.1.14		
B	Thickness (min.)	** As per Table-5 of IS 7098 Part-2		
	a) 33 kV, 3c x 400 sq. mm.	**	mm	
C	Color	Blue		
D	Embossing (details as per Cl. 2.1.14)	Yes / No		
E	FRLS Properties	As per customer's requirement		
16.0	Approx. overall diameter		mm	
17.0	Standard drum length with tolerance			
	a) 33 kV, 3c x 400 sq. mm.	300 +/- 5%	meters	
17A	Overall order tolerance	- 2 % for the total		

Technical Specification for 33 kV 3Cx400 sq mm cable				
		cable length for the entire order.		
18.0	Cable Drum			
a.	Type of drum	Steel (Specify the relevant IS / IEC followed for drum design)		
b.	Markings on the drum (as per Cl. 7.0.0)	On both faces		
18A.0	Cross-Sectional Drawing (ref. Cl. 5.0.0)	Is drawing submitted, showing every feature of constructions? (Yes / No)		
19.0	a. Sealing-end Cap (provided at both ends)	Yes/No Is manufacturer's / Sub-Vendor's drawing submitted? (Yes / No)		
	b. Cable pulling eye at one end and Sealing end cap at other end	Yes/No 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	300 mtr	Kg	
	c) Weight of Cable with drum	300 mtr	kg	
	d) Drum size	300 mtr	mm	
	e) Drawing of Drum	Required	--	
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		ohm / km	

Technical Specification for 33 kV 3Cx400 sq mm cable				
	impedance			
F	Negative sequence impedance		ohm / km	
G	Capacitance		micro-farad / km	
H	Conductance		Amperes per volts	
I	Inductive susceptance		mho	
J	Capacitive susceptance		ohms	
24.0	Recommended minimum bending radius	15 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) 33 kV, 3c x400	Dry Cure and Dry Cooling 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)	Is QAP Format (Annexure-F), duly filled in and enclosed? (Yes / No)		

Technical Specification for 33 kV 3Cx400 sq mm cable

31.0	List of Sub-Vendors for construction items (Annexure-C)	Is this list enclosed for BSES approval? (Yes / No)		
------	--	---	--	--

Technical Specification for 33 kV 3Cx400 sq mm cable

Annexure - C**List of Sub-Vendors
for critical items**

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.	Raw Materials		Name of the Suppliers
1.	XLPE Compound	1	Dow Chemicals , U.S.A.
		2	Borealis , Sweden
		3	Hanwha , South Korea
2.	Semi-Conducting Compound	1	Dow Chemicals, U.S.A.
		2	Borealis , Sweden
		3	Hanwha , South Korea
3.	Conductor Water-Blocking tapes / yarn / powder	1	Lantor
		2	Geca
		3	Miracle
		4	Scapa
		5	Sneham International
4.	Water-Swellable Tapes (Pre-slitted)	1	Lantor
		2	Geca
		3	Miracle
		4	Scapa
		5	Sneham International
5.	Aluminium Rod	1	Bharat Aluminium Co. Ltd. (BALCO)
		2	Hindustan Aluminium Co. Ltd. (HINDALCO)
		3	National Aluminium Co. Ltd. (NALCO)
		4	Vedanta (Sesa Sterlite)

Technical Specification for 33 kV 3Cx400 sq mm cable			
6.	Copper Tape	1	Aggarwal Metal
		2	Indian Smelting
		3	Luvata Swedan
		4	Outokumpu Copper Strip AB, Swedan
7	Galvanized Steel Wires / Strips	1	Tata
		2	Balaji
		3	Systematic
		4	Mica Wires Pvt Ltd.
		5	Bansal Industries
8	PVC Compound	1	Kalpana
		2	Universal
		3	SCJ Plastic
		4	Sriram Polytech
		5	Shri Ram Vinyl, Kota
9	P. P. Fillers	1	Vijoy Polymers
		2	Yash Polymers
		3	AVSL Industries
10	Core Identification Tape	1	AVSL Industries
		2	Yash Polymer
		3	Vijoy Polymers
11	PE Compound	1	Borealis
		2	Shakun
		3	Kalpana

Technical Specification for 33 kV 3Cx400 sq mm cable

Annexure - D**Service Conditions**

(Atmospheric / Soil conditions at Site)

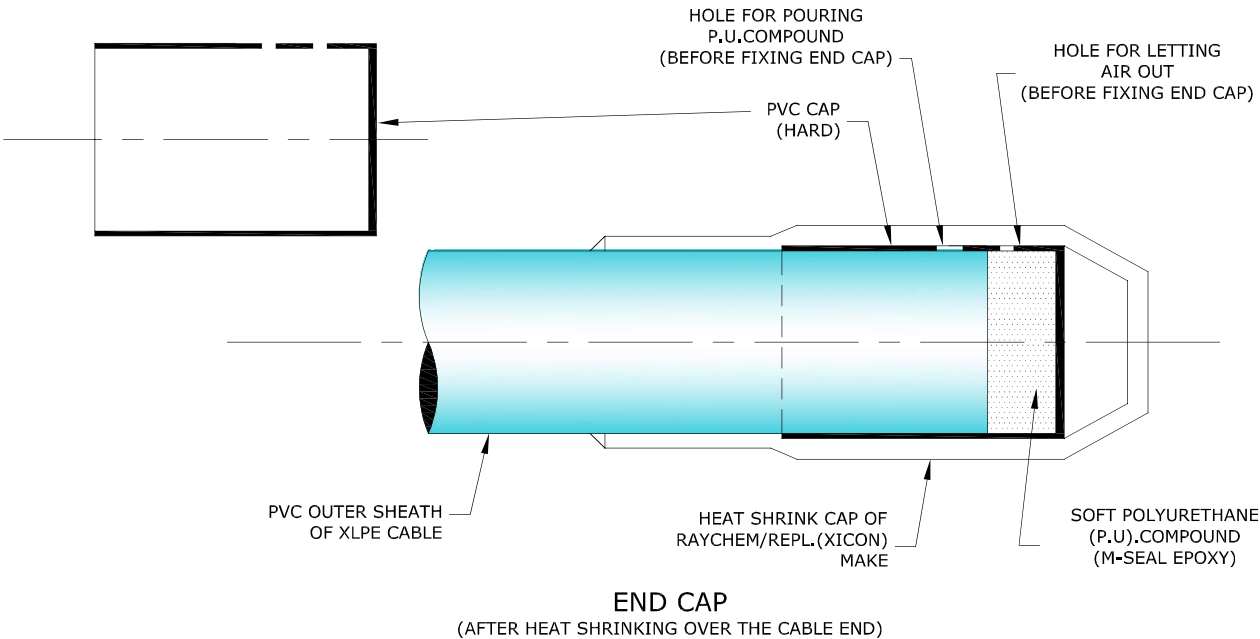
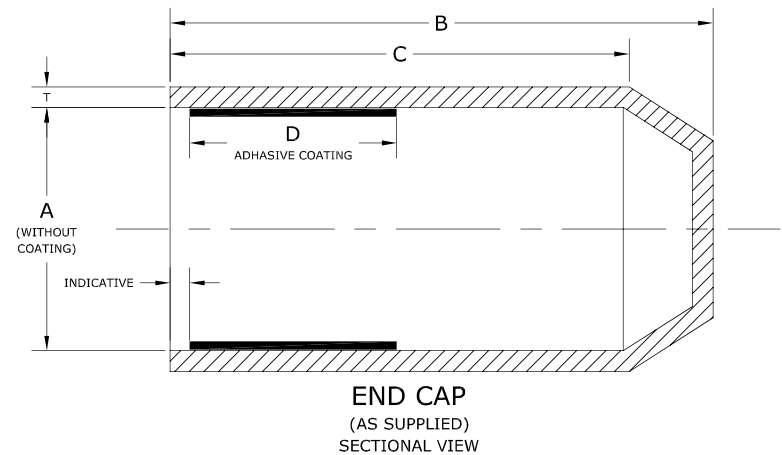
A. Delhi		
a)	Average grade atmospheric condition	Heavily polluted, dry
b)	Average grade soil condition	
c)	Maximum altitude above sea level	1000 M
d)	Air temperature Ambient	i) Highest : 50 deg C ii) Average : 40 deg C iii) Minimum : 0 deg C
e)	Relative Humidity	100 % max
f)	Thermal Resistivity of Soil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

ANNEXURE E

DIMENSIONS

SIZE	A EXP.(Min.)	A REC.(Max.)	B EXP.(Min.)	C EXP.(Min.)	D EXP.(Min.)	LC %	T (WALL REC. ± 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



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 D-149 / IEC 243
3 Dielectric Constant	Type	5 (max)	ASTM D-150 / IEC 250

- Note : 1) All dimension in mm
2) Colour Black
3) Size as mentioned in the table shall be stencilled on respective item

BSES

DRAWING No. MISC/E/4-1131/1698

SCALE :NOT TO SCALE

DATE: 09-05-2011

**END SEALING CAP
(FOR XLPE CABLE)**

DRAWN BY:

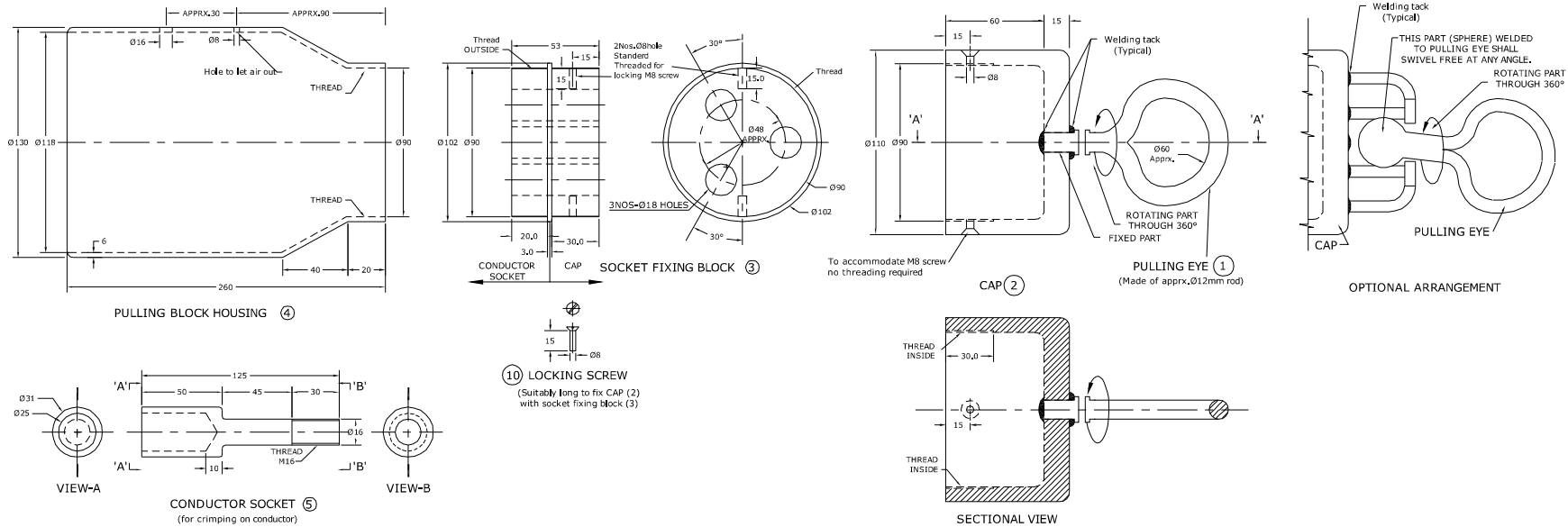
CHECKED BY:

APPROVED BY:

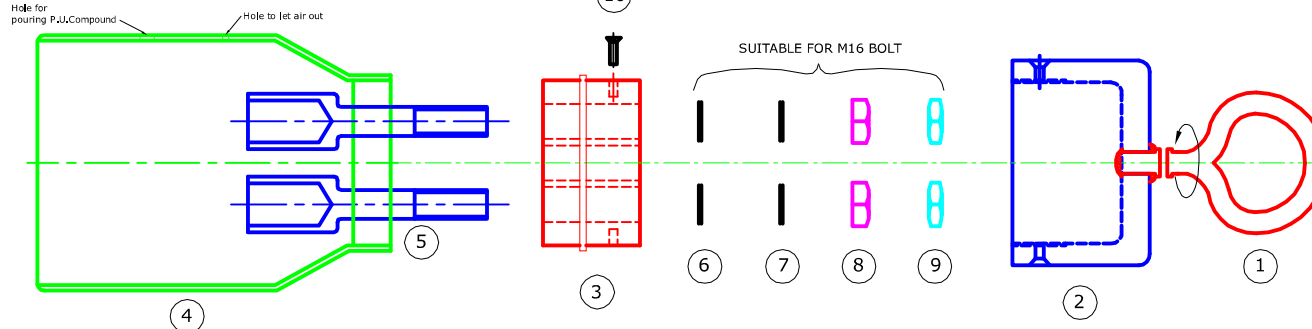
REVISIONS

Addl V.P.

ANNEXURE F



Exploded View



10	LOCKING SCREW	2	M.S.Zinc-Plated
9	LOCK NUT	3	M.S.Zinc-Plated
8	NUT	3	M.S.Zinc-Plated
7	SPRING, WASHER	3	M.S.Zinc-Plated
6	PLAIN WASHER	3	M.S.Zinc-Plated
5	CONDUCTOR SOCKET	3	AL.
4	PULLING BLOCK HOUSING	1	M.S.Zinc-Plated
3	SOCKET FIXING BLOCK	1	M.S.Zinc-Plated
2	CAP	1	M.S.Zinc-Plated
1	PULLING EYE	1	M.S.Zinc-Plated
NO.	DISCRIPTION	QTY.	MATERIAL

BSES

DRAWING No. MISC/E/4-1133/1699

SCALE :NOT TO SCALE

DATE: 09-05-2011

CABLE PULLING EYE ASSEMBLY (TYPICAL)

DRAWN BY:

CHECKED BY:

APPROVED BY:

REVISIONS

Addl V.P.

EXAMPLE:

- 1) For cable size 33kV, 3/C X 400sq mm Al XLPE.
 - 2) Diameter over conductor : 23.8mm approx.
- Overall diameter : 108±3mm approx.
Pulling force applicable on the cable : 30 N/sq mm
Pulling eye shall withstand total force of : 36000N+Safety margin

NOTE:

- 1) All Dimensions are in mm, unless otherwise stated.
- 2) This drawing is typical / indicative. Separate dimensioned drawing for cable pulling eye assembly, suitable for required size & rating of cables, shall be submitted for approval, prior to manufacturing.
- 3) After fixing cable pulling eye, P.U. (Poly-Urethane) Compound shall be poured to occupy inner spaces to avoid ingress of Water / Moisture.
- 4) After P.U. Compound oozes/flows out from the cable side, the same edge shall be sealed with suitable sleeve/Tape.

Final Assembly



ANNEXURE G: QUALITY ASSURANCE PLAN (QAP)

FOR 33 & 66 kV EHV CABLES

S. NO.	COMPONENT & OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			Remark
									SV	MFR	BSES	
1	2	3	4	5	6	7	8	9	10	11	12	13
	Legend : SV : Sub-Vendor of Cable Manufacturer, MFR : Cable Manufacturer, MPS : Material Purchase Specification,											
	P : Perform, W : Witness, V : Verification											
A RAW MATERIAL												
1	Aluminium/Copper Rod	a) Tensile strength	Major	Physical	Sample	MPS	MPS	Reg./Sheet	P	P/V	V	
		b) Resistivity	Major	Electrical	Sample	MPS	MPS	Reg./Sheet	P	P/V	V	
		c) Diameter	Major	Physical	Sample	MPS	MPS	Reg./Sheet	P	P/V	V	
		d) Chemical composition	Major	Chemical	Sample	MPS	MPS	Test certificate	P	V	V	
		e) Surface finish	Major	Visual	Sample			-	P	P	_	
2	PVC Compound	a) Tensile Strength	Major	Physical	Sample	MPS	MPS	Reg./Sheet	P	P/V	V	
		b) Elongation at break	Major	Physical	Sample	MPS	MPS	Reg./Sheet	P	P/V	V	
		c) Thermal stability	Major	Physical	Sample	MPS	MPS	Reg./Sheet	P	P/V	V	
3	TR-XLPE Compound (Borealis/Dow chemical/ Hanwa)	a) Packing	Minor	Visual	100%	MPS	MPS	-	P	V	-	
		b) Tensile Strength	Major	Physical	Sample	MPS	MPS	Reg./Sheet	P	P/V	V	
		c) Elongation at break	Major	Physical	Sample	MPS	MPS	Reg./Sheet	P	P/V	V	
		d) Hot set test	Major	Physical	Sample	MPS	MPS	Reg./Sheet	P	P/V	V	
		e) Volume Resistivity	Major	Electrical	Sample	MPS	MPS	Reg./Sheet	P	P/V	V	
		f) Cure Curve (Max. Torque)	Major	Physical	Sample	MPS	MPS	Reg./Sheet	-	P	V	
		g) Density	Major	Physical	Sample	MPS	MPS	Reg./Sheet	P	P/V	V	
4	Semi-conducting Compound (Borealis/Dow chemical/ Hanwa)	a) Packing	Minor	Visual	100%	MPS	MPS	-	P	V	-	
		b) Volume Resistivity	Major	Electrical	Sample	MPS	MPS	Reg./Sheet	P	P/V	V	
		c) Tensile Strength	Major	Physical	Sample	MPS	MPS	Reg./Sheet	P	P/V	V	
		d) Elongation at break	Major	Physical	Sample	MPS	MPS	Reg./Sheet	P	P/V	V	
		e) Cure Curve (Max. Torque)	Major	Physical	Sample	MPS	MPS	Reg./Sheet	-	P	V	
		f) Density	Major	Physical	Sample	MPS	MPS	Reg./Sheet	P	P/V	V	
5	Copper tape	a) Thickness & width	Major	Physical	Sample	MPS	MPS	Reg./Sheet	P	P/V	V	
		b) Tensile Strength	Major	Physical	Sample	MPS	MPS	Reg./Sheet	P	P/V	V	
		c) Elongation at break	Major	Physical	Sample	MPS	MPS	Reg./Sheet	P	P/V	V	
		d) Resistivity	Major	Electrical	Sample	MPS	MPS	Reg./Sheet	P	P/V	V	
6.	Armour wires/strips (Galvanised steel)	a) Dimensions	Major	Physical	Sample	MPS	MPS	Reg./Sheet	P	P/V	V	
		b) Surface condition/finish	Major	Visual	Sample	MPS	MPS	Reg./Sheet	P	P/V	V	
		c) Tensile Strength	Major	Physical	Sample	MPS	MPS	Reg./Sheet	P	P/V	V	
		d) Elongation at break	Major	Physical	Sample	MPS	MPS	Reg./Sheet	P	P/V	V	
		e) Torsion test for round wire	Major	Physical	Sample	MPS	MPS	Reg./Sheet	P	P/V	V	
		f) Wrapping test	Major	Physical	Sample	MPS	MPS	Reg./Sheet	P	P/V	V	
		g) Mass of zinc coating	Major	Physical	Sample	MPS	MPS	Reg./Sheet	P	P/V	V	
		h) Uniformity of zinc coating	Major	Physical	Sample	MPS	MPS	Reg./Sheet	P	P/V	V	
		i) Adhesion test	Major	Physical	Sample	MPS	MPS	Reg./Sheet	P	P/V	V	
		j) Resistivity test	Major	Electrical	Sample	MPS	MPS	Reg./Sheet	P	P/V	V	
7	Water Swellable	a) Dimensions	Minor	Physical	Sample	MPS	MPS	Reg./Sheet	P	P/V	V	



ANNEXURE G: QUALITY ASSURANCE PLAN (QAP)

FOR 33 & 66 kV EHV CABLES

S. NO.	COMPONENT & OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			Remark
1	2	3	4	5	6	7	8	9	10	11	12	13
	Legend : SV : Sub-Vendor of Cable Manufacturer, MFR : Cable Manufacturer, MPS : Material Purchase Specification,											
	P : Perform, W : Witness, V : Verification											
	tape	b) Swelling height	Major	Physical	Sample	MPS	MPS	Reg./Sheet	P	P/V	V	
		c) Resistivity	Major	Electrical	Sample	MPS	MPS	Reg./Sheet	P	P/V	V	
		d) Weight	Major	Physical	Sample	MPS	MPS	Reg./Sheet	P	P/V	V	
8	Steel Drum	a) Dimension	Major	Meas.	1 sample per size	IS 10418 / Purchase order		-	P	P	-	
		b) Finish & workman ship	Minor	Visual	1 sample per size	Compliance to standard Engineering norms & free from surface defects		-	P	P	-	
9	Binder tape	a) Dimensions & material	Minor	Physical	Sample	MPS	MPS	-	P	P	-	
10	Polypropylene filler	a) Size	Minor	Physical	Sample	Purchase order	Purchase order	-	P	P	-	
11	Heat shrinkable end cap	a) Bore diameter	Major	Physical	1 sample per size	--	--	-	-	P	-	
		b) Length of end cap	Minor	Physical	1 sample per size	--	--	-	-	P	-	
B PROCESS INSPECTION												
1	Wire Drawing	a) Diameter	Major	Physical	Sample			Reg./Sheet	-	P	V	
		b) Surface finish	Major	Visual	100 %	Smooth & free from defects		--	-	P	-	
		c) Tensile test (for Al)	Major	Physical	Sample	IS: 8130/84	IS: 8130/84	Reg./Sheet	-	P	V	
		d) Elongation test (for Cu)	Major	Physical	Sample	IS: 8130/84	IS: 8130/84	Reg./Sheet	-	-	V	
		e) Wrapping test (for Al)	Major	Physical	Sample	IS: 8130/84	IS: 8130/84	Reg./Sheet	-	P	V	
2	Stranding	a) No. of wires/strands	Major	Physical	At the time of m/c setting			Reg./Sheet	-	P	V	
		b) Lay length & Lay direction	Major	Physical	-do-			-	-	P	V	
		c) Dia of conductor	Major	Physical	During setting & once in each shift			Reg./Sheet	-	P	V	
		d) Surface finish	Major	Visual	100 %	No surface defects and free from sharp edges, scratches, grease, oil etc.		-	-	P	-	
3	Core extrusion (Conductor screen, Insulation & insulation screen)	a) Compound Make/Grade	Major	Visual	During m/c setting			-	-	P	-	Insulation screen shall be freely strippable, without application of heat.
		b) Thickness of insulation & extruded S.C. layers	Major	Physical	During m/c setting after stabilisation	Tech. Data Sheet / IS 7098/II/2011	Tech. Data Sheet / IS 7098/II/2011	Reg./Sheet	-	P	V	
		c) Surface finish	Minor	Visual	100 %	Smooth & free from defects		-	-	P	-	
		d) Printing on outer semi- conducting layer	Major	Visual	100 %	"DO NOT HEAT, FREELY STRIPPABLE"		-	-	P	-	
		e) Tensile Strength	Major	Physical	Sample	IS 7098/II/2011	IS 7098/II/2011	Reg./Sheet	-	P	V	
		f) Elongation at break	Major	Physical	Sample	IS 7098/II/2011	IS 7098/II/2011	Reg./Sheet	-	P	V	
		g) Hot set test	Major	Physical	Sample	IS 7098/II/2011	IS 7098/II/2011	Reg./Sheet	-	P	V	
		g1) Ovality of core	Minor	Physical	Sample	Tech. Data Sheet	Tech. Data Sheet	Reg./Sheet	-	P	V	



ANNEXURE G: QUALITY ASSURANCE PLAN (QAP)

FOR 33 & 66 kV EHV CABLES

S. NO.	COMPONENT & OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			Remark
									SV	MFR	BSES	
1	2	3	4	5	6	7	8	9	10	11	12	13
	Legend : SV : Sub-Vendor of Cable Manufacturer, MFR : Cable Manufacturer, MPS : Material Purchase Specification, P : Perform, W : Witness, V : Verification											
		h) Eccentricity of insulation	Minor	Physical	Sample	Tech. Data Sheet	Tech. Data Sheet	Reg./Sheet	-	P	V	
		i) Core diameter	Minor	Physical	Sample	Tech. Data Sheet	Tech. Data Sheet	Reg./Sheet	-	P	V	
		j) Void & contamination test for insulation (Silicon Oil test)	Major	Physical	Sample			-	-	P	V	
		k) Wafer boil test for extruded semi-conducting layers	Major	Physical	1 sample/lot	BIS draft Specn	BIS draft Specn	Reg./Sheet	-	P	V	
4	Taping - water Swellable semi-conducting	a) Dimensions	Minor	Physical	Sample	Tech. Data Sheet	Tech. Data Sheet	-	-	P	-	
		b) Tape Application (Overlap)	Minor	Visual	During m/c setting	Suitable overlap	Suitable overlap	-	-	P	-	
5	Taping - Copper tape	a) Width & Thickness of tape	Major	Physical	During m/c setting	Tech. Data Sheet	Tech. Data Sheet	Reg./Sheet	-	P	V	
		b) Number of tapes	Major	Visual	During m/c setting	Tech. Data Sheet	Tech. Data Sheet	Reg./Sheet	-	P	V	
		c) Tape application (Overlap)	Minor	Visual	During m/c setting	Tech. Data Sheet	Tech. Data Sheet	-	-	P	-	
6	Laying up	a) Identification of cores	Major	Visual	During m/c setting	Tech. Data Sheet	Tech. Data Sheet	-	-	P	-	Cores shall be laidup with PP fillers & suitable tape binder shall be provided over laid up assembly
		b) Direction of lay, core Sequence & Lay length	Major	Visual	During m/c setting	IS 7098/II/2011, PIL-W-02	IS 7098/II/2011, PIL-W-02	-	-	P	-	
		c) Application of binder tape	Minor	Visual	During m/c setting	Tech. Data Sheet		-	-	P	-	
		d) Shape of laid up assembly	Minor	Visual	100%	Reasonably circular	Reasonably circular	-	-	P	-	
7	Inner sheath	a) Material & type	Major	Visual	During m/c setting	Tech. Data Sheet	Tech. Data Sheet	-	-	P	-	
		b) Thickness	Major	Physical	During m/c setting & drum change	Tech. Data Sheet & IS 7098/II/2011	ech. Data Sheet & IS 7098/II/2011	Reg./Sheet	-	P	V	
		c) Surface finish	Minor	Visual	100 %	Surface shall be smooth & free from defects		-	-	P	-	
		d) Colour of inner sheath	Major	Visual	100 %	Tech. Data Sheet	Tech. Data Sheet	-	-	P	-	
8	Armouring	a) Dimension of armour wires/strips	Major	Physical	During m/c setting	Tech. Data Sheet	Tech. Data Sheet	Reg./Sheet	-	P	V	No negative tol. on strip thickness/wire diameter
		b) No. of armour strip/wire	Major	Counting	During m/c setting	Tech. Data Sheet	Tech. Data Sheet	Reg./Sheet	-	P	V	
		c) Armour coverage	Minor	Visual	During m/c setting	IS 7098/II/2011	IS 7098/II/2011	-	-	P	-	
		d) Direction of lay	Major	Visual	During m/c setting	IS 7098/II/2011	IS 7098/II/2011	-	-	P	-	
		e) Lay length/Gear setting	Minor	Visual	During m/c setting			-	-	P	-	
		f) Surface finish	Major	Visual	100 %	No cross over/over riding of wire/strip		-	-	P	-	
9	Outer sheath/Rewinding	a) Material & type	Major	Visual	During m/c setting	Tech. Data Sheet	Tech. Data Sheet	-	-	P	-	
		b) Anti rodent & termite additives	Major	Visual	Each loading			Reg./Sheet	-	P	V	



ANNEXURE G: QUALITY ASSURANCE PLAN (QAP)

FOR 33 & 66 kV EHV CABLES

S. NO.	COMPONENT & OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			Remark
									SV	MFR	BSES	
1	2	3	4	5	6	7	8	9	10	11	12	13
	Legend : SV : Sub-Vendor of Cable Manufacturer, MFR : Cable Manufacturer, MPS : Material Purchase Specification,											
	P : Perform, W : Witness, V : Verification											
		b) Thickness	Major	Physical	Each length	Tech. Data Sheet	Tech. Data Sheet	Reg./Sheet	-	P	V	
		c) Overall diameter	Major	Physical	Each length	Tech. Data Sheet	Tech. Data Sheet	Reg./Sheet	-	P	V	
		d) Surface finish & colour of sheath	Major	Visual	100 %	Surface smooth & free from defects. Colour as per Tech. Data Sheet		-	-	P	-	
		e) Cable length verification	Major	Visual	Each length	Manufacturing Plan	Manufacturing Plan	-	-	P	-	
		f) Marking	Major	Visual	Each length	As per approved GTP/cross sectiona drawing		Reg./Sheet	-	P	V	
C FINAL INSPECTION												
1	Routine tests	a) High Voltage	Critical	Electrical	100 %	IS 7098/II/2011	IS 7098/II/2011	Test Report	-	P	V	
		b) Conductor Resistance	Critical	Electrical	100 %	IS 8130/84	IS 8130/84	Test Report	-	P	V	
		c) Partial Discharge	Critical	Electrical	100 %	IS 7098/II/2011	IS 7098/II/2011	Test Report	-	P	V	
		d) Impulse	Critical	Electrical	One sample per lot			Test Report		P	V	
		e) Armour Coverage	Critical	Physical	One sample per lot			Test Report		P	V	
		f) Physiacal Dimensions	Critical	Physical	One sample per lot			Test Report		P	V	
		g) Freely Strippable insulation screen (Strippability Test)	Major	Physical	One sample per lot	Factory Standard	Factory Standard	Test Report	-	P	V	
2	Stage Inspection	Wire Drawing	Major	Visual	100 %	Tech. Data Sheet	IS/IEC	Test Report	-	P	W	Stage Inspection shall be conducted subject to BSES requirement
		Extrusion process	Major	Visual	100 %	Tech. Data Sheet	IS/IEC	Test Report	-	P	W	
		Raw maerial inspection at factory	Major	Physical	100 %	Tech. Data Sheet	IS/IEC	Test Report	-	P	W	
		Wrapping of Aluminium	Major	Physical	100 %	Tech. Data Sheet	IS/IEC	Test Report	-	P	W	
		Tensile test for Aluminium	Major	Physical	100 %	Tech. Data Sheet	IS/IEC	Test Report	-	P	W	
		a) Annealing test for copper	Major	Physical	Appendix A to IS 7098/II/2011, each lot sample basis	IS 8130/84	IS 8130/84	-	-	P	V	Verification of process records.
		b) Tensile test for aluminium	Major	Physical		IS 8130/84	IS 8130/84	-	-	P	V	
		c) Wrapping test for aluminium	Major	Physical		IS 8130/84	IS 8130/84	-	-	P	V	Tests N/A on finished conductor.
		d) Conductor resistance test	Major	Electrical	Appendix A to IS 7098/II/2011, each lot sample basis	IS 8130/84	IS 8130/84	Test Report	-	P	W	
		e) Test for thickness of insulation & sheath	Major	Physical		IS 7098/II/2011 & Tech. Data sheet	IS 7098/II/2011 & Tech. Data sheet	Test Report	-	P	W	
		f) Hot set test for insulation	Major	Physical		IS 7098/II/2011	IS 7098/II/2011	Test Report	-	P	W	



ANNEXURE G: QUALITY ASSURANCE PLAN (QAP)

FOR 33 & 66 kV EHV CABLES

S. NO.	COMPONENT & OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			Remark
									SV	MFR	BSES	
1	2	3	4	5	6	7	8	9	10	11	12	13
	Legend : SV : Sub-Vendor of Cable Manufacturer, MFR : Cable Manufacturer, MPS : Material Purchase Specification, P : Perform, W : Witness, V : Verification											
3	Acceptance tests	g) Tensile strength & Elongation at break of insulation & outer sheath	Major	Physical		IS 7098/II/2011 & IS 5831/84	IS 7098/II/2011 & IS 5831/84	Test Report	-	P	W	
		h) Partial discharge test	Critical	Electrical		IS 7098/II/2011	IS 7098/II/2011	Test Report	-	P	W	
		i) High voltage test	Critical	Electrical		IS 7098/II/2011	IS 7098/II/2011	Test Report	-	P	W	
		j) Insulation resistance (Volume resistivity) test	Major	Electrical		IS 7098/II/2011	IS 7098/II/2011	Test Report	-	P	W	
		k) Tests for dimension of armour wires/strips	Major	Physical	Each Lot Sample Basis	IS 3975, IS 10810 Pt. 36 & Tech. Data sheet		Test Report	-	P	W	
		l) Test for anti termite & anti rodent property of outer sheath	Major	Physical		Tech. Data Sheet	Tech. Data Sheet	Reg./Sheet	-	P	W	
		m) Rewinding of cable on drum	Major	Visual		To check cable appearance, drum appearance, cable winding, packing, embossing/printing/sequential marking		Reg./Sheet	-	P	W	
		n) Void & contamination test for insulation (Silicon Oil test)	Major	Physical				Reg./Sheet	-	P	W	
		o) Wafer boil test for extruded semi-conducting layers	Major	Physical				Reg./Sheet	-	P	W	
		p) Freely Strippable insulation screen	Major	Physical		Factory Standard	Factory Standard	Test Report	-	P	W	
		q) Water Penetration test (WPT) on core (i.e. Logitudinal Water Blocking Test)	Major	Physical		IEC:60502	IEC:60502	Test Report	-	P	W	Test shall be conducted for leakage of water through conductor.
		r) Armour coverage	Major	Physical		As per data sheet & FS	As per data sheet & FS	Test Report	-	P	W	
		s) Ovality	Major	Physical		As per data sheet	As per data sheet	Test Report	-	P	W	
		t) Eccentricity	Major	Physical		As per data sheet	As per data sheet	Test Report	-	P	W	
		u) Mass & uniformity & zinc coating on armour	Major	Physical		As per data sheet & FS	As per data sheet & FS	Test Report	-	P	W	
		v) Resistivity of Strip armour	Major	Electrical		As per data sheet & FS	As per data sheet & FS	Test Report	-	P	W	
		w) Swelling height of water swellable tape	Major	Physical		As per data sheet & FS	As per data sheet & FS	Test Report	-	P	W	
		x) Flammability test	Major	Physical		As per IS-78098/II/2011	As per IS-78098/II/2011	Test Report	-	P	W	
		y) Impulse withstand test	Critical	Electrical		IS 7098/II/2011	IS 7098/II/2011	Test Report	-	P	W	



ANNEXURE G: QUALITY ASSURANCE PLAN (QAP)

FOR 33 & 66 kV EHV CABLES

S. NO.	COMPONENT & OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			Remark
									SV	MFR	BSES	
1	2	3	4	5	6	7	8	9	10	11	12	13
	Legend : SV : Sub-Vendor of Cable Manufacturer, MFR : Cable Manufacturer, MPS : Material Purchase Specification,											
	P : Perform, W : Witness, V : Verification											
		z) Ageing & Water absorption test(Gravimetric) on Insulation & Outer sheath	Major	Physical		IS 5831/84	IS 5831/84	Test Report	-	P	W	
		z1) Heating Cycle with Potential	Critical	Electrical	sample basis, once per PO			Test Report	-	P	W	
		z2) Raw Material Verification in all aspects	Major	Physical	Each Lot					P	W	
		Z3) OFC Continuty Test and verification of outer sheath marking with continuous 15mm red strip for OFC embedded identification	Major	Physical	Each Lot					P	W	
4	Type tests at vendor's works	a) Tests on conductor										
		i) Annealing test for copper	Major	Physical		IS 8130/84	IS 8130/84	-	-	P	V	Verification of process records. Tests N/A on finished conductor.
		ii) Tensile test for aluminium	Major	Physical		IS 8130/84	IS 8130/84	-	-	P	V	
		iii) Wrapping test for aluminium	Major	Physical		IS 8130/84	IS 8130/84	-	-	P	V	
		iv) Conductor resistance test	Major	Electrical		IS 8130/84	IS 8130/84	Test Report	-	P	V	
		b) Tests for armouring wires/strips										
		i) Dimensions of wire/strip	Major	Physical		IS 3975, IS 10810 Pt. 36 & Tech. Data sheet		Test Report	-	P	W	
		ii) Tensile strength & Elongation at break	Major	Physical		IS 3975	IS 3975	Test Report	-	P	W	Only for Steel wires/strips
		iii) Torsion test for wire	Major	Physical		IS 3975	IS 3975	Test Report	-	P	W	
		iv) Winding test for strip	Major	Physical		IS 3975	IS 3975	Test Report	-	P	W	
		v) Uniformity of zinc coating	Major	Chemical		IS 3975	IS 3975	Test Report	-	P	W	
		vi) Mass of zinc coating	Major	Chemical		IS 3975	IS 3975	Test Report	-	P	W	
		vii) Resistivity of wire/strip	Major	Electrical		IS 3975	IS 3975	Test Report	-	P	W	
		c) Test for thickness of insulation & sheath	Major	Physical		IS 7098/II/2011 & Tech. Data sheet	IS 7098/II/2011 & Tech. Data sheet	Test Report	-	P	W	
		d) Physical tests for insulation									W	
		i) Tensile strength & Elongation test	Major	Physical		IS 7098/II/2011	IS 7098/II/2011	Test Report	-	P	W	
		ii) Ageing in air oven	Major	Physical		IS 7098/II/2011	IS 7098/II/2011	Test Report	-	P	W	
		iii) Hot set test	Major	Physical		IS 7098/II/2011	IS 7098/II/2011	Test Report	-	P	W	
		iv) Shrinkage test	Major	Physical		IS 7098/II/2011	IS 7098/II/2011	Test Report	-	P	W	
		v) Water absorption (gravimetric)	Major	Physical		IS 7098/II/2011	IS 7098/II/2011	Test Report	-	P	W	
		e) Physical tests for outer sheath									W	

One sample per Tender



ANNEXURE G: QUALITY ASSURANCE PLAN (QAP)

FOR 33 & 66 kV EHV CABLES

S. NO.	COMPONENT & OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			Remark
									SV	MFR	BSES	
1	2	3	4	5	6	7	8	9	10	11	12	13
	Legend : SV : Sub-Vendor of Cable Manufacturer, MFR : Cable Manufacturer, MPS : Material Purchase Specification, P : Perform, W : Witness, V : Verification											
		i) Tensile strength & Elongation test at break	Major	Physical		IS 5831/84	IS 5831/84	Test Report	-	P	W	
		ii) Ageing in air oven	Major	Physical		IS 5831/84	IS 5831/84	Test Report	-	P	W	
		iii) Shrinkage test	Major	Physical		IS 5831/84	IS 5831/84	Test Report	-	P	W	
		iv) Hot deformation test	Major	Physical		IS 5831/84	IS 5831/84	Test Report	-	P	W	
		v) Loss of mass in air oven	Major	Physical		IS 5831/84	IS 5831/84	Test Report	-	P	W	
		v) Heat shock test	Major	Physical		IS 5831/84	IS 5831/84	Test Report	-	P	W	
		vi) Thermal stability test	Major	Physical		IS 5831/84	IS 5831/84	Test Report	-	P	W	
		f) Electrical tests in sequence									W	
		i) Partial discharge test	Critical	Electrical		IS 7098/II/2011	IS 7098/II/2011	Test Report	-	P	W	
		ii) Bending test	Major	Physical		IS 7098/II/2011	IS 7098/II/2011	Test Report	-	P	W	
		iii) Partial discharge test	Critical	Electrical		IS 7098/II/2011	IS 7098/II/2011	Test Report	-	P	W	
		iv) Dielectric power factor as a function of voltage	Major	Electrical		IS 7098/II/2011	IS 7098/II/2011	Test Report	-	P	W	
		v) Dielectric power factor as a function of temperature	Major	Electrical		IS 7098/II/2011	IS 7098/II/2011	Test Report	-	P	W	
		vi) Heating cycle test	Major	Electrical		IS 7098/II/2011	IS 7098/II/2011	Test Report	-	P	W	
		vii) Dielectric power factor as a function of voltage	Major	Electrical		IS 7098/II/2011	IS 7098/II/2011	Test Report	-	P	W	
		viii) Partial discharge test	Critical	Electrical		IS 7098/II/2011	IS 7098/II/2011	Test Report	-	P	W	
		ix) Impulse withstand test	Critical	Electrical		IS 7098/II/2011	IS 7098/II/2011	Test Report	-	P	W	
		x) High voltage test	Critical	Electrical		IS 7098/II/2011	IS 7098/II/2011	Test Report	-	P	W	
		g) Insulation resistance (Volume resistivity test)	Major	Electrical		IS 7098/II/2011	IS 7098/II/2011	Test Report	-	P	W	
		h) Flammability test	Major	Physical		IS 7098/II/2011	IS 7098/II/2011	Test Report	-	P	W	
D PACKING & MARKING												
1	Packing & Marking	a) Cable end sealing	Major	Visual	100 %	IS 7098/II/2011/ Agreement	IS 7098/II/2011/ Agreement	-	-	P	W/V	BSES representative may verify these characteristics on randomly selected drums.
		b) Pulling eye at leading end- removed from vendor scope, end cap shall be provided at both the end of cable	Major	Visual	100 %	As per agreement	As per agreement	-	-	P	W/V	
		b) Stencilling/Marking on drum	Minor	Visual	100 %	IS 7098(Part 2):2011/ Agreement	IS 7098(Part 2):2011/ Agreement	-	-	P	V	



ANNEXURE G: QUALITY ASSURANCE PLAN (QAP)

FOR 33 & 66 kV EHV CABLES

S. NO.	COMPONENT & OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			Remark
									SV	MFR	BSES	
1	2	3	4	5	6	7	8	9	10	11	12	13
	Legend : SV : Sub-Vendor of Cable Manufacturer, MFR : Cable Manufacturer, MPS : Material Purchase Specification,											
	P : Perform, W : Witness, V : Verification											
Note		1. Checks specified above for Raw Material, In-Process and Final Inspection shall be as relevant to the specific cable construction. 2. Number of samples shall be selected as per Factory Standard/Agreement wherever 'sample' is indicated for extent of check. 3. Plant standards shall be followed in case Technical Data Sheet does not include requirements for characteristics to be checked. 4. BSES may witness Raw material and in process inspection in addition to Routine/Acceptance tests at any time/stage of manufacturing. 5. BSES's Inspector may randomly select a cable drum for type testing at vendor's works. 6. For each of the offered lot for inspection, BSES may randomly select one cable drum for testing of end cap "Destructive testing" to verify adhesion of sealing cap to cable outer sheath. . 7. All factory Type Tests shall be Witnessed by BSES										

Technical Specification for 33 kV 3Cx400 sq mm cable

Annexure- H**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

Annexure-I: Deviation Format

Sl. No.	Document Name	Clause No.	Deviation	Reason	Merit to BSES



Technical Specification
For Heat Shrinkable & Cold Shrinkable
Straight Through Jointing Kit
(11 KV, 33 KV, 66 KV XLPE Insulated Cables)

Specification no – BSES-TS-44-STTH-R0

Rev:		0
Pages		20
Date:		19 Apr 2022
Prepared by	Ashishhek Vashistha	
	Gautam Deka/Pronab Bairag	
Reviewed by	Puneet Duggal	
	Amit Toner	
Approved by	Gaurav Sharma	
	Gopal Naraya	

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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)**1.0.0 Scope of work**

- A. Heat Shrinkable / Cold shrinkable Straight 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. Supervision, during installation of joints at site if mentioned in the order.
- C. During post-installation period, if a joint fail 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, construction features and corresponding joint requirements of cables are indicated below:

- a. 11kV, 3-core x 150 sq mm AL
- b. 11kV, 3-core x 300 sq mm AL
- c. 11kV, 3-core x 400 sq mm AL (Conventional)
- d. 11kV, 3-core x 300/400 sq mm AL (Single and three core long barrel Repairing Joint)
- e. 11kV, 3-core x 400 sq mm AL (OFC embedded)
- f. 11kV, 1-core x 1000 sq mm AL
- g. 11kV, 1-core x 150 sq mm AL HTAB
- h. 11kV, 1-core x 95 sq mm AL HTAB
- i. 33kV, 3-core x 400 sq mm AL
- j. 33kV, 3-core x 400 sq mm AL (OFC embedded)
- k. 33kV, 3-core x 400 sq mm AL (Single and three core long barrel Repairing Joint)
- l. 66kV, 1-core x 630 sq mm AL
- m. 66kV, 1 core x 1000 sq mm AL
- n. 66kV, 1 core x 1000 sq mm AL (For Single core long barrel Repairing Joint)
- o. 66kV, 3-core x 300 sq mm AL
- p. 66kV, 3-core x 300 sq mm AL (OFC Embedded)

3.1.0	Conductor	a) Electrolytic Grade Stranded Aluminum 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 for 11 kV and Extruded TR-XLPE Insulation for 33 kV and 66 kV
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. In case of OFC embedded cable. 48 no OFC (36 single mode and 12 no multi mode) as a filler in 11kV 3CX400 sqmm cable, 33kV 3CX400 and 66 kV 3CX300 sqmm cable
3.1.7	Over all three cores	Binder tape
3.1.8	Inner Sheath	Extruded Inner Sheath of Black PVC type ST-2.

Technical Specification For Heat Shrinkable And Cold Shrinkable Straight Through Jointing Kit (11 kV, 33 kV, 66 kV XLPE Insulated Cables)

3.1.9	Armour	a) For 11 kV 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 1core 66kV Cable d) For 33kV and 66 kV 3-core cable- Galvanized Steel Round wire
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 cable. For 66 kV cable, HDPE ST 7 with termite- repellent and anti-rodent properties with extruded semicon/graphite layer over HDPE ST7.
3.1.12	HTAB Cable (1CX150 and 1CX95)	AB cable- conductor-conductor semicon screen- TR XPLE- insulation screen-- Water Swallowable tape -Round wire armour (in the place of copper tape), Water Swallowable tape-outer sheath+massenger wire
3.1.13	OFC	For OFC embedded cable of sizes 11kV 3CX400 sqmm cable, 33kV 3CX400 and 66 kV 3CX300 sqmm cable - Single Mode-36 Nos. Multi Mode- 12 nos. All the OFC cable is placed as filler inside the cable.

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 be provide Installation instruction sheet in every kit
Connector		
4.1.2	Conductor Screen	For 11kV a) Conductors to be jointed by crimping connectors 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.) c) For aluminium cable, the crimped ferrule shall be of aluminium d) Refer annexure F for GA drawing of crimping ferrule e) For single core repairing joint- long barrel mechanical connector/ferrule shall be provided (middle part of ferrule/connector shall be solid for better connectivity)

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		<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) • Nexans • Niled • Or equivalent type tested 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> <p>Note: In all voltage grade- For single core long barrel repairing joint, one long barrel connector/ferrule and for three core long barrel repairing joint, three long barrel connector/ferrule shall be provided along with all kind of accessories.</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/CFS
Armour / Earthing Continuity		
4.1.5	Armour bond	<p>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.</p> <p>b) GI Support Ring shall be 'zinc-sprayed with central bulge / bump'.</p>
4.1.6	Minimum Armour Fault Current Carrying capacity	<p>11 kV Cable – 11 kA for 1 sec</p> <p>33 kV Cable – 31.5 kA for 1 sec</p> <p>66 kV Cable – 31.5 kA for 1 sec</p>
4.1.7	Provision of Armour continuity	<p>By means of tinned copper braided conductor as per following</p> <p>11 kV cables –</p> <p>11 kV Cable – Three No's of 25 sq mm each</p> <p>33 kV Cable – Four No's of 50 sq mm each</p> <p>66 kV Cable – Four No's of 50 sq mm each</p>

Technical Specification For Heat Shrinkable And Cold Shrinkable Straight Through Jointing Kit (11 kV, 33 kV, 66 kV XLPE Insulated Cables)

Accessories		
4.1.8	Suppression of electrical discharges over XLPE insulation	Cleaning solvent /equivalent, for manual application.
4.1.9	Installation Instruction	Shall be provided in English and Hindi and shall be inside every kit.
4.1.10	Sheet paper Tap	Paper tape, required for measurements during jointing, shall be provided inside every kit.
4.1.11	Identification Tag (for traceability)	<p>1. An aluminum pouch with paper tag & sealing arrangement at one end shall be provided. This tag is required to be tied over the cable at one side of the joint. The paper tag shall give following information</p> <ol style="list-style-type: none">1) Vendor kit designation2) Cable section/Division3) Type of joint4) Size of Joint5) Make of joint6) Voltage class7) Serial no. of kit8) Vendor lot & batch no9) Month & year of manufacturing10) Date of installation11) Name of jointer12) Name of vendor supervisor13) Name of BSES supervisor14) Remarks <p>2. In addition to above Stainless Steel Tag shall be provided with following details for straight through joint</p> <ol style="list-style-type: none">a. Manufacturing month and year (MM/YY format)b. Manufacturer name i.e Compc. Manufacturer own sl no for future tracing
4.1.12	Printing on each Heat/cold shrinkable or Moulded component	Month and year of manufacturing, batch no. /lot no., size, make, type etc.
4.1.13	GPS Coordination	Vendor to capture GPS coordinates and shall include in job card of each joint at their own cost.
4.1.14	Hydraulic Crimping	Using of Hydraulic crimping tool is mandatory for crimping purpose
4.1.15	Coffin for completed joint and Joint Marker	<p>After successfully completion of joint, Coffin shall be made by bidder for completed joint. Drawing shall be provided by BSES. Excluding drawing, everything shall be in the scope of bidder.</p> <p>After back filling a joint marker shall be fixed by bidder above ground to mark the joint location. Drawing is enclosed with this</p>

Technical Specification For Heat Shrinkable And Cold Shrinkable Straight Through Jointing Kit (11 kV, 33 kV, 66 kV XLPE Insulated Cables)

		tech spec.
4.1.15	Electronic Ball Marker for 33kV and 66kV Cable Joint.	Passive and Active ball shall be supplied and placed at each and every joint to mark the joint electronically. Data shall be filled by bidder as per BSES requirement.
4.1.16	OFC	11kV 3CX400, 33kV 3CX400 and 66kV, 3CX300 sqmm cables are OFC embedded. OFC joint shall be supplied along with main cable joint. (36 single mode and 12 nos. multi mode OFC inbuilt inside cable). OFC joint shall be made separately from main cable joint.
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 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> <p>d) For single phase repairing joint-stress control tube shall be suitable for long barrel mechanical connector/ferrule</p>
4.2.1.1	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> <p>d) For single phase repairing joint-insulation build up shall be suitable for long barrel mechanical connector/ferrule</p>
4.2.2	Sealing end of tube	By means of Core end sealing sleeve with red mastic coating
4.2.3	Mechanical Protection	<p>a) For 3-core cable: By means of a rollable steel mat (with required protective coating against corrosion)</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

Technical Specification For Heat Shrinkable And Cold Shrinkable Straight Through Jointing Kit (11 kV, 33 kV, 66 kV XLPE Insulated Cables)

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.
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.

4.4.0	Technical Particulars	Vendor shall submit Guaranteed Technical Particulars (GTP) as per Annexure A.
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4.5.0 Testing & Inspection

4.5.1	Type Tests (CPRI/ERDA)	<p>a) Straight-Through Joint shall be of type-tested quality from CPRI/ERDA. Type Test report shall not be more than 5 years old.</p> <p>b) In addition to this, in case of rate contract, 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 to BSES. Also special test shall be done as per IS 13573.2.2011, Table-7 without any cost implication to BSES. Cable for type test may be provided by buyer at the cost of bidders.</p> <p>C) If product is not type tested or test report is more than 10 years old from CPRI/ERDA (subject to no change in the relevant IS/IEC.IEEE) , same shall be carried out by seller, sample shall be selected randomly by BSES, test cost to be borne by seller. For new vendor, type test is mandatory from CPRI/ERDA of BSES sample at their own cost.</p>
4.5.2	Routine & acceptance Tests	<p>I) All the routine and acceptance tests shall be carried out as per EA TS 09-13 guidelines, refer Annexure C.</p> <p>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.</p> <p>III) The joint shall withstand a test of 4Uo voltage for 4 hours.</p>

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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) or CD.
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.

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4.9.0	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). Every kit box shall be wrapped in polythene covers.</p> <p>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.</p> <p>i) Crotch Kit Components</p> <ul style="list-style-type: none">--Conductive cable break-out-- Yellow moulded wedge-- Break-out end sealing tube-- Break-out finger sealing tube-- Stress grading mastic <p>ii) Connector Kit : Components</p> <ul style="list-style-type: none">-- Ferrule (connector)-- Void Filling mastic (yellow)
4.9.1	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) BSES's SAP code number6) Weights (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)
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.

Technical Specification For Heat Shrinkable And Cold Shrinkable Straight Through Jointing Kit (11 kV, 33 kV, 66 kV XLPE Insulated Cables)**6.0.0 Deviations**

6.1.0	Deviations	<p>a) Deviations from this specification shall be listed by bidder clause wise along with optional offer and has to submit the list along with bid./quotation. BSES will review the deviations and if BSES is agreed with the deviation, seller has to take written confirmation from BSES on deviation during tender evaluation..</p> <p>b) In the absence of any list of deviations from the Seller with bid as well as written confirmation from BSES on deviations, it will be assumed by the Buyer that the Seller complies with the Specification fully.</p> <p>c) Any deviations mentioned in any other submitted bid documents (i.e.in filled GTP, Catalog, BSES old approval, buyer's/seller's standards etc) by seller without separate deviation sheets will not be considered as a deviation from this tech spec at any stage of contract.</p>
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7.0.0 Delivery

7.1.0	Delivery	<p>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.</p>
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8.0.0 Inspection Expenses**NA****9.0.0 Failure Analysis and Penalty**

Failure of joint shall be analyzed by BSES and Vendor jointly. Joint failure in regards to poor quality joint, poor work man ship, etc. shall be in the account of vendors. Losses due to failure shall be recovered from vendor in case of warranty.


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	To be conducted on Installed joint at works	
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)		

Technical Specification For Heat Shrinkable And Cold Shrinkable Straight Through Jointing Kit (11 kV, 33 kV, 66 kV XLPE Insulated Cables)

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 Program (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	

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18	Printing details on each of the Heat- shrinkable and Moulded components	(Mention the text, presently printed on each of the component)	
19	OFC kit (for OFC Embedded cable only of sizes 11kV 3CX400, 33kV 3CX400 and 66kV, 3CX300 sqmm cable)	Yes/no	

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.

Annexure - D: Deviation Sheet

Sr No.	Clause No.	Deviation

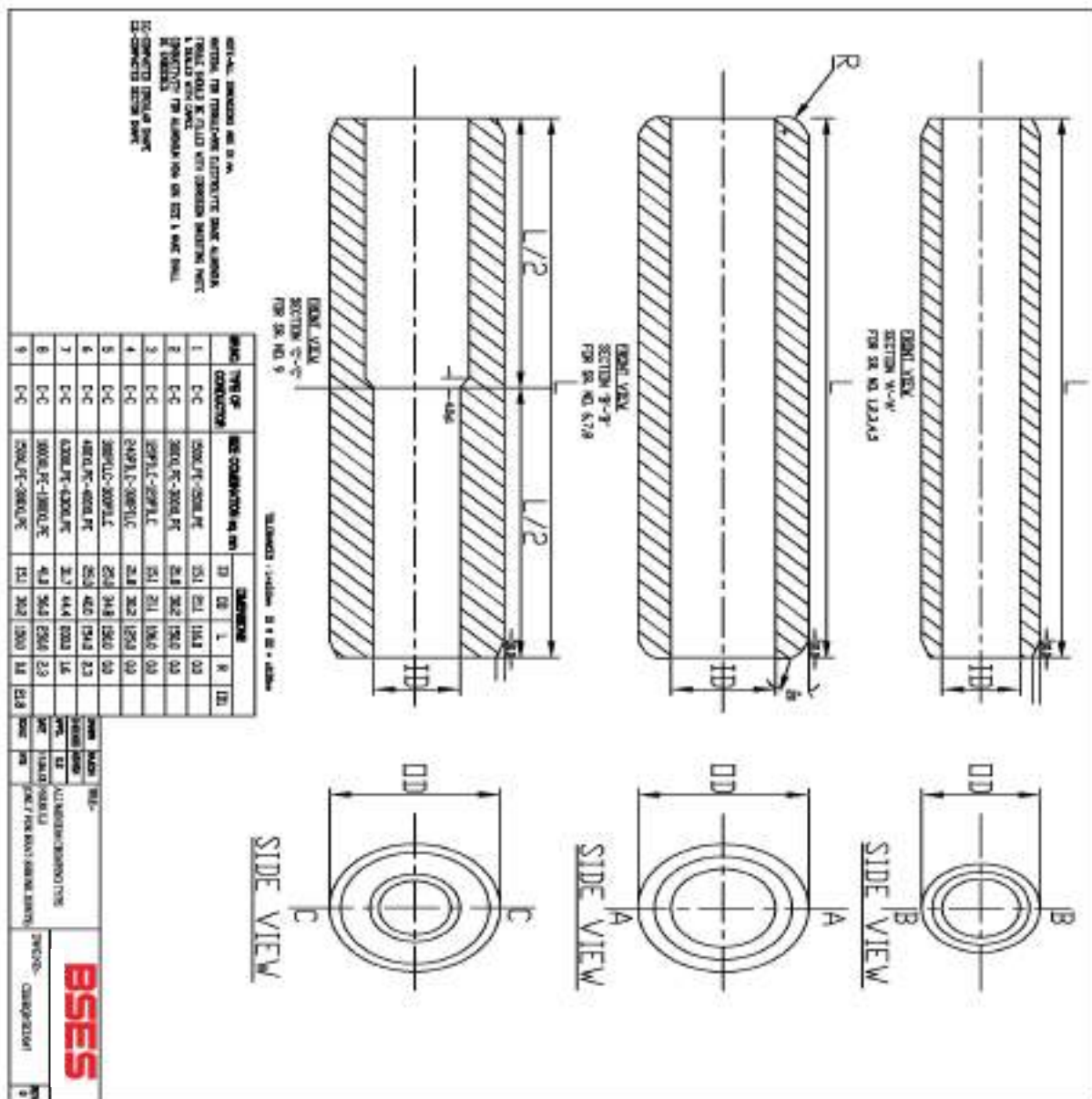
Technical Specification For Heat Shrinkable And Cold Shrinkable Straight Through Jointing Kit (11 kV, 33 kV, 66 kV XLPE Insulated Cables)**Annexure - E: Service Conditions**

(Atmospheric conditions in Delhi)

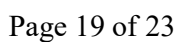
a)	Average grade Soil Condition	
b)	Maximum altitude above sea level	1000 M
c)	Ambient Air temperature	Highest 50 Deg C, Average 40 Deg C
d)	Minimum ambient air temperature	0 Deg C
e)	Relative Humidity	100 % Max
f)	Thermal Resistivity of Soil	150 Deg C cm/W
g)	Seismic Zone	4
h)	Rainfall	750 mm concentrated in four months

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Annexure - F: Aluminium crimping-type Ferrule for compacted circular conductor only for Heat Shrink joints



Annexure – G: Strip type GI canister (V.B. Can) for joint protection only for Heat Shrink Joint



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Annexure – H : Job card Details

[illegible]

Technical Specification For Heat Shrinkable And Cold Shrinkable Straight Through Jointing Kit (11 kV, 33 kV, 66 kV XLPE Insulated Cables)

Annexure – I : SOP for jointing work

SOP FOR REPAIRING OF CABLE FAULT (Shall be part of PO)		
Sl. No.	Activity	Responsibility
Initiation		
1	Identify and isolate fault and inform GNIIT in case of cable fault	Break down team
2	Updation of the details in OMS against respective feeder tripping event.	GNIIT
Fault Location		
1	Information sent to FLC team and SDO.	GNIIT
2	Mobilize FLC team and cable jointing contractor.	SDO
3	Identification of fault location	FLC Team
Preparation for Jointing		
1	Seeking permission from road owning agency	SDO
2	Payment of RR charges to Road owning agency	Finance
3	Digging	Cable jointing contractor
4	Cut faulty section and Pre-test (HV test) cable for multiple fault	Cable jointing contractor
5	BOQ estimation for jointing work (type, size and length of cable, type of jointing kit)	Cable jointing contractor
6	Filling material reservation slip (MRS) in SAP	SDO
7	Issuing and transporting material from store.	Cable jointing contractor
Jointing		
1	Cable preparation (overlap length of cable, slide of armour, build up with inner sheath etc)	Cable jointing contractor (for jointing details refer to manufacturer instruction manual)
2	Copper tape shields	
3	Core preparation	
4	Location of parts in completed joints	
5	Earthing of connection	
6	Completion of joints	
7	Take Photographs before, during and after jointing and send to CES	SDO
8	Supervision during jointing	SDO
9	Sending failed joint to Division store	Cable jointing contractor
Completion and reporting		
1	Intimate to breakdown team about joint completion.	Cable jointing contractor
2	Conduct HV test	Break down team
3	Restore of Supply through jointed cable	Break down team

Technical Specification For Heat Shrinkable And Cold Shrinkable Straight Through Jointing Kit (11 kV, 33 kV, 66 kV XLPE Insulated Cables)

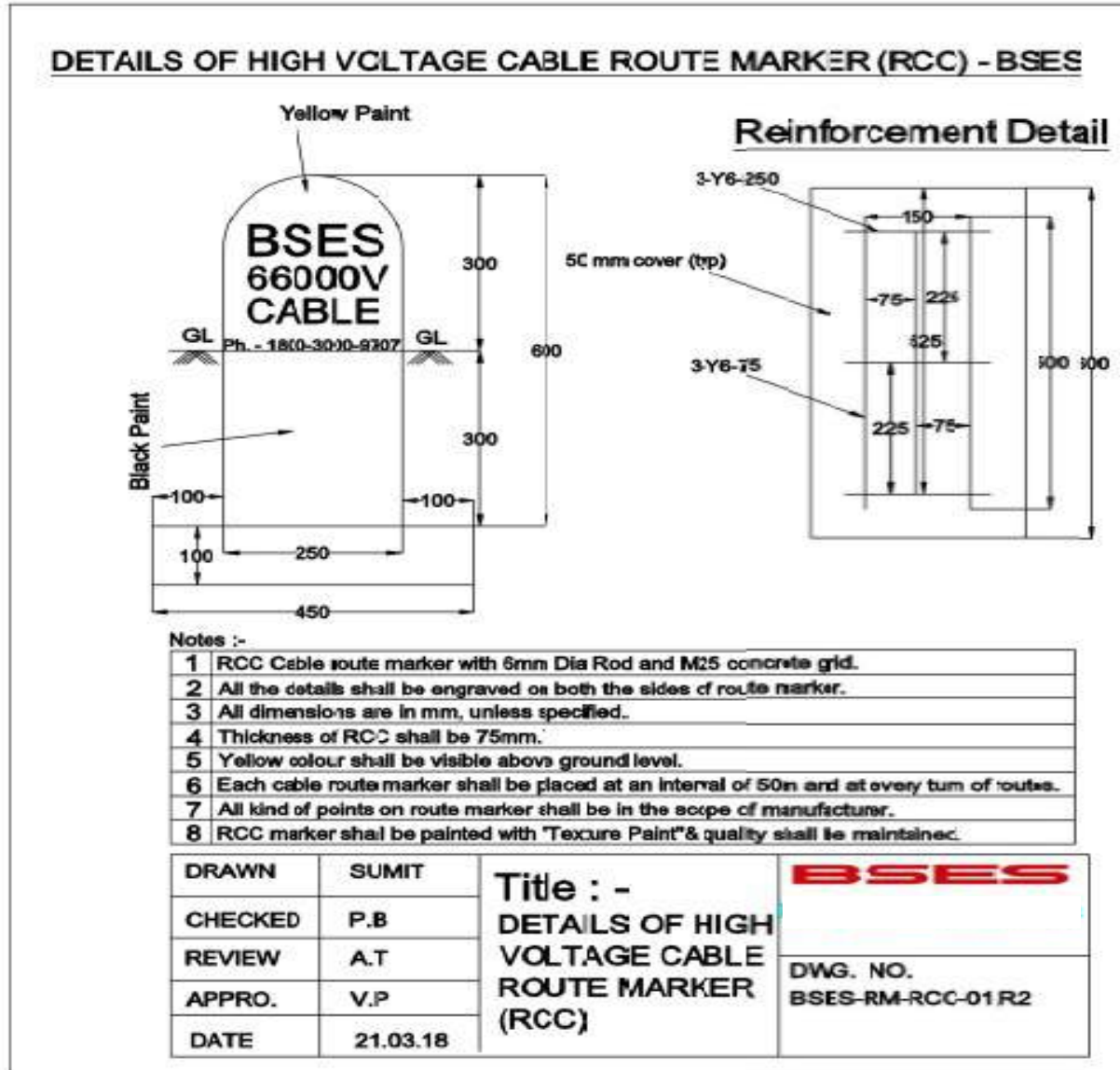
4	Backfilling, compaction of excavated soil and removing of excess earth from the site	Cable jointing contractor
5	Completion information in Job Card (Details of work done, material consumption, location, feeder name and joint tag no., date, supervisor name, jointer name) sent to SDO	Cable jointing contractor
6	Above information sent to GNIIT	SDO
7	Send information about GPS location of Cable fault to GIS	SDO
8	Daily report of cable jointing to CES	Division Head
9	Updating of information in OMS including supervisor name, jointer name, feeder name	GNIIT
10	Information to include GPS location of cable fault.	GNIIT

Special Note-

- 1) Joints to be done preferably during day. In case of constraints, DGM (O&M) to authorize for night time jointing with supervisor
- 2) Daily joint report to be shared with CES
- 3) Bi-monthly analysis of faulty joint for ensuring warranty compliance to be organized at circle level by contractor in presence of DGM (O&M) and CES
- 4) Certification of job card for payment by DGM (O&M) subject to OMS compliance CES to check any gaps.
- 5) After completion of jointing (33kV and 66kV), all the joints shall be covered with RCC coffin. Coffin shall be filled with white sand complete from the hole provided at the top of the coffin.

Technical Specification For Heat Shrinkable And Cold Shrinkable Straight Through Jointing Kit (11 kV, 33 kV, 66 kV XLPE Insulated Cables)

Annexure – J Joint Marker





**Technical Specification
For Heat Shrinkable &
GIS Cable Termination Kit
(11 kV, 33 kV, 66 kV XLPE Insulated Cables)**

Specification no – BSES-TS-45-TERM-R0

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BSES-TS-45-TERM-R0

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, 66 kV 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 : 2011	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
2.1.3	IS – 10810: 1984	Methods of test for cables
2.1.4	IS – 7098 Part 3 : 2019	Cross-linked polyethylene insulated thermoplastic sheathed Cables specification: Part 3 - For working voltages from 66 kV up to and including 220 KV

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.

Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 kV, 33 kV, 66 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:

- a. 11 kV, 3-core x 150 sq mm AL
- b. 11 kV, 3-core x 300 sq mm AL
- c. 11 kV, 3-core x 400 sq mm AL
- d. 11 kV, 3-core x 400 sq mm AL (OFC Embedded)
- e. 11 kV, 1-core x 1000 sq mm AL
- f. 11 kV, 1-core x 150 sq mm AL HTAB with copper metallic screen
- g. 11 kV, 1-core x 150 sq mm AL HTAB with Aluminium wire metallic screen
- h. 11 kV, 1-core x 95 sq mm AL HTAB with copper metallic screen
- i. 11 kV, 1-core x 95 sq mm AL HTAB with Aluminium wire metallic screen
- j. 33 kV, 3-core x 400 sq mm AL
- k. 33 kV, 3-core x 400 sq mm AL (OFC Embedded)
- l. 33 kV, 1-core x 1000 sq mm AL
- m. 66 kV, 1-core x 630 sq mm AL
- n. 66 kV, 1 core x 1000 sq mm AL
- o. 66 kV, 3-core x 300 sq mm AL
- p. 66 kV, 3-core x 300 sq mm AL (OFC Embedded)

PILC type Cables:

3-core 240 or 300 sq. Mm. Al

3.1.0	Conductor	For XLPE : a) Electrolytic Grade stranded Aluminium Conductor / Annealed Copper Conductor 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 TR XLPE For PILC: Layers of impregnated papers

Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 kV, 33 kV, 66 kV Cables)

3.4.0	Insulation Screen	Non Metallic Screen: For XLPE Insulated cable: a) For 11, 33 U/G cable and HTAB cable - Freely strippable Semi Conducting (without application of heat) b) For 66kV cable - Firmly bonded semi conducting Metallic Screen: a) For 11, 33 & 66 Kv U/G cable – Copper Tape b) For HTAB – option 1 – Copper Tape (old installations) and option 2 – Aluminium wire (new installations) 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. Note- In special cases, for 66kV 3CX300 sqmm, 33kV, 3CX400 and 11kV 3CX400 cable are with-36 nos. Single mode and 12 nos. Multi modes OFC are also inbuilt as filler.Requirement of cable joint kit with OFC shall be fulfilled as per tender requirement 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
3.11.0	Armour	For XLPE : a) Galvanised Steel round Wires/ Galvanised steel flat strip armour (For 3 core cables) b) Hard drawn Aluminium Wire (For 1 core cables) c) Aluminium or lead sheathed for 1Core 66kV cables For PILC : a) 11 kV double steel tape armour
3.12.0	Binder Tape	For XLPE: Rubberised cotton tape

Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 kV, 33 kV, 66 kV Cables)

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 66kV Cable- HDPE extruded semicon layer or HDPE with graphite layer. For PILC : compounded (bituminised) Jute/PVC
3.14.0	HTAB Cable (1CX150 and 1CX95) core construction	Aluminium conductor-conductor semicon screen- TR XPLE insulation- insulation semicon screen–Water Swell-able tape –Round wire armour installation) / Copper Tape (old installation)) Water Swell-able tape-outer sheath

4.0.0 Cable Termination Kits

General Technical Requirements for Cable Termination Kits are as follows:

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	3Cx150, 3Cx300 and 3Cx400 sq mm	Indoor	Bi-Metal	Crimping
				Outdoor	Bi-Metal/ Aluminium as per tender requirement	Crimping
			1Cx1000 sq mm	Indoor	Aluminium	Crimping
				Outdoor	Aluminium	Crimping
		HTAB (indoor not required)	1Cx95	Outdoor	Aluminium	Crimping
			1Cx150	Outdoor	Aluminium	Crimping
		33 kV	3Cx400 sq mm	Indoor	Aluminium	Crimping
				Outdoor	Aluminium	Crimping
			1Cx1000 sq mm	Indoor	Aluminium	Crimping
				Outdoor	Aluminium	Crimping
		66 kV	3Cx300	Indoor	Aluminium	Crimping
				Outdoor	Aluminium	Crimping
			1Cx630, 1Cx1000 sq mm	Indoor	Aluminium	Crimping
				Outdoor	Aluminium	Crimping

* For Bimetallic Lug Copper portion shall be tinned

Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 kV, 33 kV, 66 kV Cables)

		<p>a) For GIS cable termination kits: Plug in type, Conductor connection assembly shall be by standard method of split, silver-plated copper cone and pressure-fit contact assembly or as per manufacturer's standard.</p> <p>b) Top corners of all lugs shall be circular shape not rectangular. Refer Annexure F for details.(Except GIS kit)</p>			
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 up to an operating temperature and shall be within the range 1×10^{08} ohm-cm to 8×10^{08} ohm-cm.</p> <p>d) Length of stress control tube for 11 kV and 33 kV shall be 130 mm and 260 mm respectively or according to insulation tube length. For 66kV termination kits, stress control tube shall be as per type tested design.</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 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> <p>d) Insulation Tube length for termination- shall be 650 mm for both Indoor and Outdoor Termination kits of 11kV, 3CX150, 3CX300 and 3CX400 sqmm cable. All other accessories related to termination shall be according to 650mm insulation tube length.</p>			
4.2.3.1	Outer Anti-tracking Tube	<p>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: Creepage distance shall be 31mm/kV minimum.</p>			
4.2.3.2	OFC (66kV, 3CX300 sqmm , 33kV, 3Cx400 sqmm and 11kV, 3Cx400 sqmm cable)	<p>Termination kit for OFC (36 single mode and 12 nos. Multi mode) shall be supplied along with termination kit.</p>			
Cable System		Length of tube (mm)		Creepage Extension Shed (No.)	
Voltage	Cores	Indoor	Outdoor	Indoor	Outdoor
11 kV	3 – core	650	650	Nil	2

Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 kV, 33 kV, 66 kV Cables)

	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>
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>

Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 kV, 33 kV, 66 kV Cables)

4.2.5	Earth Bond System	<p>Minimum Armour Fault Current Carrying capacity of cbles is as following: 11 kV U/G Cable – 11 kA for 1 sec 33 kV Cable – 31.5 kA for 1 sec 66 kV Cable – 31.5 kA for 1 sec 11 kV HTAB Cable – 11 kA for 1 sec</p> <p>Fault current requirement shall be met by Tinned copper braid as per following: 11 kV U/G cables – Three No's 25 sq mm each 33 kV Cable – Four No's of 50 sq mm each 66 kV Cable – Four No's of 50 sq mm each HTAB Cable with copper tape metallic screen – Three No's of 25 sq mm each</p> <p>Length of the copper braided conductor shall be 750 mm.</p> <p>Each copper braided conductor shall be supplied with copper lug, crimped at one end</p> <p>For HTAB Cable with Aluminium wire metallic screen – Tinned copper braid is not required. 1 No's of Aluminium crimping lug of 120 sq mm cross section area shall be provided instead</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 semicon 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	Paper Measuring Tap	Required for use during cable preparation / terminations.
4.2.9	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 joint8) Voltage class

Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 kV, 33 kV, 66 kV Cables)

		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 In addition to above Stainless Steel Tag shall be provided with following details for straight through joint a. Manufacturing month and year (MM/YY format) b. Manufacturer name i.e Comp c. Manufacturer own sl no for future tracing
4.3.0	Technical Particulars	Vendor shall submit Guaranteed Technical Particulars (GTP) as per Annexure A.
4.4.0	Type Tests	i. Termination Kit shall be of type-tested quality from CPRI/ERDA/KEMA/CESI as per the BIS/IEC/IEEE within last 5 years. ii. In case of type test is more than 5 years old but less than 10 years old, bidder has to give undertaking that there is no changes in design. iii. In case of type test report is more than 10 years old, bidder has to conduct type test from CPRI/ERDA/KEMA/CESI as per the BIS/IEC/IEEE without any cost implications to BSES
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 10 days 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.
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.)

Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 kV, 33 kV, 66 kV Cables)

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.
4.6.3	"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.
4.7.0	Packing, Marking, Shipping, Handling and Storage	Every component/kit/box shall be properly sealed/ packed for protection against damage.
a)	Identification Labels:	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 c) BSES's SAP code number 6) Weight (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) 10) In case, the termination kit is for RMU, following text shall be written in bold letters, with higher font size : "For RMU Application".
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.

Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 kV, 33 kV, 66 kV Cables)**6.0.0 Deviations**

6.1.0.	Deviations	<p>a) Deviations from this specification shall be listed by bidder clause wise along with optional offer and has to submit the list along with bid./quotation. BSES will review the deviations and if BSES is agreed with the deviation, seller has to take written confirmation from BSES on deviation during tender evaluation..</p> <p>b) In the absence of any list of deviations from the Seller with bid as well as written confirmation from BSES on deviations, it will be assumed by the Buyer that the Seller complies with the Specification fully.</p> <p>c) Any deviations mentioned in any other submitted bid documents (i.e.in filled GTP, Catalog, BSES old approval, buyer's/seller's standards etc) by seller without separate deviation sheets will not consider as a deviation from this tech spec at any stage of contract.</p>
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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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8.0.0 Inspection Expenses

Not Applicable

9.0.0 Penalty

Joint/Termination failure under warranty in regards to poor quality joint, poor work man ship, etc. shall be in the account of vendors. All kind of losses due to Joint/Termination failure shall be recovered from vendor.


Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 kV, 33 kV, 66 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.

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	To be conducted on Installed joint at works	
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 GIS Cable Termination Kit (11 kV, 33 kV, 66 kV 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 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.)	
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	

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Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 kV, 33 kV, 66 kV Cables)	

18	Printing details on each of the Heat- shrinkable and Moulded components	(Mention the text, presently printed on each of the component)	
19	OFC kit (For OFC embedded cable only 66Kv, 3CX300 sqmm, 33Kv, 3cx400 sqmm and 11kv, 3cx400 sqmm)	Yes/no	

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.)

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)

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

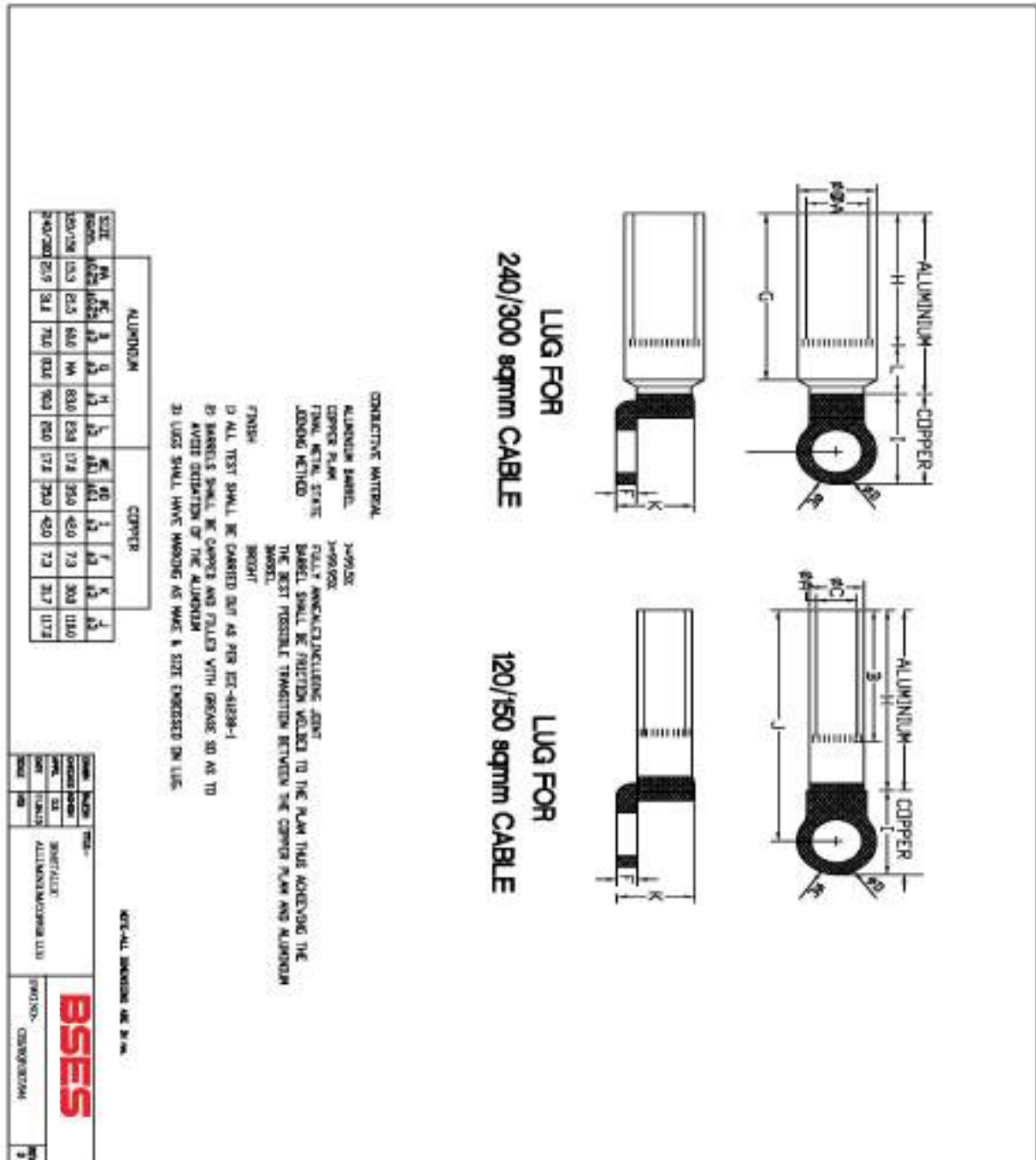
Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 kV, 33 kV, 66 kV Cables)**Annexure – E: Service Conditions**

(Atmospheric conditions at Site)

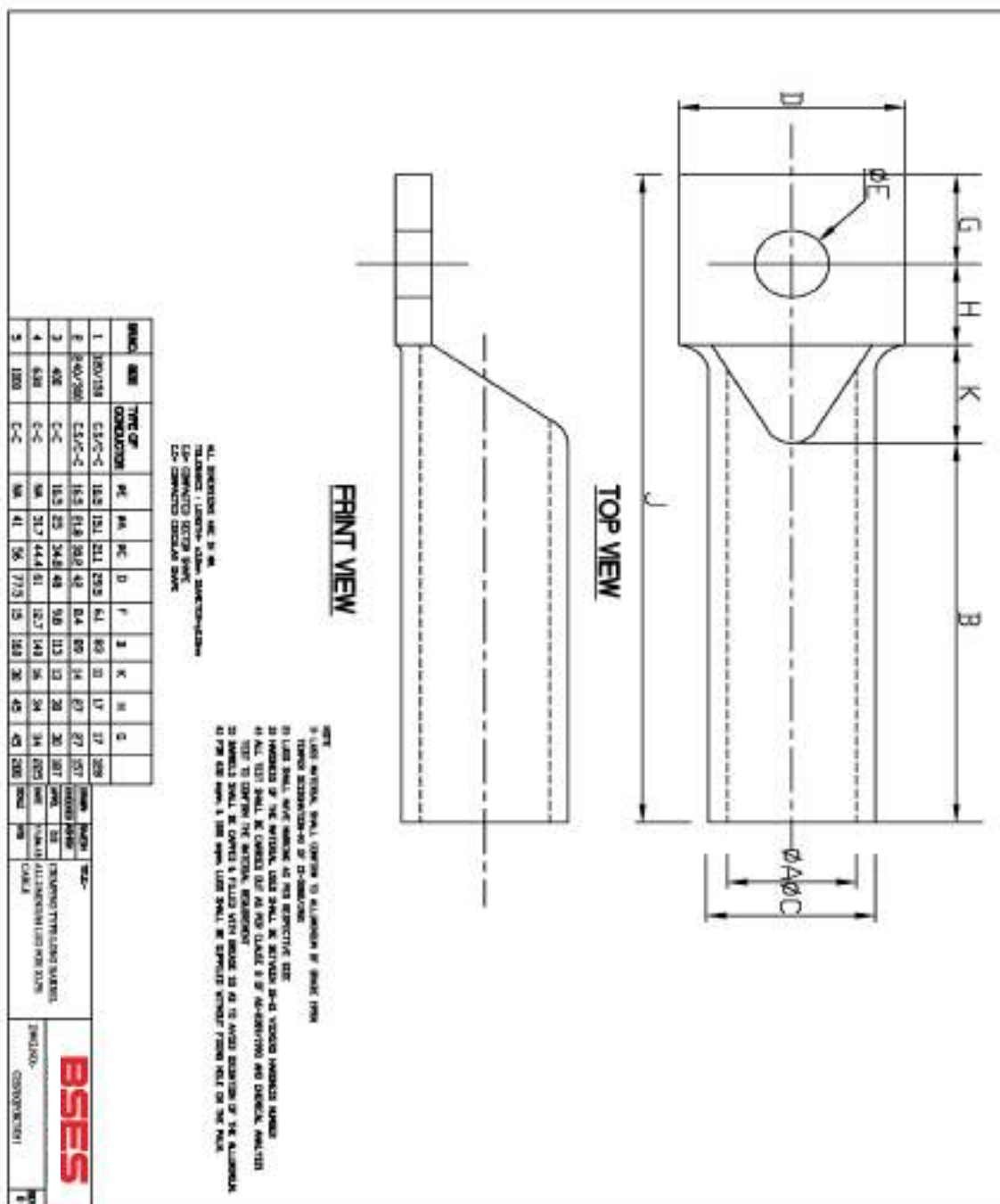
1	Delhi	
a)	Average grade Atmospheric Condition:	Heavily Polluted, Dry
b)	Maximum altitude above sea level	1000 M
c)	Ambient Air temperature	Highest 50 deg C, Average 40 deg C
d)	Minimum ambient air temperature	0 deg C
e)	Relative Humidity	90 % Max
f)	Thermal Resistivity of Soil	150 Deg. C cmm
g)	Seismic 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



Annexure – G: Aluminum/Copper Lug For XLPE Cable



Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 kV, 33 kV, 66 kV Cables)**Annexure-H**

SOP FOR REPAIRING OF CABLE FAULT (Shall be part of PO)		
Sl. No	Activity	Responsibility
Initiation		
1	Identify and isolate fault and inform GNIIT in case of cable fault	Break down team
2	Updation of the details in OMS against respective feeder tripping event.	GNIIT
Fault Location		
1	Information sent to FLC team and SDO.	GNIIT
2	Mobilize FLC team and cable jointing contractor.	SDO
3	Identification of fault location	FLC Team
Preparation for Jointing		
1	Seeking permission from road owning agency	SDO
2	Payment of RR charges to Road owning agency	Finance
3	Digging	Cable jointing contractor
4	Cut faulty section and Pre-test (HV test) cable for multiple fault	Cable jointing contractor
5	BOQ estimation for jointing work (type, size and length of cable, type of jointing kit)	Cable jointing contractor
6	Filling material reservation slip (MRS) in SAP	SDO
7	Issuing and transporting material from store.	Cable jointing contractor
Jointing		
1	Cable preparation (overlap length of cable, slide of armour, build up with inner sheath etc)	Cable jointing contractor (for jointing details refer to manufacturer instruction manual)
2	Copper tape shields	
3	Core preparation	
4	Location of parts in completed joints	
5	Earthing of connection	
6	Completion of joints	
7	Take Photographs before, during and after jointing and send to CES	SDO
8	Supervision during jointing	SDO
9	Sending failed joint to Division store	Cable jointing contractor
Completion and reporting		
1	Intimate to breakdown team about joint completion.	Cable jointing contractor
2	Conduct HV test	Break down team
3	Restore of Supply through jointed cable	Break down team
4	Backfilling, compaction of excavated soil and removing of excess earth from the site	Cable jointing contractor

BSES	BSES-TS-45-TERM-R0
Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 kV, 33 kV, 66 kV Cables)	

5	Completion information in Job Card (Details of work done, material consumption, location, feeder name and joint tag no., date, supervisor name, jointer name) sent to SDO	Cable jointing contractor
6	Above information sent to GNIIT	SDO
7	Send information about GPS location of Cable fault to GIS	SDO
8	Daily report of cable jointing to CES	Division Head
9	Updating of information in OMS including supervisor name, jointer name, feeder name	GNIIT
10	Information to include GPS location of cable fault.	GNIIT

Special Note-

- 1) Joints to be done preferably during day. In case of constraints, DGM (O&M) to authorize for night time jointing with supervisor
- 2) Daily joint report to be shared with CES
- 3) Bi-monthly analysis of faulty joint for ensuring warranty compliance to be organized at circle level by contractor in presence of DGM (O&M) and CES
- 4) Certification of job card for payment by DGM (O&M) subject to OMS compliance CES to check any gaps.
- 5) After completion of jointing (33kV and 66kV), all the joints shall be covered with RCC coffin. Coffin shall be filled with white sand complete from the hole provided at the top of the coffin.