

Tender Notification for

**Supply, Installation, Testing & Commissioning of 11kV
Cable and accessories including RMU on single point
responsibility basis in connection with providing New Load
of 4MVA at DTC Mayapuri Depot, New Delhi**

NIT NO CMC/BR/21-22/RB/PR/KG/0968 DT 07.12.2021

Due Date for Submission: 28.12.2021 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, Installation, Testing & Commissioning of 11kV Cable and accessories including RMU on single point responsibility basis in connection with providing New Load of 4MVA at DTC Mayapuri Depot, New Delhi	1.3 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 "Supply, Installation, Testing & Commissioning of 11kV Cable and accessories including RMU on single point responsibility basis in connection with providing New Load of 4MVA at DTC Mayapuri Depot, New Delhi NIT NO CMC/BR/21-22/RB/PR/KG/0968"

- 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 28/12/2021 1530 HRS at the address given at 3.01 below. Part A of the Bid shall be opened on 28/12/2021 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 2,60,000/-** 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:-

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

- The bidder must be a manufacturer of 11KV or higher Voltage HT Power Cable of conductor size 300mm² and above having valid Type Test Reports carried out at CPRI/ERDA (Not More than 5 years Old from the NIT date) for the same.
- The bidder should have supplied at least 150 km. of similar Cross section (i.e 300mm²) or higher (Voltage level 11KV and Above) to any major utilities/SEB's in last 3 years from the NIT date out of which at least 50% should be in successful operation for the last 3 years.
- The bidder who is a manufacturer of 11KV or higher Voltage HT Power Cable of conductor size 300mm² and above can enter into Consortium /Joint Deed with the enlisted BRPL contractors who can jointly fulfill the Qualification Criteria.
- Bidder along with consortium, as mentioned above, should have at least two performance Certificates for the works executed in the last 3 years from reputed companies /utilities of successful laying, testing & commissioning of similar Cross section (i.e 300mm²) or higher (Voltage level 11KV and Above) cable. Out of these, one certificate should be more than 10 KMs of cable.
- The Bidder should have In –house raw material, routine and acceptance testing facilities as per relevant IS/IEC. Self-declaration & List of testing equipment to be submitted in support of this QR.
- 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
- 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 start of the work.
- Bidder should have Average Annual Sales Turnover of Rs 100 Crore or more in last three (3) financial years, duly certified CA certificate to be submitted. (FY 19-20, 18-19 & 17-18).

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.

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.

3.00 TERMS & CONDITIONS TO APPLY AS CONSORTIUM:

- i. Cable OEM may form a consortium with BRPL enlisted contractors and apply against this tender specification, provided they jointly qualify as per qualification criteria of the tender.

- ii. Cable OEM shall be lead partner(Bidder) and this authorization shall be supported by submitting a power of attorney signed by legally authorized signatories of all the partners; Refer Annexure-I for Sample Format
- iii. The Bidder (Lead partner) shall be authorized to incur liabilities and receive instructions for and on behalf of any and all partner of the Consortium and the entire execution of the contract including payment shall be done exclusively with the Bidder (lead partner). This authorization shall be evidenced by submitting by a Power of Attorney signed by legally authorized signatories of all partners.
- iv. The Bidder (Lead partner) shall be solely liable for the execution of the contract in accordance with the contract terms and a copy of the agreement entered into by the consortium partners having such a provision shall be submitted with the Bid.
- v. In the event of any default by any partner/partners of the Consortium, BRPL reserves the right to get the work executed from any other source at the Risk & Cost of the Bidder (Lead Partner). The Extra Expenditure so incurred shall be debited to the Bidder (Lead Partner)..
- vi. Responsibilities in respect of execution of tendered work by the Bidder (lead partner) as well as of each Consortium member shall be clearly indicated in the agreement.
- vii. The Consortium agreement shall not be cancelled or amended unilaterally without consent of the purchaser and a statement to this effect should appear in the consortium agreement.
- viii. A firm can submit only one bid in the same bidding process, either individually as a bidder or as a partner of a Consortium. A bidder who submits or participates in more than one bid will cause all the bids in which the bidder has participated to be disqualified.

Original consortium agreement on Non judicial stamp paper duly registered with sub registrar office/Notarized of appropriate value satisfying the above conditions shall be submitted along with the bid indicating role and duties of each consortium member.

Note:

- **In case of non-furnishing the requisite documents along with the bid, the bid will be considered as non-responsive and bid may be summarily rejected.**
- **Purchase Order & Work Order shall be issued in favor of the Lead Partner/Bidder only**

4.00 **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	07.12.2021
2	Pre-Bid meeting	14.12.2021 1430 HRS
3	Pre-Bid meeting link	https://bsesbrpl.webex.com/meet/rakesh.bansal
4	Last date of Queries, if any	18.12.2021
5	Last date of receipt of bid documents	28.12.2021 1530HRS
6	Date & time of opening of tender – Part A	28.12.2021 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

5.00 Award Decision

5.01 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.

5.02 **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.

5.03 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.

5.04 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.

6.00 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.

7.00 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.



BSES RAJDHANI POWER LIMITED

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

8.00 **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	sheshadri.krishnapura@relianceada.com amit.as.tomar@relianceada.com	pankaj.goyal@relianceada.com kumar.ga.gaurav@relianceada.com

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, Installation, Testing & Commissioning of 11kV Cable and accessories including RMU on single point responsibility basis in connection with providing New Load of 4MVA at DTC Mayapuri Depot, New Delhi".

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
Scope Demarcation and Route Map – Annexure III
Technical Specifications - Annexure IV

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. 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 of HT Feed and installation, testing & commissioning etc 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.
- 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, RMU & 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. 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 as asked by the Purchaser.

1.25. 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



BSES RAJDHANI POWER LIMITED

- 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 has 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% pro-rata 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% pro-rata after installation/erection of equipment duly certified by BRPL Project-in-charge

- c) 15% pro-rata 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 forfeiture 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

	BSES RAJDHANI POWER LTD.							
Scheme	Name of the Scheme: BS-5836 Providing New Load of 4MVA (EV-HT category) IN F/O Depot Manager,DTC mayapuri Depot,near Mayapuri Metro station , New Delhi .							
MATERIAL SUPPLY								
Sl no	Description	UOM	Qty	Basic (Rs)	Freigh t (Rs)	GST (Rs)	Unit Lande d (Rs)	Total Lande d Cost (Rs)
1	CBL,PWR,300MM2;3C;11KV;AL;XLPE	M	120					
2	CBL,PWR,400MM2;3C;11KV;AL;XLPE, OFC Embedded	M	2840					
3	KIT CBL TERN IND 11KV 3CX400MM2 HS XLPE, Including OFC kit	EA	14					
4	KIT STRT JNT -- 11KV 3CX400MM2 HS XLPE,Including OFC kit	EA	15					
5	KIT CBL TERN IND 11KV 3CX300MM2 HS XLPE	EA	1					
6	KIT STRT JNT -- 11KV 3CX300MM2 HS XLPE	EA	1					
7	RNG MAIN UNT,INDR,4WAYS,11KV, with FRTU	EA	1					
8	RNG MAIN UNT,INDR,3WAYS,11KV, with FRTU	EA	2					
9	Kit Chemical Earthing	EA	10					
10	EXTNGSR,FIRE,CO2;4.5Kg;CO2gas;17kg	EA	3					
11	MAT,INSLTNG:5M:1M:3MM:Elastomer	EA	2					
12	PNL,MET CUBICAL 300/5 amp;11KV	NOS	2					
13	GI strip 50x6 mm	M	460					
14	HDPE 200 mm Pipe, PN6, PE 80	M	2100					
15	Exhaust Fan of size 12” of Crompton make.	NOS	3					

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% pro-rata after installation/erection of equipment c. 15% pro-rata 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, RMU & 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 undertake 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**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 Bidder 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 Cable with required accessories and installation, testing & commissioning as per BOQ 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, if required, 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. HT Cable should be tested as per the specification only. Contractor shall test the complete cable; BRPL will also witness the same.
- b. All cable laying tools and tackles and testing equipment shall be available with contractor in event of order.
- c. Contractor shall submit copy of cable laying schedule to BRPL in event of order so that quality checks can be done on sample basis.
- d. Penalty clause shall be incorporated in case any of workmen of contractor is found violating safety protocol as per BRPL WO.
- e. 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.

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, RMU & 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 are 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 the 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
- 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.

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

BSES RAJDHANI POWER LTD.							
Scheme	Providing New Load of 4MVA (EV-HT category) IN F/O Depot Manager,DTC mayapuri Depot,near Mayapuri Metro station , New Delhi .						
MATERIAL SERVICE							
Sr. no.	Description	Unit	Qty	Basic (Rs)	GST (Rs)	Unit Landed (Rs)	Total Landed Cost (Rs)
1	E70409-Trans/Hiring FullTruck8 Hr-Crane	TRP	28				
2	Transportation of Electrical equipments	TRP	12				
3	High Voltage test of 11KV 3x300sq.mm cable - Testing Equipment to be provided by the contractor.	EA	10				
4	C1040201 Digging 650x1055mm3x400sqmm Rocky	M	255				
5	E3010223-Lay.Cable I/C Dkt3x400D/ckt	M	255				
6	Digging 400x1055mm3x300sqmmRocky	M	110				
7	Lay.Cable I/C Dkt3x300sqmmS/ckt	M	111				
8	Pnemumatic jack hammer 1600MM	M	200				
9	Cleaning and clearing of malba after completion of work at site or removal of malba to carry out the work at site.	CUM	5				
10	Laying of HT/LT cable of 11kv 3Cx400 size in pipe	M	2100				
11	Laying of HT/LT cable of 11kv 3Cx300 size in S/Stn Trench	M	190				
12	Laying of 50x6mmGI Strip earth	M	200				
13	Route survey for Cable laying work	M	2700				
14	E1020301-Inst. HT11KV 350MVA RMU-3Funct.	EA	2				
15	E1020301-Testing & Comm. RMU 3Function	EA	2				
16	Inst.Testing &Comis.Chem.Earth Rocy Soil	EA	10				
17	Lay.GI Strp 500mm Depth Mesh Info	M	90				
18	Lay.GI Strp connect Equip Soil	M	170				
19	E1030104-Supply MS Frame I/D 3-RMU<500MM	EA	2				
20	E1020301-Inst. HT11KV 350MVA RMU-4Funct.	EA	1				

21	E1020301-Testing & Comm. RMU 4Function	EA	1				
22	E1030104-Supply MS Frame I/D 4-RMU<500MM	EA	1				
23	E302-Make End Termination(upto 3Cx400 sqmm)	EA	15				
24	E302-Make St Th.Box	EA	16				
25	SUPPLY, PRECAST RCC TRENCH COVER OF VARIOUS SIZE VARYING 1500 MM. IN "LENGTH, 450 MM. IN WIDTH & 50 MM. IN THICKNESS, WITH 3 MM THICK 50MM "WIDE,MS STRIP ALL AROUND WELDED TO THE STEEL REINFORCEMENT BAR OF 6MM" DIA, 100 MM CENTRE TO CENTRE & TWO NO. HOOKS OF 12 MM DIA BAR FOR " LIFTING GAVING FINISHING TOP SURFACE & GRADE OF CEMENT CONCRETE M-20 (ITEM TO BE EXECUTED DURING/AFTER ENERGISATION).	SQMM	4				
26	Fix/inst Exhaust Fan 12"	EA	3				
27	E301-Prov Steel Barricading of 1.2 M	M	500.00				
28	C106-Pro/lay CC 1:4:8	CUM	42.00				
29	C11102-Brick Work in cement mort 1:6	CUM	45.00				
30	C113-Plaster with cement mort 1:4	SQM	261.82				
31	Charges for GPR of the proposed cable route prior to execution	M	2000.00				
32	Installation , testing and commissiong of metering cubical 300/5;11KV	EA	2				
33	Fabrication work using MS steel	Kg	60				
34	Supply of MS Steel (Angle, Channel, Flat)	KG	60				
35	Laying of HDPE 200 mm Pipe through Trenchless method.	M	2100				

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

SI 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 upto 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, RMU & 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-X
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, Installation, Testing & Commissioning of 11kV Cable and accessories including RMU on single point responsibility basis in connection with providing New Load of 4MVA at DTC Mayapuri Depot, New Delhi			
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**FORM OF POWER OF ATTORNEY FOR CONSORTIUM**

(On Non –Judicial Stamp Paper of Appropriate value to be purchased in the Name of Lead Member)

KNOW ALL MEN BY THESE PRESENTS THAT WE, the Members whose details are given hereunder..... have formed a Consortium and having our Registered Office (s)/Head Office (s) at(hereinafter called the 'Consortium' which expression shall unless repugnant to the context or meaning thereof, include its successors, administrators and assigns) do hereby constitute, nominate and appoint M/s..... a company incorporated under the laws ofand having its Registered/Head Office atas our duly constituted lawful Attorney hereinafter called "Attorney" (hereinafter called Bidder) to exercise all or any of the powers for and on behalf of the Consortium in regard to Tender Notice No..... for "Supply, Installation, Testing & Commissioning of 11 kV feeders including RMU, Cable and accessories on single point responsibility basis in connection with providing new load of 1345 kw on HT system for NICF, Ghitrani " under jurisdiction of BRPL (hereinafter called the "Owner") for which bids have been invited by the Owner, to undertake the following acts :

(i) To submit proposal, participate and negotiate in respect of the aforesaid Bid – Specification of the Owner on behalf of the "Consortium".

(ii) To negotiate with Owner the terms and conditions for award of the contract pursuant to the aforesaid Bid and to sign the contract with the Owner for and on behalf of the "Consortium".

(iii) To do any other act or submit any document related to the above.

(iv) To receive, accept and execute the contract for and on behalf of the "Consortium".

(v) To submit the Contract performance security in the form of an unconditional irrecoverable Bank Guarantee in the prescribed format and as per terms of the contract.

It is clearly understood that the Bidder/Lead Partner shall ensure performance of the contracts(s) and if one or more Member fail to perform their respective portion of the contracts(s), the same shall be deemed to be a default by all the Partners.

It is expressly understood that this power of Attorney shall remain valid, binding and irrevocable till expiry of contract period or any extension thereof.

The Consortium hereby agrees and undertakes to ratify and confirm all the whatsoever the said Lead Partner quotes in the bid, negotiates and signs the Contract with the Owner and / or proposes to act on behalf of the Consortium by virtue of this Power of Attorney and the same shall bind the Joint Consortium as if done by itself.

IN WITNESS THEREOF the Members Constituting the Consortium as aforesaid have executed these presents on this day of under the Common Seal (s) of their Companies.



BSES RAJDHANI POWER LIMITED

For and on behalf of the members of Consortium

.....
.....
.....

The Seal of the above Partners of the Consortium:

The Seal has been affixed there unto in the presence of:

WITNESS

1. Signature
Name
Designation
Occupation

2. Signature
Name
Designation
Occupation

ANNEXURE –II

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-III

SCOPE DEMARACATION AND ROUTE MAP



BSES Rajdhani Power Ltd

TECHNICAL SPECIFICATION FOR SUPPLY, ERECTION, TESTING & COMMISSIONING OF 11KV CABLE
SUPPLY AND LAYING WORK ON TURNKEY BASIS

**TECHNICAL SPECIFICATION
FOR
SUPPLY, ERECTION, TESTING & COMMISSIONING
OF
11KV CABLE SUPPLY AND LAYING
WORK ON TURNKEY BASIS**

BSES RAJDHANI POWER LTD			
Prepared By	Gautam Deka		Rev: 00
	Pronab Bairagi		
Reviewed by	Amit Tomar		Page 1 of 10
Approved By	K. Sheshadri		17.11.2021
Registered office: BSES Bhawan , Nehru Place , New Delhi- 19			

**TECHNICAL SPECIFICATION FOR SUPPLY, ERECTION, TESTING & COMMISSIONING OF 11KV
CABLE SUPPLY AND LAYING WORK ON TURNKEY BASIS****Index**

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2.	11kV HT cable (3CX300 sqmm cable)	
3.	11kV HT cable (3CX400 sqmm cable)	
4.	66kV / 33kV /11kV Jointing Kit	
5.	66kV / 33kV /11kV Termination Kit	
6.	11kV Ring Main Unit (Motorized)	
7.	Chemical Earthing	
8.	GI and Earthing pipe	
9.	Nut bolt, Washer etc, PVC insulation tape	
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**TECHNICAL SPECIFICATION FOR SUPPLY, ERECTION, TESTING & COMMISSIONING OF 11KV
CABLE SUPPLY AND LAYING WORK ON TURNKEY BASIS****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 11KV
CABLE SUPPLY AND LAYING WORK ON TURNKEY BASIS****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 11kV Cable including Cable Jointing , Cable termination	X	√	NA
3	Supply, Laying, testing and commissioning of 11kV Ring Main Unit (Indoor and Outdoor)	X	√	
4	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
5	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.
6	Drawing Submissions	X	√	NA
7	Engineering Approvals	√	X	NA
8	Testing Equipments	X	√	NA
9	Lighting Arrangement	X	√	NA

**TECHNICAL SPECIFICATION FOR SUPPLY, ERECTION, TESTING & COMMISSIONING OF 11KV
CABLE SUPPLY AND LAYING WORK ON TURNKEY BASIS**

S.No.	Head	BRPL Scope	Contractor's Scope	Remarks
10	Construction Power and Construction Water	X	√	NA
11	Safety , Security and insurance of Manpower(Labour, Engineers, Supervisors etc)	X	√	Labour should be provided with every safety gear like safety jacket, helmet etc.
12	Various Tools and Tackles related to Job	X	√	NA
13	Transportation of Material and any other tender related work	X	√	NA
14	Cleanliness around project site	X	√	NA
15	Security and Safety of material until handing over the project to BRPL	X	√	NA
16	Providing of Various Machines e.g Crane, Hydra, JCB, Hammer , Cutting Machine etc to complete the project	X	√	NA
17	Providing of Trenchless Machine	X	√	NA
18	Loading and Unloading of material at site including scrap returning to BRPL site	X	√	NA
19	Electrical Inspector Clearance	X	√	Statutory fees will be borne by BRPL
20	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.
21	Permit to work requesting Agency in BRPL premises	X	√	Permit Should be applied to Engineer Incharge prior to work through proper procedure
22	Permit to work issuing agency inside BRPL Premises	√	X	NA
23	Temporary office and Material Store near work premises	X	√	NA
24	Storage of all kind of Material required for project	X	√	BRPL premises will not provide for any kind of material storage

**TECHNICAL SPECIFICATION FOR SUPPLY, ERECTION, TESTING & COMMISSIONING OF 11KV
CABLE SUPPLY AND LAYING WORK ON TURNKEY BASIS**

S.No.	Head	BRPL Scope	Contractor's Scope	Remarks
				and issuance
25	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
26	Preparation, updation and submission of PERT chart fortnightly to track activities	X	√	NA
27	Submission of final drawing showing layout of cable in Google map alongwith of cable joint location with GPS Coordinates	X	√	Approval will be done by BRPL Representative
28	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
29	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
30	Sheath Integrity test before Charging of Cable	X	√	Mandatory
31	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	√	
32	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
33	De-watering of pits	X	√	Scope shall be covered as per execution team requirement.
34	Petty/Miscellaneous items related to job	X	√	

**TECHNICAL SPECIFICATION FOR SUPPLY, ERECTION, TESTING & COMMISSIONING OF 11KV
CABLE SUPPLY AND LAYING WORK ON TURNKEY BASIS****Special requirement**

1. Delivery of cable at site and all other associate equipments/accessories have to be aligned as per site requirement and progress.
2. All kind of structural steel shall be GI unless otherwise specified.
3. Make of all kind of materials shall be as per BRPL approved make list, no deviation shall be allowed from make list.
4. Cable drum no shall be included by embossing or by laser printing at a interval of 1 meter on the outer sheath of the cable.

3.00.00 PACKAGE

3.01.00 Providing New Load of 4MVA (EV-HT category) IN F/O Depot Manager,DTC mayapuri Depot,near Mayapuri Metro station , New Delhi .

3.02.00 Route map and Single Line diagram (attached below)

4.00.00 TECHNICAL SPECIFICATION

Please refer individual Technical Specification

5.00.00 SCHEDULES

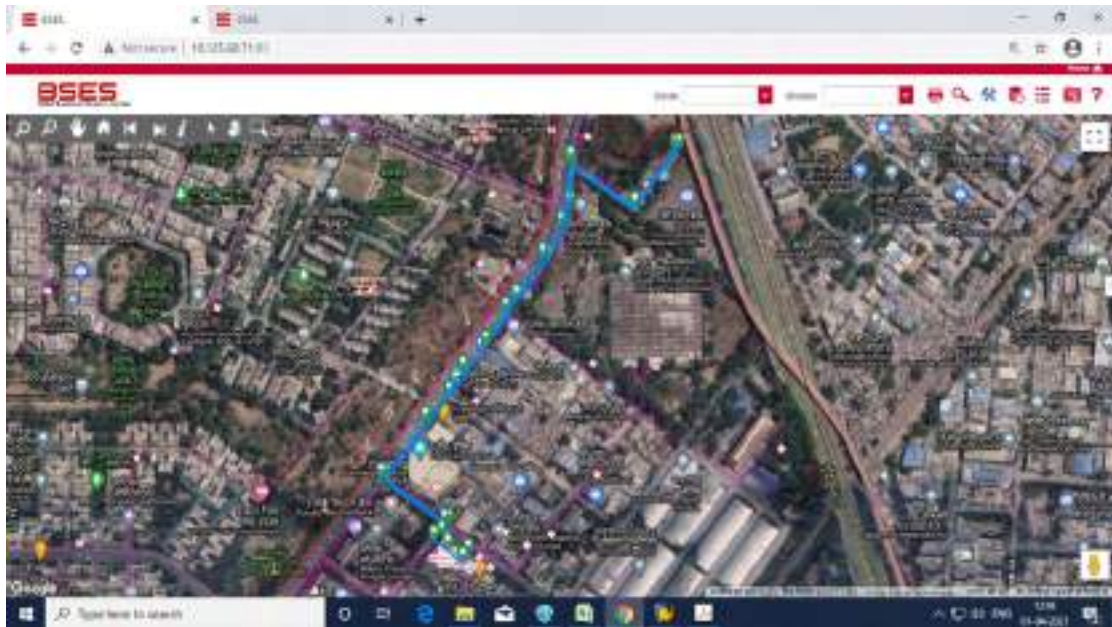
SCHEDULE -I
TECHNICAL DEVIATION FROM THE SPECIFICATION
(This shall be part of Technical bid)










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

Sl no	Specification cl no	Deviation	Remark

**TECHNICAL SPECIFICATION FOR SUPPLY, ERECTION, TESTING & COMMISSIONING OF 11KV
CABLE SUPPLY AND LAYING WORK ON TURNKEY BASIS****SCHEDULE -II
BRPL APPROVED MAKE LIST OF MAJOR ITEMS**

Sl no	Items Description	Approved Make	Remark
1	11kV HT cable	1. Universal Cables 2. Dynamic Cables 3. Torrent Power 4. KEI Industries 5. Sterlite Power 6. Gupta Power 7. Gemscab Industries 8. Polycab 9. Apar 10. KEC International	
2	11kV RMU	1. Schneider Electric 2. Lucy Electric 3. Siemens	
3	11 kV Jointing and Termination KIT	1. Raychem 2. 3M 3. Compaq 4. Yamuna Denson 5. BBC Cellpack	
4	11kV Metering Cubicle	1. Adhunik 2. Perfect sales 3. Concord	
5	HDPE Pipes	1. Flow well 2. Tirupati 3. Narendra Polyplast 4. Eon plast	

**TECHNICAL SPECIFICATION FOR SUPPLY, ERECTION, TESTING & COMMISSIONING OF
11KV CABLE SUPPLY AND LAYING WORK ON TURNKEY BASIS****3.02.00 Route Map****Single Line diagram for DTC_Mayapuri**

LEGEND	
	CUT OFF
	SINGLE POLE
	DOUBLE POLE
	FOUR POLE
	W/B
	C/B
	ST
	CIRCUIT BREAKER
	ISOLATOR
CHECKED BY: M/L S/L H/L	
PREPARED BY: GRS WEST	
DATE: 6.8.73	

ANNEXURE-IV

TECHNICAL SPECIFICATIONS


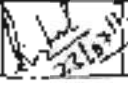



Technical Specification for

H. T. Cables

(11kV : 1CX1000, 3CX300 and 3CX150 sqmm)

Specification No: GN101-03-SP-172-00

Prepared by		Reviewed by		Approved by		Rev./Pages	Date
Name	Sign	Name	Sign	Name	Sign		
Pronab Boragi		Amil Tomar		K. Sheshadri		0/42	23.07.2019

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Revision Record

Sl. no.	Clause no.	Item descriptions	As per old Technical Specification (SP-ETAMP-01-R3)	As per Revised Technical Specification (GN101-03-SP-172-00)	Date of approval	Approved by
1	1.0.0	Cable Construction Features	XLPE	TR-XLPE	23/07/19	KS
2	2.1.12-C-13	Embossing and printing	Drum no. was not included	Drum no. included in embossing along with laser printing at an interval 1 mtr.	23/07/19	KS
3	4.0.0-a	Type Test	Type test report with validity 5 years only	<u>Type Test Required after Award of PO:</u> 1) Type test-1: 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 BRPL during inspection of cable. Cost for this type test shall be borne by the respective bidder. 2) Type test-2: 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 BRPL during inspection of cable. This type test is applicable subject to BRPL requirement and cost shall be borne by BRPL.	23/07/19	KS
4	4.0.0-b	Routing Test	1. CRM 2. HV 3. PD	<u>Test Added:</u> 1. Stripability 2. Impulse 3. Armour Coverage 4. Physical Dimensions	23/07/19	KS
5	4.0.0-d	Inspection	Only final inspection was included	Added Stage inspection before final inspection - OSHA shall announce 10 days advance to BRPL along with complete manufacturing schedule	23/07/19	KS
6	4.0.0-e	Acceptance Tests	a. Water Ball test- once per PO b. Void-and-contamination Test- once per PO c. Stripability Test- once per PO d. Water Penetration Test (WPT)- once per PO e. Impulse- not included f. Heating Cycle- not included	<u>Upgraded</u> a. Water Ball test- in each lot b. Void-and-contamination Test- in each lot c. Stripability Test- in each lot d. Water Penetration Test (WPT)- in each lot <u>Added</u> e. Impulse in each lot sample basis f. Heating Cycle with Potential on sample basis once per PO	23/07/19	KS
7	6.0.0	Drum Length and Tolerance	<u>11kV, 3 Core cable</u> a) 100 mtr +/- 5 %	<u>11kV, 3 Core cable</u> a) 300 mtr +/- 5 % (60% of PO qty.) b) 500 mtr +/- 5 % (40% of PO qty.)	23/07/19	KS
8	7.0.0-a	Type of Drum	Steel/Wooden	only Steel non returnable	23/07/19	KS

Proposed by
Pranab Bairagi

Reviewed by
Anil Kumar

Approved by
K. Sheshadri

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 TR-XLPE H. T. Cables used in BRPL network in Delhi 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 H. T. Cables (11kV: 1CX1000, 3CX300 and 3CX150 sqmm)

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.)

WW 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.	11 kV, 3c x 150 sq. mm.	Al	A 2X F Y
2.	11 kV, 3c x 300 sq. mm.	Al	A 2X F Y
3.	11 kV, 1c x 1000 sq. mm.	Al	A 2X Wa Y

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

2.1.1	Conductor	<p>a) Electrolytic Grade Stranded Aluminium Conductor</p> <p>b) Grade: H2 as per IS: 8130 / 1984 (For Al)</p> <p>c) Stranded, compacted and circular in shape</p> <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.</p> <p>i) As per manufacturer’s procedures, 100 % water-tight conductor shall be achieved.</p> <p>iii) Make & Type of materials to be used (i.e. Water-swellaable tapes / yarn / powder, etc.) shall also be stated in the List of Sub-Vendors for pre-order approval.</p> <p>f) 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 BRPL-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. (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>
2.1.4A	XLPE Process	
2.1.4A-1	11 kV	Dry Cure and Dry Cool process only.
2.1.4A-2	Not in use	
2.1.4A-3	Extrusion	It is desirable that Conductor Screen, Insulation and Insulation Screen shall be extruded simultaneously, in a Single One-Time Process (i.e. as a triple-head extrusion) to ensure homogeneity of layers over the conductor, and absence of voids.
2.1.4A-4	Make of Compounds for Insulation and Semi-conducting	Any deviation from Approved Makes mentioned in Annexure-C shall not be acceptable, unless the deviation has been specifically approved by BRPL during tendering stage,
2.1.5	Water-Swell able 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 approx.</p> <p>d) Swell height: ≥ 12 mm in 1 min.</p> <p>e) Compatible to strippable / non-strippable semi-</p>

		con, over which it is applied.
2.1.6	Core Identification	<p>a) For 3-core cables, cores shall be identified by coloured strips (Red, Yellow, Blue), applied helically / longitudinally below the copper tape.</p> <p>The coloured strips shall carry the name of cable manufacturer permanently printed at 1 meter intervals; this is to provide additional identification of manufacturer of the cable.</p>
2.1.6A	Copper Tape	Copper Tape shall be applied helically over the layer formed after application of insulation screen, water-swell able tape and identification strip.
2.1.7	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>
2.1.8	Binder Tape	As per manufacturer's standard
2.1.9	Inner Sheath	Extruded Inner Sheath of Black PVC type ST-2 (IS 5831)
2.1.10	Armour	<p>a) For 3-core Cables : Galvanised Steel flat strip armour</p> <p>b) For 1-core Cables : Non-magnetic round wire armour (hard-drawn aluminium wire)</p> <p>c) Minimum area of coverage of armouring shall be 90 % (min.). At any time, the gap between any two adjacent armour strips / wires shall not be</p>

		<p>more than the width of strip / diameter of wire.</p> <p>d) Zero negative tolerance is for :</p> <ul style="list-style-type: none"> • Thickness of armour strip • Diameter of armour wire
2.1.11	Binder Tape	Rubberised cotton tape
2.1.12	Outer Sheath	<p>a) Extruded outer sheath of PVC (ST-2 as per IS 5831) with termite-repellant and anti-rodent properties.</p> <p>(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. A2XFY) 3. Manufacturer's Name and Trade-mark 4. Number of cores and nominal cross-sectional area of conductor 5. Progressive (sequential) length of cable at every meter, starting from zero for every drum. <p>Colour filled in for the progressive marking, shall be with proper contrast in colouring.</p> <ol style="list-style-type: none"> 6. Name of buyer / purchaser, 7. Month & Year of manufacturing

		<p>8. IS reference, i.e. IS : 7098</p> <p>9. Batch No. / Lot No. (For traceability purpose, in case of any, in case of any manufacturing defect or otherwise arising in the cable in future.)</p> <p>10. Purchase Order Number & date</p> <p>11. Word ' FRLSH ', in case the cable is of FRLSH type.</p> <p>12. Drum no.</p>
2.1.13	<p>Pulling-eye Assembly and Sealing-end Cap (for Cables)</p>	<p>a) A cable pulling-eye assembly Drg. No. MISC/E/4-1131/1698 (see Annexure-E) shall be provided at the loose end (outer end) of the cable on each drum. Sealing material shall be filled in inside the spaces / gaps between the pulling-eye assembly and cable outer sheath. Further, a heat-shrinkable sleeve shall be provided over the pulling-eye assembly and outer sheath of cable.</p> <p>b) Other end (inner end) of the cable shall be sealed as per MISC/E/4-1131/1699 (see Annexure-E.) One PVC cap with Polyurethane compound shall be provided as primary sealing and heat-shrink end-cap shall form a secondary sealing over the PVC cap.</p>
3.0.0	(This number not used.)	
4.0.0	Testing & Inspection	Tests shall be carried out in accordance with IS 7098 (Part-2).
	a) Type Tests (IS 7098, IEC)	<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 rating of cable offered in the bid. Test report shall not be more than 5 years old.</p>

		<p>2) <u>Type Test Required After Award of PO:</u></p> <p>i) Type test-1: 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 BRPL during inspection of cable. Cost for this type test shall be borne by the respective Bidder.</p> <p>ii) Type test -2: 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 BRPL during inspection of cable. This type test is applicable subject to BRPL requirement and cost shall be borne by BRPL.</p>
	b) BRPL QAP (Typical)	<p>In general, all tests mentioned in the BRPL QAP (Characteristics – Typical) mentioned in Annexure-F shall be included in the Routine Tests, Type Tests and Acceptance Tests stated above.</p>
	c) Routine Tests	<ol style="list-style-type: none"> 1. Measurement of Electrical Resistance 2. HV Test with power frequency AC voltage 3. Partial Discharge 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

		<p>Sellers works at any time prior to dispatch, to verify compliance with the specifications.</p> <p>3. In-process (stage inspection) and final inspection call intimation shall be given at 10 days advance to the purchaser along with complete manufacturing scheduled.</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) for 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-in each lot.</p> <p>b) "Void-and-contamination Test" for the Insulation-in each lot</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) - in each lot.</p> <p>d) "Water Penetration Test (WPT)", as per applicable IEC standards, to check adequacy of water-blocking arrangement provided inside the conductor -in each lot.</p> <p>e) Impulse voltage test – in each lot sample basis.</p> <p>f) Heating Cycle along with potential once per PO on sample basis.</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 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> <p>a) Cross-sectional drawing</p> <p>b) GTP (all data to appear)</p> <p>c) Type Test certificates</p> <p>d) Dimensional drawing for pulling eye</p> <p>e) Fault Level Calculation for armour and copper tape screen</p> <p>f) Complete Cable Catalogue and Manual</p> <p>g) Armour Coverage Calculation</p> <p>h) Raw materials make list</p>

5.0.2	Documents after award of contract	Within 15 days, the seller has to submit four sets of above-mentioned drawings, along with one soft copy for buyer's approval.
5.0.3	Final As-Built Drawings	One soft copy of all documents, including type & routine test certificates.
6.0.0	Drum length & tolerance	Cable length per drum
6.0.1	a) 11 kV, Three core b) 11 kV, Single core	a) 300 mtr +/- 5 % (60% of the order quantity) and 500 mtr +/- 5% (40% of the ordered quantity) a) 500 mtr +/- 5 %
6.0.2	Overall tolerance	+/- 2 % for the total cable length for the entire order.
6.0.3	Short length of cables	<p>Manufacturer shall take prior approval from Purchaser for any supply of short length cables.</p> <p>For 11 kV cables, minimum acceptable short length cables can be 250 meter.</p> <p>In any case, manufacturer shall not put two cable pieces of different short lengths in same cable drum. Only one short length drum shall be accepted and in last lot only.</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,

		<p>including the initial length marking.</p> <ol style="list-style-type: none"> Similarly, outer end of the cable shall be saddled / secured to the drum properly to prevent any external damage to the end at any time. Before putting on wooden planks, protective covers (thick plastic sheets, etc.) shall be secured over the wound cable, to avoid any abrasion by wooden planks, over the outer sheath of the cable. After providing the protective covers, the cable drums shall be finally closed by wooden planks (with saddles), without leaving any gaps between the planks; i.e. 100 % covering shall be ensured.
	b) Drum Identification Markings:	<p>Direct marking (i.e. text painting through stencils, etc.) shall be done on the drums, instead of attaching labels, which may be misplaced/lost over a period of time.</p> <ol style="list-style-type: none"> Drum identification number Cable voltage grade Cable code (e.g. A2XFY, etc.) Number of cores and cross sectional area Cable quantity, i.e. cable length (meter) Purchase order number & date SAP item code Total weight of cable and drum (kg) Manufacturer's Name Buyer's name Month & Year of Manufacturing Direction of rotation of drum Cable length final end-markings (i.e., reading at the inner end and reading at the outer end, just before packing, shall be marked on the drum.)
	c) Shipping information	The seller shall give complete shipping information

		concerning the weight, size of each package
	d) Transit damage	The seller shall be responsible for any transit damage due to improper packing.
	e) Type of Drum	Steel drums (all the drums shall be non returnable except otherwise mentioned in the tender), as per relevant IS / IEC.
	f) Cable Drum handling	The drums shall be with M.S. spindle plate (with nut-bolts) of adequate size to suit the spindle rods, normally required for handling the drums, according to expected weight of the cable drums.
8.0.0	Quality Assurance Plan (QAP)	
8.0.1	Vendor's QAP	Manufacturer shall submit QAP in line with BRPLQAP (Annexure-F) for purchaser's approval before starting of manufacturing which is mandatory
8.0.2	Inspection Points	As per BRPL approved QAP and special BRPL requirement if any to cross check the product quality. Seller must have to meet the special requirement of BRPL during inspection.
9.0.0	Progress Reporting	
9.0.1	Outline Document	To be submitted for purchaser's approval for outline of programmes for production, stage-inspection, testing, final inspection, packing, dispatch and documentation.
9.0.2	Detailed Progress Report	To be submitted to Purchaser once a month containing : i) Progress on material procurement ii) Progress on fabrication (as applicable) iii) Progress on assembly (as applicable) iv) Progress on internal stage-inspection v) Reason for any delay in total programme vi) Details of test failures, if any, during manufacturing stages.

		vii) Progress on final box-up Constraints / Forward Path
10.0.0	Deviation	<p>a) Deviations from this specification shall be listed separately by bidder clause wise (format given in Annexure- H) 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.</p> <p>b) 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.</p> <p>c) 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.</p>

Annexure – A**Scope, Documentation and Delivery schedule****1. Scope**

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

a) Document Submission

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

Legend:

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

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

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

3. Delivery Schedule

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

Annexure - B**GUARANTEED TECHNICAL PARTICULARS (GTP)****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 (as required by purchaser)			
	a) 11 kV, 3c x 150 sq. mm.	A2XFY		
	b) 11 kV, 3c x 300 sq. mm.	A2XFY		
	c) 11 kV, 1c x 1000 sq. mm.	A2XWaY		
6.0	Voltage Grade			
	a) 11 kV, 3c or 1c	6.35 / 11	kV	
7.0	Maximum Conductor temperature			
A	Continuous	90	deg. C	
B	Short time	250	deg. C	
8.0	Conductor	Compacted, Circular, Water tight construction is mandatory		
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.	

Technical Specification for H. T. Cables (11kV: 1CX1000, 3CX300 and 3CX150 sqmm)

D	Conductor Shape	As per Cl. 2.1.1	ε	
E	Dia. of wires in each conductor before compaction	Manufacturer Standard	mm	
F	Diameter over conductor		mm	
G	Maximum Conductor resistance at 20 ° C			
	a) 11 kV, 3c x 150 sq. mm.	0.2060	ohm/km	
	b) 11 kV, 3c x 300 sq. mm.	0.1000	ohm/km	
	c) 11 kV, 1c x 1000 sq. mm.	0.0291	ohm/km	
H	Longitudinal Water Blocking Arrangement within conductor	Is it provided and shown in the cross-sectional drawing? (Yes / No)		
I	Short circuit current-carrying capacity of conductor		kA for 1 sec.	
9.0	Conductor Screen (inner semi-con)			
A	Material & type	As per Cl. 2.1.2		
B	Thickness (min)	0.50	mm	
C	Diameter over conductor screen		mm	
D	Make and grade of semi-conducting compound			
10.0	Insulation			
A	Insulation Material	As per Cl. 2.1.3		
B	Nominal thickness			
	a) 11 kV, 3c or 1c	3.6	mm	
C	Minimum thickness			
	a) 11 kV, 3c or 1c	3.14	mm	
D	Diameter over Insulation		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	2	%	
b.	Diameter over Insulation Screen (approx.)		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 BRPL	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 : 0.06 + 5 % b) Width : 50 mm C) Overlap: 10% d) no negative tolerance in 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 (approx.)		mm	
12.0	Filler (Material and type)	As per Cl. 2.1.7 (Specify no. & size of filler at center & core interstices)		
	a) 11 kV, 3c x 150 sq. mm.			
	b) 11 kV, 3c x 300 sq. mm.			
	d) 11 kV 1core	Not applicable		
12A.0	Binder Tape	over laid-up cores		
13.0	Inner Sheath			
A	Material and type	As per Cl. 2.1.9		

Technical Specification for H. T. Cables (11kV: 1CX1000, 3CX300 and 3CX150 sqmm)

B	Minimum thickness			
	a) 11 kV, 3c x 150 sq. mm.	0.6	mm	
	b) 11 kV, 3c x 300 sq. mm.	0.7	mm	
	c) 11 kV, 1c x 1000 sq. mm.	0.7	mm	
C	Approx. dia. over inner sheath		mm	
14.0	Armour	as per purchaser's requirements		
A	Material			
	a) 11 kV, 3c	G. I. Strip	No.	
	b) 11 kV 1c	non-magnetic wire armour (Aluminium wire)	No.	
B	Armour – Wires	As per Table 4 of IS 7098 Part-2 (zero negative tolerance for diameter)	mm.	
	a) Diameter of wire			
	b) Number of wires (min.)		no.	
C	Armour – GI strips			
	a) Width of strip & Thickness of strip	4 x 0.8 (zero negative tolerance for thickness)	mm	
	b) Number of strips (min.)		no.	
D	Approx. Equivalent Area		sq. mm.	
E	Area covered by armour	Min. 90 % Calculation shall be attached.	%	
F	Dia. over armour - approx.		Mm	
G	Fault current carrying capacity of armour	Calculation sheet shall be attached.	... kA for ... sec.	
15.0	Outer Sheath			
A	Material and type	As per Cl. 2.2.12		
B	Thickness (min.)	** As per Table-5 of IS 7098 Part-2		
	a) 11 kV, 3c x 150 sq. mm.	**	mm	
	b) 11 kV, 3c x 300 sq. mm.	**	mm	
	e) 11 kV, 1c x 1000 sq. mm.	**	mm	
C	Color	Blue		
D	Embossing (details as per Cl. 2.1.12)	Yes		
E	FRLS Properties	As per customer's requirement		
16.0	Approx. overall diameter		mm	

Technical Specification for H. T. Cables (11kV: 1CX1000, 3CX300 and 3CX150 sqmm)

17.0	Standard drum length with tolerance			
	a) 11 kV, 3c x 150 / 300 sq. mm.	300 +/- 5% (60% of PO qty.) 500 +/- 5% (40% of PO qty.)	meters	
	b) 11 kV 1c x 1000 sq. mm.	500 +/- 5%	meters	
17A	Overall order tolerance	+ / - 2 % for the total cable length for the entire order.		
18.0	Cable Drum			
a.	Type of drum	Steel non returnable (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. Pulling-eye Assembly (provided at one running end) Refer drawing in Annexure-E	Is manufacturer's / Sub-vendor's drawing submitted? (Yes / No)		
	b. Sealing-end Cap (provided at the other end) Refer drawing in Annexure-E	Is manufacturer's / Sub-Vendor's drawing submitted? (Yes / No)		
20.0	Weights			
	a) Net weight of cable (approx.)		kg / km	
	b) Weight of empty drum		Kg	
	c) Weight of Cable with drum		kg	
21.0	Continuous current rating for standard I. S. condition laid Direct			
	a) In ground 30° C		Amp	
	b) In duct 30° C		Amp	
	c) In air 40° C		Amp	
22.0	(not used)			

Technical Specification for H. T. Cables (11kV: 1CX1000, 3CX300 and 3CX150 sqmm)

23.0	Electrical Parameters at Maximum Operating temperature:			
A	AC Resistance		ohm / km	
B	Reactance at 50 c/s		ohm / km	
C	Impedance		ohm / km	
D	Zero sequence impedance		ohm / km	
E	Positive sequence impedance		ohm / km	
F	Negative sequence impedance		ohm / km	
G	Capacitance		micro-farad / km	
24.0	Recommended minimum bending radius	12 x O. D.	mm	
25.0	De-rating factor for following Ambient Temperatures :	Ground / Air		
	a) At 30° C			
	b) At 35° C			
	c) At 40° C			
	d) At 45° C			
	e) At 50° C			
26.0	Group factor for following numbers of cables laid :	Touching Trefoil		
	a) 3 Nos.			
	b) 4 Nos.			
	c) 5 Nos.			
	d) 6 Nos.			
27.0	Recommended pressure for laying cable using power winch	30 N / mm ²	N / sq. mm.	
28.0	Process of Cross-linking of Polyethylene			
	a) 11 kV, 3c or 1c	Dry Cure process and Dry Cooling 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)		
31.0	List of Sub-Vendors for construction items (Annexure-C)	Is this list enclosed for BRPL approval? (Yes / No)		

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

Vendor/Bidder to state sub-vendors' names for other items, wherever approved names are not mentioned, for purchaser's approval during tendering stage else purchaser shall impose as per their requirement and bidder to follow the same in post-order stages.

Ser. No.	Raw Materials		Name of the Make
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	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)

Ser. No.	Raw Materials		Name of the Make
		4	Vedanta (Sesa Sterlite)
6.	Copper Tape	1	Aggarwal Metal
		2	Indian Smelting
		3	Luvata Swedan
		4	Outokumpu Copper Strip AB, Swedan
7	Galvanised 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
		3	Shakun
		4	Kalpana

Annexure - D**Service Conditions**

(Atmospheric / Soil conditions at Site)

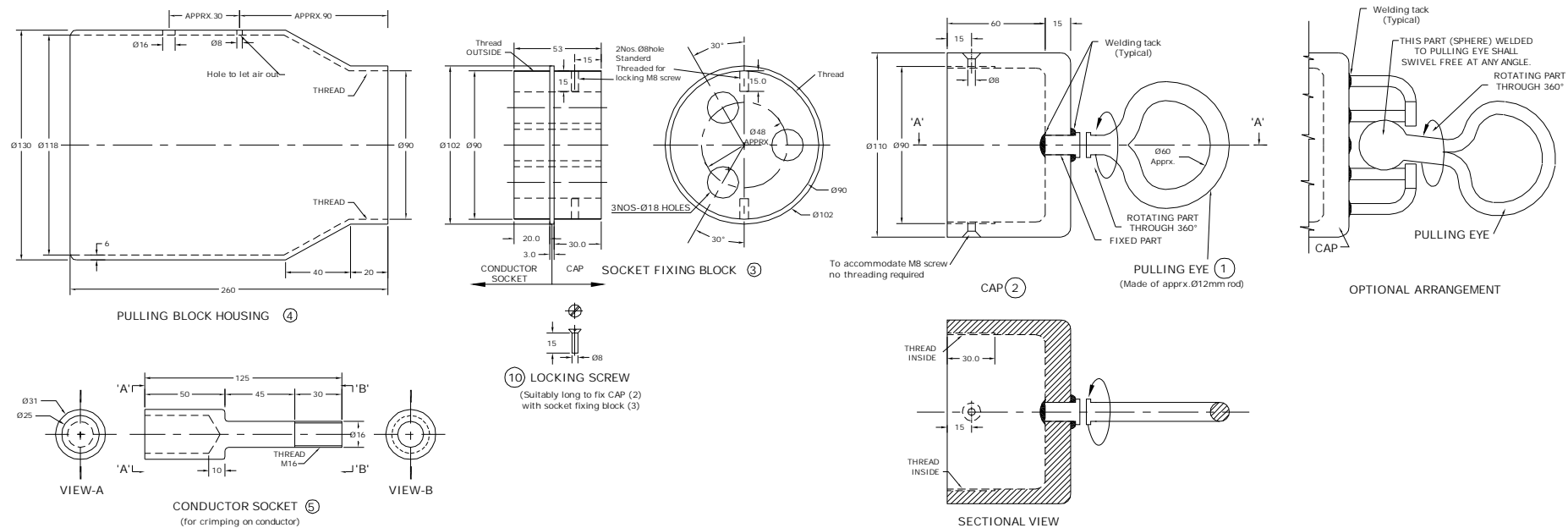
B. Delhi		
a)	Average grade atmospheric condition	Heavily polluted, dry
b)	Maximum altitude above sea level	1000 M
c)	Air temperature Ambient	i) Highest : 50 deg C ii) Average : 40 deg C iii) Minimum : 0 deg C
d)	Relative Humidity	100 % max
e)	Thermal Resistivity of Soil	150 deg. C. cm / W max.
f)	Seismic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

Annexure E

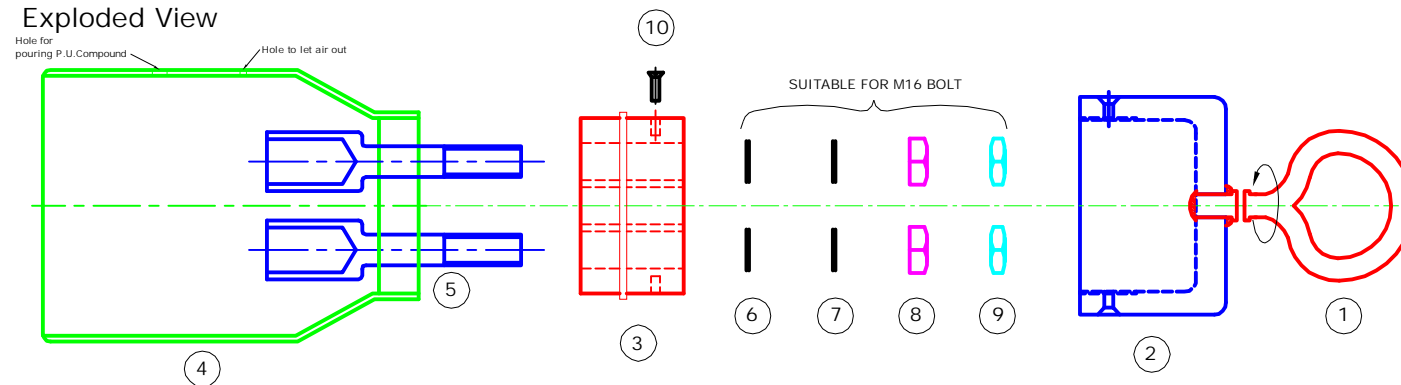
1. General Arrangement Drawing for Cable Pulling Eye

2. General Arrangement Drawing for End-sealing Cap

Both the above drawings are given on next pages.



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: BJR CHECKED BY: AP/D5/PS APPROVED BY:

REVISIONS

Addl V.P.

EXAMPLE:

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

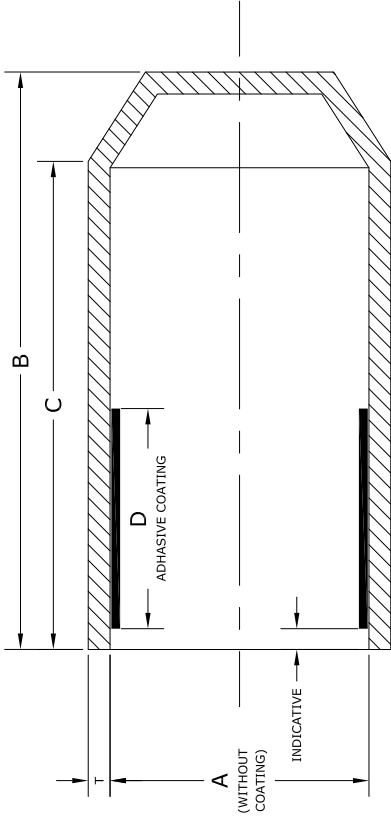
NOTE:

- All Dimensions are in mm, unless otherwise stated.
- 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.
- After fixing cable pulling eye, P.U. (Poly-Urethane) Compound shall be poured to occupy inner spaces to avoid ingress of Water / Moisture.
- After P.U.Compound oozes/flows out from the cable side, the same edge shall be sealed with suitable sleeve/Tape.

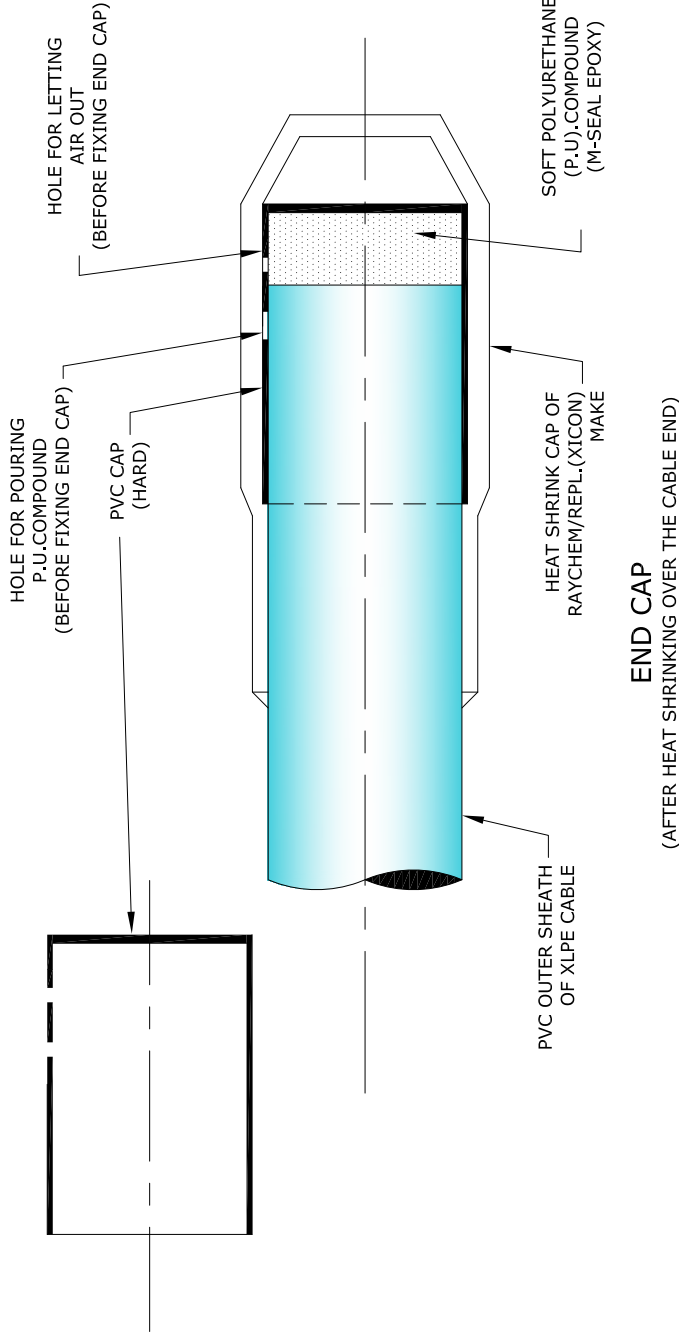
DIMENSIONS

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



END CAP
(AS SUPPLIED)
SECTIONAL VIEW



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

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
B Thermal Test			
1 Thermal Ageing (120°C for 500 hrs)			
1 Tensile Strength	Type	8 N/sqmm (min)	ASTM D-412 / ISO 37
2 Ultimate Elongation	Type	200% (min)	ASTM D-412 / ISO 37
C Electrical Properties			
1 Volume Resistivity	Type	10 ¹² ohm-cm. (min)	ASTM D-257 / IEC 93
2 Dielectrical Strength	Type	10 kV/mm. (min)	ASTM D149 / IEC 243
3 Dielectric Constant	Type	5 (max)	ASTM D150 / IEC 250

BSES

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

SCALE :NOT TO SCALE DATE: 09-05-2011

END SEALING CAP
(FOR XLPE CABLE)

DRAWN BY: BJR CHECKED BY: AP/DS/PS APPROVED BY:

REVISIONS

Annexure- F**QAP Format
(Quality Assurance Plan)
For H. T. Cables (Typical)**

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

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



QUALITY ASSURANCE PLAN (QAP)

FOR 11 kV H. T. CABLES

S. NO.	COMPONENT & OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			Remark
									SV	MFR	BRPL	
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,												
BRPL : BSES Rajdhani Power Ltd, 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	



QUALITY ASSURANCE PLAN (QAP)

FOR 11 kV H. T. CABLES

S. NO.	COMPONENT & OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			Remark
									SV	MFR	BRPL	
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, BRPL : BSES Rajdhani Power Ltd, 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	Cable Pulling eye	a) Dimensions & Material	Major	Meas.	1 sample per size	Purchase order	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	-	
		c) Tension test on pulling eye	Major	Physical	1 sample per size	Pulling eye subjected to load		-	P	P	-	
10	Binder tape	a) Dimensions & material	Minor	Physical	Sample	MPS	MPS	-	P	P	-	
11	Polypropylene filler	a) Size	Minor	Physical	Sample	Purchase order	Purchase order	-	P	P	-	
12	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	-	



QUALITY ASSURANCE PLAN (QAP)

FOR 11 kV H. T. CABLES

S. NO.	COMPONENT & OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			Remark
									SV	MFR	BRPL	
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, BRPL : BSES Rajdhani Power Ltd, P : Perform, W : Witness, V : Verification											
		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	
		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	



**QUALITY ASSURANCE PLAN (QAP)
FOR 11 kV H. T. CABLES**

S. NO.	COMPONENT & OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			Remark
									SV	MFR	BRPL	
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, BRPL : BSES Rajdhani Power Ltd, P : Perform, W : Witness, V : Verification											
		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	
		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) Physiactal 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 BRPL 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	
3	Acceptance tests	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	



**QUALITY ASSURANCE PLAN (QAP)
FOR 11 kV H. T. CABLES**

S. NO.	COMPONENT & OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			Remark
									SV	MFR	BRPL	
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, BRPL : BSES Rajdhani Power Ltd, P : Perform, W : Witness, V : Verification												
		c) Wrapping test for aluminium	Major	Physical	Appendix A to IS 7098/II/2011, each lot sample basis	IS 8130/84	IS 8130/84	-	-	P	V	Tests N/A on finished conductor.
		d) Conductor resistance test	Major	Electrical		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	
		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	



**QUALITY ASSURANCE PLAN (QAP)
FOR 11 kV H. T. CABLES**

S. NO.	COMPONENT & OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			Remark
									SV	MFR	BRPL	
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, BRPL : BSES Rajdhani Power Ltd, P : Perform, W : Witness, V : Verification												
		v) Resistivity of Strip armour	Major	Electrical	sample basis, once per PO Each Lot	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) Cable pulling eye strength test on one sample	Major	Physical		As per data sheet & FS	As per data sheet & FS	Test Report	-	P	W	
		y) Flammability test	Major	Physical		As per IS-78098/II/2011	As per IS-78098/II/2011	Test Report	-	P	W	
		z) Impulse withstand test	Critical	Electrical		IS 7098/II/2011	IS 7098/II/2011	Test Report	-	P	W	
		z1) Ageing & Water absorption test(Gravimetric) on Insulation & Outer sheath	Major	Physical		IS 5831/84	IS 5831/84	Test Report	-	P	W	
		z2) Heating Cycle with Potential	Critical	Electrical				Test Report	-	P	W	
		z3) Raw Material Verification in all aspects	Major	Physical						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	



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S. NO.	COMPONENT & OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			Remark	
									SV	MFR	BRPL		
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,													
BRPL : BSES Rajdhani Power Ltd, P : Perform, W : Witness, V : Verification													
		iii) Hot set test	Major	Physical	One sample per order	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	
		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	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		



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FOR 11 kV H. T. CABLES**

S. NO.	COMPONENT & OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			Remark
									SV	MFR	BRPL	
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,											
	BRPL : BSES Rajdhani Power Ltd, 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. BRPL may witness Raw material and in process inspection in addition to Routine/Acceptance tests at any time/stage of manufacturing.										
		5. BRPL's Inspector may randomly select a cable drum for type testing at vendor's works.										
		6. For each of the offered lot for inspection, BRPL may randomly select one cable drum for testing of end cap "Destructive testing" to verify adhesion of sealing cap to cable outer sheath. Similarly, pulling eye shall be tested with 30N/mm ² pressure.										
		7. All factory Type Tests shall be Witnessed by BRPL										

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

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

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

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

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

Annexure-H: Deviation Format

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



Technical Specification
for
11kV, 3CX400 sqmm Cable
[Conventional and Cable in Co-extruded Duct(CCD) Cable]

Specification No: GN101-03-SP-81-04

BSES Rajdhani Power Ltd.								
Prepared by		Reviewed by		Approved by		Rev.	Pages	Date
Name	Sign	Name	Sign	Name	Sign			
Pronab Bairagi		Amit Tomar		K. Sheshadri		4	41	28.07.21

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Revision Record

Rev. No.	Revision Date	Item/ clause no:	Descriptions	Nature of Changes	Approved by
1	16.05.2018	2.1.3	XLPE	XLPE to TR-XLPE (Hanwa-CLNA TR-8142, DOW-HFDB-4202 EC, BOREALIS-TR-LE-4121)	KS
1	16.05.2018	7.0.0 (e)	Drum	Returnable to Non-Returnable Drum	KS
2	18.04.2019	2.1.6A	OFC	Optical Fiber Cable (Embedded in the place of filler)	KS
2	18.04.2019	Annexure B 12A.0		Guranteed Technical Particulars of Optical Fiber Cable	KS
2	18.04.2019	Annexure I		Detailed Technical Parameter of Optical Fiber Cable (Single Mode Fiber –G.657.A1 -36Nos; Multi Mode Fiber –OM2 -12Nos.)	KS
3	25.07.2019	4.0.0 (a)	Type Test	Type Test Required After Award of PO: i) Type test-1: 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 BRPL during inspection of cable. Cost for this type test shall be borne by the respective Bidder. ii) Type test -2: 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 BRPL during inspection of cable. This type test is applicable subject to BRPL requirement and cost shall be borne by BRPL.	KS
3	25.07.2019	2.1.11 (c)	Outer Sheath	Outer Sheath- a) Drum no. added in embossing b) Drum no. added in printing (laser print)	KS
3	25.07.2019	4.0.0 (C)	Routine Test	Routine Test added a. Impulse Voltage test b. Armour Coverage c. Physical Dimensions	KS
3	25.07.2019	4.0.0 (e)	Acceptance Test	Acceptance Test a. Impulse voltage test added	KS
3	25.07.2019	Annexure -F	QAP	QAP added	KS
3	25.07.2019	Annexure -G	Inspection Expenses	Inspection Expenses-Not Applicable	KS
4	16.07.2021	Clause no 2.1.11.2	For CCD cable(Cable in Co-extruded duct)	a) Extruded PE compound Type ST 7 (Black) – Thickness 2.84 mm b) Conduit material over Extruded PE compound – Extruded HDPE compound Thickness 2 mm, Color Orange(IS 557)	KS
4	16.07.2021	2.1.9 (a)	Armour	a) For CCD cable Galvanized Steel round armour added	KS

Proposed by
Gautam Deka/Pronab Bairagi

Reviewed by
Amit Tomar

Approved by
K. Sheshadri

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 10462 (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 (Um = 7.2 kV) up to 30 kV (Um = 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 TR-XLPE H. T. Cables used in BRPL network in Delhi , mostly under-ground (buried, with chances of flooding by water) or for laying on racks, in ducts, trenches, conduits, and so on.

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

Cable Code:

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.	11 kV, 3CX400 sq. mm. (Conventional cable)	Al	A 2X F Y
	11 kV, 3CX400 sq. mm. (CCD Cable)	Al	A 2X W 2Y 2Y

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

2.1.1	Conductor	<ul style="list-style-type: none"> a) Electrolytic Grade Stranded Aluminium Conductor b) Grade: H2 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) shall be provided within the Conductor. <ul style="list-style-type: none"> i) As per manufacturer’s procedures, 100 % water-tight conductor shall be achieved. iii) Make & Type of materials to be used (i.e. Water-swellable tapes/ yarn) shall also be stated in the List of Sub-Vendors for pre-order approval. f) All detailed constructional features shall be shown in the cross-sectional drawing.
2.1.2	Conductor Screen	<p>Extruded semi-conducting material.</p> <p>(Also refer Cl. 2.1.3.)</p> <p>(Tapes are not acceptable)</p>
2.1.3	Insulation	<ul style="list-style-type: none"> a) Extruded TR-XLPE (TR-Cross-Linked Poly-Ethylene) Insulation. Technical requirement of TR-XPLE shall be full filled as mentioned in Annexure-H b) The required compound used shall be from BRPL-approved sub-vendors and not from any other (refer Annexure – C). c) Uniform thickness of insulation shall be within the permissible values as per IEC Standards; eccentricity check shall be carried out to ensure

		this. d) Insulation Color : natural
2.1.4	Insulation Screen	a) Freely-strippable semi-conducting screen, which should not require application of heat for its removal. (Refer Cl. 2.1.3.) b) Text “Do not Heat - Freely Strippable” to be printed on insulation screen (at every 600 mm interval). c) Round shape over the outer semi-con shall be within the permissible limits as per IEC standards; Ovality (2% max) check shall be carried out to ensure this. d) Compound used shall be suitable for the operating temperature of the Cable and shall be compatible with the insulation used.
2.1.4A	XLPE Process	
2.1.4A-1	11 kV	Dry Cure and Dry Cool process only.
2.1.4A-2	Extrusion	It is desirable that Conductor Screen, Insulation and Insulation Screen shall be extruded simultaneously, in a Single One-Time Process (i.e. as a triple-head extrusion) to ensure homogeneity of layers over the conductor, and absence of voids.
2.1.4A-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 BRPL, prior to sourcing the compounds and taking up manufacturing of cable.
2.1.4	Water-Swellable Tape	a) Semi-Conducting Water-Sellable Tape shall be provided, under the copper tape, on each core. b) Nominal thickness : 0.3 mm c) Weight: 118 gm / sq. m approx.

		<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>
2.1.5	Core Identification	<p>a) For 3-core cables, cores shall be identified by coloured strips (Red, Yellow, Blue), applied helically / longitudinally below the copper tape.</p> <p>The coloured strips shall carry the name of manufacturer permanently printed at close intervals; this is to provide additional identification of manufacturer of the cable.</p>
2.1.5A	Copper Tape	<p>Copper Tape 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>
2.1.6		
2.1.6A	Filler Details	<p>a) All interstices, including center interstices shall be filled by PP filler.</p> <p>b) PP Filler shall be non-hygroscopic, 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>
2.1.6B	Optical Fiber Cable	<p>a) OFC shall be embedded inside the cable in place of one filler, details as per Annexure I</p>
2.1.7	Binder Tape	As per manufacturer's standard
2.1.8	Inner Sheath	Extruded Inner Sheath of Black PVC type ST-2 (IS 5831)

2.1.9	Armour	<p>a) For 3-core Cables :</p> <p>For Conventional cable Galvanized Steel flat strip armour</p> <p>For CCD cable Galvanized Steel round armour {R4}</p> <p>b) Minimum area of coverage of armouring shall be 90 % (min.). At any time, the gap between any two adjacent armour strips shall not be more than the width of strip.</p> <p>c) Zero negative tolerance is for : Thickness of armour strip</p>
2.1.10	Binder Tape	Rubberised cotton tape
2.1.11	Outer Sheath	
2.1.11.1	For conventional cable	<p>a) Extruded outer sheath of PVC (ST-2 as per IS 5831) with termite-repellant and anti-rodent properties.</p> <p>(Outer Sheath shall be FRLS-type, if chosen by purchaser.)</p>
2.1.11.2	For CCD cable(Cable in Co-extruded duct) {R4}	<p>b) Extruded PE compound Type ST 7 (Black) – Thickness 2.84 mm</p> <p>c) Conduit material over Extruded PE compound – Extruded HDPE compound Thickness 2 mm, Color Orange (IS 557)</p>
		<p>c) 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.</p> <p>Manufacturing quality shall be such that cable will retain its circular shape, even after it is laid at site.</p>
		<p>d) The Outer Sheath shall be embossed as well as laser printed with following minimum text at a interval 1 mtr. :</p> <p>1. The voltage designation</p>

		<ol style="list-style-type: none"> 2. Type of construction / cable code (e.g. A2XFY) 3. Manufacturer's Name and Trade-mark 4. Number of cores and nominal cross-sectional area of conductor 5. Progressive (Laser print) (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. 6. Name of buyer / purchaser, 7. Month & Year of manufacturing 8. IS reference, i.e. IS : 7098 9. Batch No. / Lot No. (For traceability purpose, in case of any, in case of any manufacturing defect or otherwise arising in the cable in future.) 10. Purchase Order Number & date 11. Word ' FRLSH ', in case the cable is of FRLSH type. 12. Drum no.
2.1.12	Pulling-eye Assembly and Sealing-end Cap (for Cables)	<ol style="list-style-type: none"> a) A cable pulling-eye assembly Drg. No. MISC/E/4-1131/1698 (see Annexure-E) shall be provided at the loose end (outer end) of the cable on each drum. Sealing material shall be filled in inside the spaces / gaps between the pulling-eye assembly and cable outer sheath. Further, a heat-shrinkable sleeve shall be provided over the pulling-eye assembly and outer sheath of cable. b) Other end (inner end) of the cable shall be sealed as per MISC/E/4-1131/1699 (see Annexure-E.) One PVC cap with Polyurethane compound shall be provided as primary sealing and heat-shrink end-cap shall form a secondary

		sealing over the PVC cap.
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 rating of cable offered in the bid. Test report shall not be more than 5 years old.</p> <p><u>2) Type Test Required After Award of PO:</u></p> <p>i) Type test-1: 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 BRPL during inspection of cable. Cost for this type test shall be borne by the respective Bidder.</p> <p>ii) Type test -2: 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 BRPL during inspection of cable. This type test is applicable subject to BRPL requirement and cost shall be borne by BRPL.</p>
	b) BRPL QAP (Typical)	In general, all tests mentioned in the BRPLQAP (Characteristics – Typical) mentioned in Annexure-F shall be included in the Routine Tests, Type Tests and Acceptance Tests stated above.
	c) Routine Tests	<ol style="list-style-type: none"> 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).

		<p>5. Impulse voltage test of one drum</p> <p>6. Armour coverage measurement</p> <p>7. Physical test-Dimensions of each and every layer and components.</p> <p>Test results from the above tests must appear in the documents forwarded by the vendor for Inspection call / waiver.</p>
	d) Inspection	<p>1. The Buyer reserves the right to witness all tests specified on completed cables.</p> <p>2. The Buyer reserves the right to inspect cables at Sellers works at any time prior to dispatch, to verify compliance with the specifications.</p> <p>3. In-process (stage inspection) and final inspection call intimation shall be given 10 days 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</p>

		<p>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>g) Internal type test shall be carried out once against each every BRPL PO, 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 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	Within 15 days, the seller has to submit four sets of above-mentioned drawings, along with one soft copy for buyer's approval.
5.0.3	Final As-Built Drawings	One soft copy of all documents, including type & routine test certificates.
6.0.0	Drum length & tolerance	Cable length per drum
6.0.1	11 kV, Three core	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>11 kV cables, minimum acceptable short length cables can be 250 meter and only one short length drum shall be acceptable in last lot.</p> <p>In any case, manufacturer shall not put two cable pieces of different short lengths in same cable drum.</p>
7.0.0	Packing, Shipping, Handling & Storage	
	a) Packing	

		<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 be put as protective covers. After providing the protective covers, the cable drums shall be finally closed by wooden planks (with saddles), without leaving any gaps between the planks; i.e. 100 % covering shall be ensured.
	b) Drum Identification Markings:	<p>Direct marking (i.e. text painting through stencils, etc.) shall be done on the drums, instead of attaching labels, which may be misplaced/lost over a period of time.</p> <ol style="list-style-type: none"> Drum identification number Cable voltage grade Cable code (e.g. A2XFY, etc.) Number of cores and cross sectional area Cable quantity, i.e. cable length (meter) Purchase order number & date SAP item code Total weight of cable and drum (kg) 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	Non-Returnable Steel drums, as per relevant IS / IEC.
	f) Cable Drum handling	The drums shall be with M.S. spindle plate (with nut-bolts) of adequate size to suit the spindle rods, normally required for handling the drums, according to expected weight of the cable drums.
8.0.0	Quality Assurance Plan (QAP)	
8.0.1	Vendor's QAP	Manufacturer shall submit QAP in line with BRPL QAP format for purchaser's approval before manufacturing.
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 program for production, stage-inspection, testing, final inspection, packing, dispatch and documentation.
9.0.2	Detailed Progress Report	To be submitted to Purchaser once a month containing : i) Progress on material procurement ii) Progress on fabrication (as applicable) iii) Progress on assembly (as applicable)

		iv) Progress on internal stage-inspection v) Reason for any delay in total program vi) Details of test failures, if any, during manufacturing stages. vii) Progress on final box-up Constraints / Forward Path
10.0.0	Deviation	a) Deviations from this specification are only acceptable, where the Seller has listed in his quotation the requirements he cannot, or does not, wish to comply with, and the Buyer has accepted, in writing, the deviations before the order is placed. b) In the absence of any list of deviation, it will be assumed by the Buyer that the Seller complies fully with this specification. c) Any deviations mentioned in any other submitted bid documents (i.e.in filled GTP, Catalog, BRPLold 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.

Annexure – A

Scope, Documentation and Delivery schedule

1. Scope

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

a) **Document Submission**

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

Legend:

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

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

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

3. Delivery Schedule

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

Annexure - B

GUARANTEED TECHNICAL PARTICULARS (GTP)

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 (as required by purchaser)			
	11 kV, 3c x 400 sq. mm.	A2XFY		
6.0	Voltage Grade			
	11 kV, 3c	6.35 / 11	kV	
7.0	Maximum Conductor temperature			
A	Continuous	90	deg. C	
B	Short time	250	deg. C	
8.0	Conductor			
A	Material and Grade	As per Cl. 2.1.1		
B	Size	As shown under 5.0 above		
C	Wires in each conductor	As per Table 2 of IS 8130	Nos.	
D	Conductor Shape	As per Cl. 2.1.1 e		
E	Dia. of wires in each conductor before compaction	Manufacturer Standard	mm	
F	Diameter over conductor		mm	

G	Maximum Conductor resistance at 20 ° C			
	11 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	Short circuit current-carrying capacity of conductor	37.6	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			
	11 kV, 3c	3.6	mm	
C	Minimum thickness (at a point)			
	11 kV, 3c	3.14	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	NA		
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	%	
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 BRPL	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 : 0.06 +/- 5 % b) Width : 50 mm C) Overlap: 10% Zero negative tolerance in thickness of copper tape	Mm	
	ii) Fault current-carrying capacity of copper tape	1.1kA (3 cores combined) (Calculation sheet shall be attached)	... kA for ... sec.	
11E.	Diameter over laid up core (approx.)		mm	
12.0	Filler (Material and type)	As per Cl. 2.1.7 (Specify no. & size of filler at center & core interstices)		
	11 kV, 3c x 400 sq. mm.			
12A.0	Optical Fiber Cable	Single Mode (G.657.A1)- 36Nos. Multi Mode (OM2)- 12Nos. As per Annexure I	Nos.	
12B.0	Binder Tape	over laid-up cores		

13.0	Inner Sheath			
A	Material and type	As per Cl. 2.1.9		
B	Minimum thickness			
	11 kV, 3c x 400 sq. mm.	0.7	mm	
C	Approx. dia. over inner sheath		mm	
14.0	Armour	as per purchaser's site-specific requirements		
A	Material			
	11 kV, 3c	G. I. Strip	No.	
C	Armour – GI strips			
	a) Width of strip & Thickness of strip	4 x 0.8 (zero negative tolerance for thickness)	mm	
	b) Number of strips (min.)		no.	
D	Approx. Equivalent Area		sq. mm.	
E	Area covered by armour	Min. 90 % Calculation shall be attached.	%	
F	Dia. over armour - apprx.		Mm	
G	Fault current carrying capacity of armour	Calculation sheet shall be attached.	... kA for ... sec.	
15.0	Outer Sheath			
i	Conventional Cable			
A	Material and type	PVC Compound , ST-2, as per IS 5831:1984		
B	Thickness (min.)	3		
	11 kV, 3c x 400 sq. mm.	**	mm	
C	Color	Blue		
D	Embossing (details as per Cl. 2.1.11)	Yes / No		
E	FRLS Properties	As per customer's requirement		
ii	CCD Cable			
A	Outer sheath (Outer Layer)			
	Material Type	Extruded PE, ST-7		
	Colour	Black		
	Thickness	2.84 mm		
B	Conduit (Most outer Layer)			
	Material Type	Extruded HDPE		
	Colour	Orange		

	Thickness	2 mm		
16.0	Approx. overall diameter		mm	
17.0	Standard drum length with tolerance			
	11 kV, 3c x 400 sq. mm.	300 +/- 5%	meters	
17A	Overall order tolerance	+ / - 2 % for the total cable length for the entire order.		
18.0	Cable Drum			
a.	Type of drum	Steel (Non-Returnable) (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. Pulling-eye Assembly (provided at one running end) Refer drawing in Annexure-E	Is manufacturer's / Sub-vendor's drawing submitted? (Yes / No)		
	b. Sealing-end Cap (provided at the other end) Refer drawing in Annexure-E	Is manufacturer's / Sub-Vendor's drawing submitted? (Yes / No)		
20.0	Weights			
	a) Net weight of cable (apprx.)		kg / km	
	b) Weight of empty drum		Kg	
	c) Weight of Cable with drum		kg	
21.0	Continuous current rating for standard I. S. condition laid Direct			
	a) In ground 30° C	400	Amp	
	b) In duct 30° C	IS/IEC	Amp	
	c) In air 40° C	520	Amp	
22.0	(not used)			
23.0	Electrical Parameters at			

	Maximum Operating temperature:			
A	AC Resistance		ohm / km	
B	Reactance at 50 c/s		ohm / km	
C	Impedance		ohm / km	
D	Zero sequence impedance		ohm / km	
E	Positive sequence impedance		ohm / km	
F	Negative sequence impedance		ohm / km	
G	Capacitance		micro-farad / km	
24.0	Recommended minimum bending radius	12x O. D.	mm	
25.0	De-rating factor for following Ambient Temperatures :	Ground / Air		
	a) At 30° C			
	b) At 35° C			
	c) At 40° C			
	d) At 45° C			
	e) At 50° C			
26.0	Group factor for following numbers of cables laid :	Touching Trefoil		
	a) 3 Nos.			
	b) 4 Nos.			
	c) 5 Nos.			
	d) 6 Nos.			
27.0	Recommended pressure for laying cable using power winch	30 N / mm ²	N / sq. mm.	
28.0	Process of Cross-linking of Polyethylene			
	a) 11 kV, 3c	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)		



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

List of Sub-Vendors

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)
6.	Copper Tape	1	Aggarwal Metal
		2	Indian Smelting
		3	Luvata Swedan

		4	Outokumpu Copper Strip AB, Sweden
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

Annexure - D

Service Conditions

(Atmospheric / Soil conditions at Site)

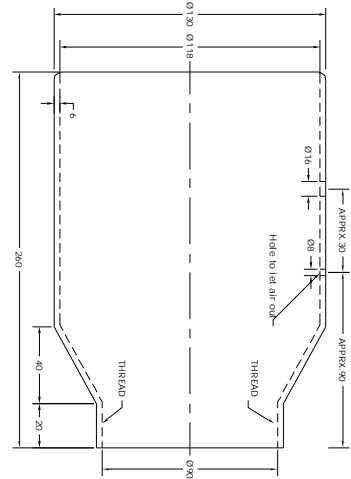
B. Delhi		
a)	Average grade atmospheric condition	Heavily polluted, dry
b)	Average grade soil condition	Rocky
c)	Maximum altitude above sea level	1000 M
d)	Air temperature Ambient	i) Highest : 50 deg C ii) Average : 40 deg C iii) Minimum : 0 deg C
e)	Relative Humidity	100 % max
f)	Thermal Resistivity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

Annexure- E

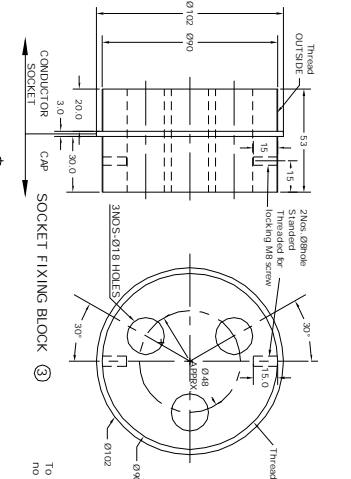
- 1. General Arrangement Drawing for
Cable Pulling Eye**

- 2. General Arrangement Drawing for
End-sealing Cap**

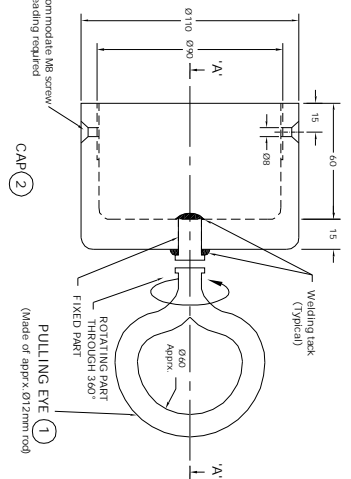
Both the above drawings are given on next pages.



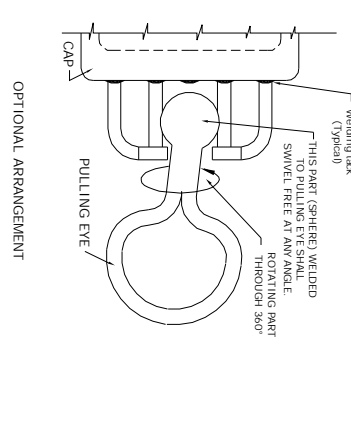
PULLING BLOCK HOUSING ④



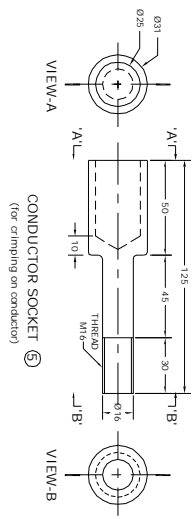
SOCKET FIXING BLOCK ③



PULLING EYE ①

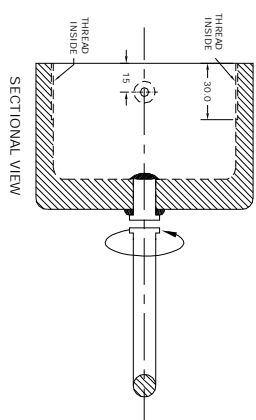


OPTIONAL ARRANGEMENT



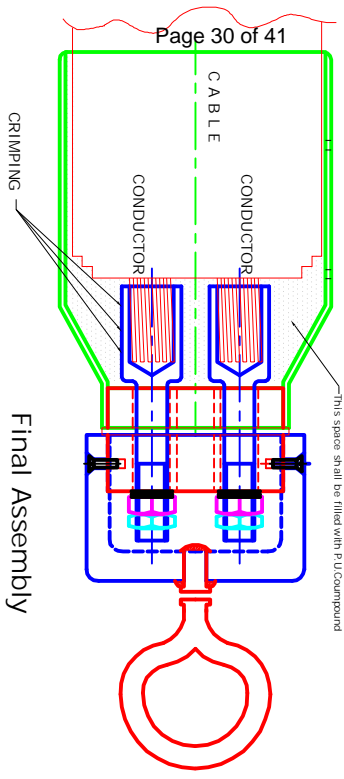
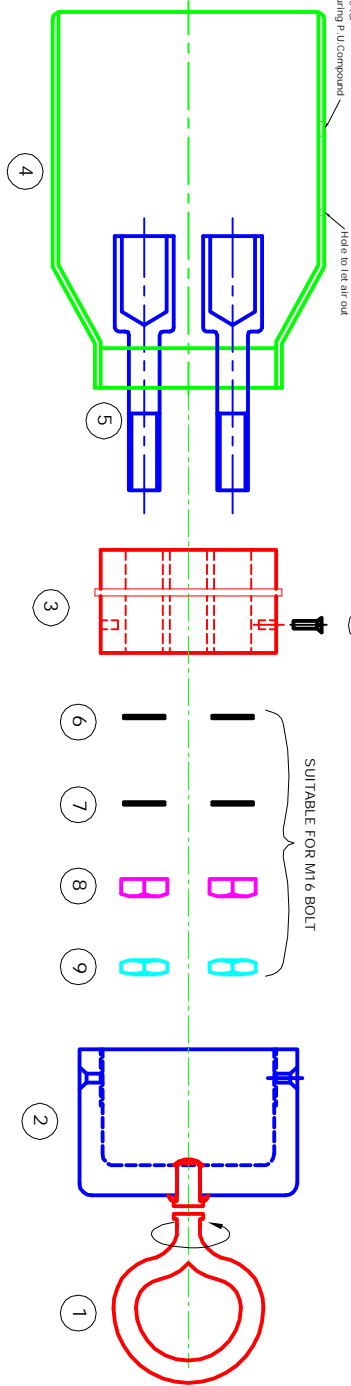
CONDUCTOR SOCKET ⑤

⑩ LOCKING SCREW
(Suitably long to fix CAP (2) with socket fixing block (3))



SECTIONAL VIEW

Exploded View



Final Assembly

EXAMPLE:

- 1) For cable size 33kV, 3/C X 400sq mm AL XLPE.
- 2) Diameter over conductor : 23.8mm approx.
- 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 cures/flows out from the cable side, the same edge shall be sealed with suitable sleeve/Tape.

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 cures/flows out from the cable side, the same edge shall be sealed with suitable sleeve/Tape.

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



DRAWING No. MISC/E/4-1133/1699
SCALE NOT TO SCALE
DATE 09-05-2011

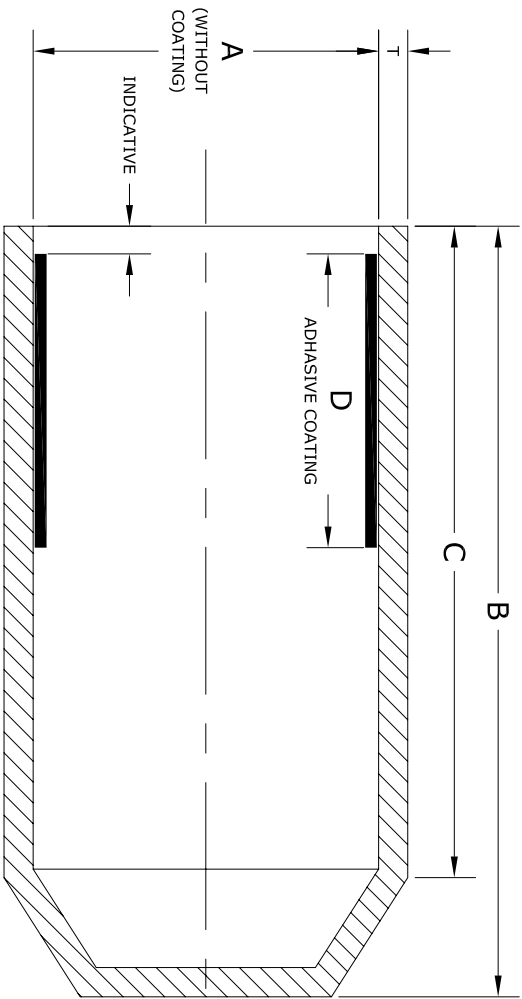
CABLE PULLING EYE ASSEMBLY (TYPICAL)

REVISIONS	DRAWN BY: BJR	CHECKED BY: AP/DSP/PS	APPROVED BY:

DIMENSIONS

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



END CAP
(AS SUPPLIED)
SECTIONAL VIEW

MATERIAL SPECIFICATIONS

Characteristics	Test Class	Value	Test Method
A Physical Properties			
1 Specific Gravity	Type	1.05 ± 0.2	ASTM D -1505
2 Water Absorption	Type	1 % (max)	ASTM D-570 / ISO 62
3 Tensile Strength	Routine	10 N /sqmm (min)	ASTM D-412 / ISO 37
4 Ultimate Elongation	Routine	300% (min)	ASTM D-412 / ISO 37
5 Hardness	Type	45 shore D ± 3	ASTM D -2240
6 Thermal Test			
B Thermal Ageing (120 °C for 500 hrs)			
1 Tensile Strength	Type	8 N/sqmm (min)	ASTM D-412 / ISO 37
2 Ultimate Elongation	Type	200% (min)	ASTM D-412 / ISO 37
C Electrical Properties			
1 Volume Resistivity	Type	10 ¹² ohm-cm. (min)	ASTM D-257 / IEC 93
2 Dielectrical Strength	Type	10 kV/mm. (min)	ASTM D-149 / IEC 243
3 Dielectric Constant	Type	5 (max)	ASTM D-150 / IEC 250

HOLE FOR POURING
P.U.COMPOUND
(BEFORE FIXING END CAP)

PVC CAP
(HARD)

HOLE FOR LETTING
AIR OUT
(BEFORE FIXING END CAP)

PVC OUTER SHEATH
OF XLPE CABLE

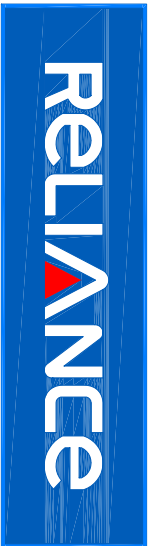
HEAT SHRINK CAP OF
RAYCHEM/REPL.(XICON)
MAKE

SOFT POLYURETHANE
(P.U).COMPOUND
(M-SEAL EPOXY)

END CAP

(AFTER HEAT SHRINKING OVER THE CABLE END)

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



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

SCALE :NOT TO SCALE

DATE: 09-05-2011

END SEALING CAP
(FOR XLPE CABLE)

DRAWN BY: BJR

CHECKED BY: AP/DS/PS

APPROVED BY:

REVISIONS

Addl V.P.

Annexure- F

**QAP Format
(Quality Assurance Plan)
For H. T. Cables (Typical)**

Vendor shall follow the QAP enclosed with this specification strictly,

GN101-03-SP-81-04



QUALITY ASSURANCE PLAN (QAP)

FOR 11 kV H. T. 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,												
BRPL : BSES Rajdhani Power Ltd, 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	

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QUALITY ASSURANCE PLAN (QAP)

FOR 11 kV H. T. CABLES

S. NO.	COMPONENT & OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			Remark
									SV	MFR	BRPL	
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, BRPL : BSES Rajdhani Power Ltd, 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	Cable Pulling eye	a) Dimensions & Material	Major	Meas.	1 sample per size	Purchase order	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	-	
		c) Tension test on pulling eye	Major	Physical	1 sample per size	Pulling eye subjected to load		-	P	P	-	
10	Binder tape	a) Dimensions & material	Minor	Physical	Sample	MPS	MPS	-	P	P	-	
11	Polypropylene filler	a) Size	Minor	Physical	Sample	Purchase order	Purchase order	-	P	P	-	
12	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	-	

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		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	
		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	

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									SV	MFR	BRPL	
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		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	
		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) Physiactal 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 BRPL 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	

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3	Acceptance tests	c) Wrapping test for aluminium	Major	Physical	Appendix A to IS 7098/II/2011, each lot sample basis	IS 8130/84	IS 8130/84	-	-	P	V	Tests N/A on finished conductor.
		d) Conductor resistance test	Major	Electrical		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	
		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	

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		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) Cable pulling eye strength test on one sample	Major	Physical		As per data sheet & FS	As per data sheet & FS	Test Report	-	P	W	
		y) Flammability test	Major	Physical		As per IS-78098/II/2011	As per IS-78098/II/2011	Test Report	-	P	W	
		z) Impulse withstand test	Critical	Electrical		IS 7098/II/2011	IS 7098/II/2011	Test Report	-	P	W	
		z1) Ageing & Water absorption test(Gravimetric) on Insulation & Outer sheath	Major	Physical		IS 5831/84	IS 5831/84	Test Report	-	P	W	
		z2) Heating Cycle with Potential	Critical	Electrical	sample basis, once per PO			Test Report	-	P	W	
		z3) Raw Material Verification in all aspects	Major	Physical	Each Lot					P	W	
		Z4) OFC Continuity 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	

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		d) Physical tests for insulation			One sample per order						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	
		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
		b) Pulling eye at leading end	Major	Visual	100 %	As per agreement	As per agreement	-	-	P	W/V	

GN101-03-SP-81-04



**QUALITY ASSURANCE PLAN (QAP)
FOR 11 kV H. T. CABLES**

S. NO.	COMPONENT & OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			Remark
									SV	MFR	BRPL	
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, BRPL : BSES Rajdhani Power Ltd, P : Perform, W : Witness, V : Verification												
		b) Stencilling/Marking on drum	Minor	Visual	100 %	IS 7098(Part 2):2011/ Agreement	IS 7098(Part 2):2011/ Agreement	-	-	P	V	randomly selected drums.
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. BRPL may witness Raw material and in process inspection in addition to Routine/Acceptance tests at any time/stage of manufacturing. 5. BRPL's Inspector may randomly select a cable drum for type testing at vendor's works. 6. For each of the offered lot for inspection, BRPL may randomly select one cable drum for testing of end cap "Destructive testing" to verify adhesion of sealing cap to cable outer sheath. Similarly, pulling eye shall be tested with 30N/mm ² pressure. 7. All factory Type Tests shall be Witnessed by BRPL										

Annexure- G

Inspection Expenses:

Not applicable

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.

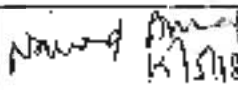
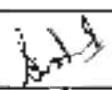

Property	Units	Requirements Values
Min. Avg. Electrical Breakdown Strength(qual. test)	Kv/mm	> 25
Impulse Strength	Kv/mm	> 83
Water Tree Length	mm	0.25
Max. Bowtie Tree Density	(Number per 16.4 cu. cm)	Maximum 15 (0.12-0.25 mm range)

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

TECHNICAL SPECIFICATIONS OF INSULATING MAT

TECHNICAL SPECIFICATIONS**OF****INSULATING MAT****BSES RAJDHANI POWER LTD.**

Prepared by	Naved Ahmad		Date:	15.05.2018
Reviewed by	Amit Tomar		Revision	R0
Approved by	K. Sheshadri		No of Pages:	8

TECHNICAL SPECIFICATIONS OF INSULATING MAT

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TECHNICAL SPECIFICATIONS OF INSULATING MAT**1.0 Scope of Supply**

1.1 The specification covers the design, manufacturing, inspection, testing & supply of safety helmet with sensor

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 Insulating Mat 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 1000mtrs

The Insulating Mat shall also be for use in moderately hot and humid tropical climate, conducive to rust and fungus growth.

TECHNICAL SPECIFICATIONS OF INSULATING MAT**3.0 Applicable Standards**

Following Indian/International Standards, which shall mean latest revision, with amendments/changes adopted and published, unless specifically stated otherwise in the Specification, shall be referred while accessing conformity of Lineman safety helmets with sensor

In the event of supply of insulating mat confirming to Standards other then specified, the bidder shall confirm in his bid that these standards are equivalent or better to those specified. In case of award, salient features of comparison between the standards proposed by the bidder and those specified in this document will be provided by the supplier to establish equivalence.

Sl. no	Product name	Standard	Title
1	Insulating Mat	IS 15652 : 2006	Synthetic Insulating Mat- Confirming
2		IS 5424 (old standard)	superseded the rubber mat
3		IS 8002/IEC 61111	
4		IEC 479	

4.0 Requirements**ANNEXURE A-TECHNICAL COMPARISON DATA SHEET FOR INSULATION Mat-11 kV**

Annexure A-Technical Comparison Data Sheet For Insulation Mat-11 Kv			
Sl. No.	Descriptions	BRPL Requirement	Vendor Data
1	Purchase Req. No		
2	Guarantee Period (Min)	5 years	
3	Applicable IS/IEC Standard to be followed by Vendor	IS 15652:2006, IS 8002/IEC 61111, IEC 479	

TECHNICAL SPECIFICATIONS OF INSULATING MAT**Annexure A-Technical Comparison Data Sheet For Insulation Mat-11 Kv**

Sl No	Descriptions	BRPL Requirement	Vendor Data
4	Make	Vendor Name	
5	Material	Dielectric Elastomer	
6	Colour	Blue/Black	
7	Type	Pastable Type, gas welding with filler material type (IS:8002)	
8	Surface	Abrasions to be provided on upper surface to mat to make surface Anti-skid	
9	Voltage Grade	3.3 KV, 11 KV, 33 KV	
10	Suitable for AC/DC	AC/DC	
11	Thickness	3 mm for 11KV & 33 KV	
12	Width	1 mtr. (min)	
13	Length	5 mtrs for 11/33 KV	
14	Tensile Strength (N/Sqmm)	15 N/Sqmm upto 33 KV	
15	Elongation (%)	250 (min) upto 33 KV	
16	Insulation Resistance with Water at 500 V	1,000,000 M ohm up to 33 KV	
17	Leakage Current at 11 KV (mAmp)	10 (max)	
18	AC Di Electric Strength	45 KV (min) for 11KV	
19	Flame Retardance	Fire Retardant, fire self-extinguish within 5 seconds	
20	Working Temperature	-10°C to +60°C.	

TECHNICAL SPECIFICATIONS OF INSULATING MAT**Annexure A-Technical Comparison Data Sheet For Insulation Mat-11 Kv**

Sl No.	Description	ARPI Requirement	Vendor Data
21	Low Temperature Resistance	No Tear, Break or Crack is Observed in Mats Under Force of 100 N for 1 Hrs. at -10 \pm 3°C	
22	Effect to Various Medium		
a	Acid		
i	Tensile Strength (N/Sqmm)	Not Less than 80% of Changes from Original Value	
ii	Elongation (%)	Not Less than 80% of Changes from Original Value	
b	Alkali		
i	Tensile Strength (N/Sqmm)	Not Less than 80% of Changes from Original Value	
ii	Elongation (%)	Not Less than 80% of Changes from Original Value	
c	Diesel		
i	Tensile Strength (N/Sqmm)	Not Less than 80% of Changes from Original Value	
ii	Elongation (%)	Not Less than 80% of Changes from Original Value	
d	Transformer Oil		
i	Tensile Strength (N/Sqmm)	Not Less than 80% of Changes from Original Value	
ii	Elongation (%)	Not Less than 80% of Changes from Original Value	
e	Ageing Properties at 70 \pm 1 °C for 168 Hrs		
i	Tensile Strength (N/Sqmm) after Ageing	Not Less than 75% of Changes from Original Value	
ii	Elongation (%) after Ageing	Not Less than 75% of Changes from Original Value	

TECHNICAL SPECIFICATIONS OF INSULATING MAT**Annexure A-Technical Comparison Data Sheet For Insulation Mat-11 Kv**

Sl No.	Descriptions	BRPL Requirement	Vendor Data
23	Class-C for 3 mm thickness		
i	Working Voltage	11 KV	
ii	Proof Voltage (for 180 sec)	36 KV max	
ii	Break Down Voltage	65 KV (max) AC RMS	
24	Embossing	Anti-Skid without metallic derivatives with Chips/without Chips.	
25	Marking	Every meter of mat should be marked with respective Class symbol, Lot No. or Batch number and Manufacturer's Identity or Brand name, Mat Tested & Stamped to IS:15652-06 and ISI mark, BSES Mark, PO no, date of manufacturing, Length of Mat.	
26	Packing	Packed in Gunny bags of Jute/Hessian cloth to avoid mechanical damage to the material in transit	

5.0 Workmanship And Finish:

One side plain and other side pattern.

6. Inspection:

Manufacturer shall intimate the manufacturing schedule in advance. The manufacturer shall give minimum 15 days advance notice about readiness of material at their works. The material shall be inspected for conformity with BRPL specification before the same is accepted.

8.1 Certificates required

8.2 Manufacturing certificates

8.3 Test certificates

8.3 Authorization of dealership/ distribution ship

7. Deviation

Deviation from this specification is only acceptable in cases where the bidder has submitted deviation list along with the technical bid. It may also be noted that the deviation can only be accepted by BRPL in case it does not hamper the basic purpose of safety helmets with sensor

In the absence of a list of deviations, it will be assumed by Buyer that the seller complies fully with this specification.



Technical Specification
For
11 kV Motorized Ring Main Unit

Specification no – GN101-03-SP-76-01

Prepared by		Reviewed by		Approved by		Rev/Pages	Date
Name	Sign	Name	Sign	Name	Sign		
Gautam Deka/ Pronab Bairagi	 26/02/2020	Amit Tomar	 26/02/2020	K. Sheshadri	 26/02/2020	R1/65	26-Feb- 2020

Technical Specification For 11 kV Motorized Ring Main Unit**Records of Revision**

S.no.	Revision no.	Item/Cl. No.	Nature of change	Approved by
1	R1	2.0	Included below standards IS 2705 - Current Transformer IS 3156 - Voltage Transformer	KS
2	R1	5.26	NO/NC Contact added to be taken for VPIS for Live line indication status to remote SCADA through FRTU.	KS
3	R1	Special requirement- Sl. No-13	500VA Aux-PT added for outdoor RMU Only.	KS
4	R1	6.10.1	Suitable arrangement to be provided for remote load monitoring at SCADA for LBS	KS
5	R1	7.13 and 7.14	1. RS-485 Port to be provided on the Relay for remote communication of the parameters to the SCADA through FRTU over MODBUS Protocol. Necessary internal wiring also shall be done between Relay and FRTU. 2. Licensed software shall be provided for Relay communication with Laptop along with necessary cables for interconnection between Laptop and Relay (Based on requirement).. 3. Appropriate wiring to be done to connect all the relays to the FRTU.	KS
6	R1	12.3	The label shall be riveted and not pasted on the panel compartment door. Preferable the labels shall be engraved on the plate.	KS
7	R1	14.3	BRPL may carry out integration of the FRTU/Modem and BRPL SCADA during Inspection stage. OEM to carry out the configuration of both Modem and FRTU in this case to establish connection between FRTU and SCADA. SIM shall be provided by BRPL	KS
8	R1	17	1. As Built Drawings. (One set of As Built drawing to be provided with each RMU during dispatch. As Built drawing shall be provided to BRPL in soft copy) 2. IO termination chart shall be provided along with the schematic drawing for approval. IO Termination chart shall be provided on the inside of FRTU Compartment door.	KS

Technical Specification For 11 kV Motorized Ring Main Unit

S.no.	Revision no.	Item/Cl. No.	Nature of change	Approved by
			3. The FRTU and modem Configuration file for every FRTU shall be shared with BRPL after successful on-site integration with SCADA. 4. FRTU and modem licensed software to be provided to BRPL. Any future software upgrades and support to be provided to BRPL without any cost implication till warranty period. 5. FRTU and modem features brochure and tutorial for configuration to be provided to BRPL for reference during configuration for their engineers	
9	R1	Annexure - A, 1.13	Training for FTRU and Relay	KS
10	R1	Annexure - G	Only 12 dB High gain multi directional antenna with 15Mtr wire to be provided. Provision for taking antenna wire outside to be provided..	KS
11	R1	Annexure - G	Adequate accessories for mounting Antenna at appropriate Sub-station location (Roof/wall) for trouble free operation such as wall mounting bracket, roof mounting bracket etc. Shall be provided.	KS
12	R1	Annexure - G	Modem should be able to send a power failure signal in case when battery/battery charger falls before shutting down.	KS
13	R1	Annexure - H, 1.3	No access to the FRTU Compartment shall be given from the RMU back side.	KS
14	R1	Annexure - H, Annexure 2	Revised DI/DO/AI/SP list along with related signals added	KS
15	R1	Annexure - I, Make List	FRTU, CT, PT and Relay Make revised and added	KS
16	R1	5.1	Revised Panel Construction sheet.	KS

Proposed By

Gautam Deka/
Pronab Bairagi

Reviewed By

Amit Tomar

Approved By

K. Shesh

Technical Specification For 11 kV Motorized Ring Main Unit**Index**

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1.0 Scope of work

11kV Motorized RMU with FRTU, Modem (4G, GSM), Battery, Battery charger and auxiliary transformer (for outdoor RMU only) shall be supplied as per the specification. All the accessories mentioned above shall be supplied along with RMU's as a composite unit. Inside the composite unit, battery and battery charger shall be inbuilt inside RMU compartment and FRTU, modem shall be inbuilt inside LV compartment. Refer Annexure-J for drawing. Make of all accessories shall be as per Annexure-I. Spares are also to be supplied by bidder along with RMU as per the list mentioned in Annexure-D.

2.0 Codes & standards

Materials, equipment and methods used in the manufacture of switchboards shall conform to the latest edition of following –

S No.	Title
Indian Electricity Rules	With latest amendments
Indian electricity act	IE act 2003
IS 3427	A.C. Metal Enclosed Switchgear and Control gear for Rated Voltages Above 1 Kv
IS 9920 part 1,3 & 4	High voltage switches above rated voltage 1kv
IS 13118	General requirements of circuit breakers above rated voltage 1kv
IS 3231	Electric Relays for Power System Protection
IS 2705	Current Transformer {R1}
IS 3156	Voltage Transformer {R1}
IEC 60059	Preferred current ratings of high voltage switchgear
IEC 60298	AC metal enclosed switchgear
IEC 60529	Classification of degrees of protection provided by enclosures
IEC 60255	Electrical relays
IEC 62271	HV Switchgear and Control gear

Technical Specification For 11 kV Motorized Ring Main Unit

IEC 62271 – 103	HV Switchgear and Control gear - Switches for rated voltages above 1 kV up to and including 52 kV
IEC 62271 – 1	HV Switchgear and Control gear – Common Specifications
IEC 62271 – 201	HV Switchgear and Control gear - AC insulation-enclosed switchgear and control gear for rated voltages above 1 kV and up to and including 52 Kv
IEC 60044	Instrument Transformers – Current Transformers
IEC 62271 – 102	HV Switchgear and Control gear – Alternating Current Disconnecter and Earthing Switches

Note:

In the event of direct conflict between various order documents, the precedence of authority of documents shall be as follows -

- i. Guaranteed Technical Particulars (GTP)
- ii. Specification including applicable codes & standards
- iii. Approved Vendor Drawings
- iv. Deviation sheet

3.0 Electrical Distribution System Data

3.1	Supply	3 phase AC, 3 wire
3.2	Voltage	11000 volt $\pm 10\%$
3.3	Frequency	50 Hz $\pm 5\%$
3.4	System neutral	Earthed at upstream 11kV source

4.0 11 kV RMU System layout

4.1	RMU Configuration	As per scheme given in Annexure E & type as per Purchase requisition
4.2	Extensibility	Right hand side
4.3	Load break switch, Circuit breaker & earth switch in RMU panel	All shall be non draw out type, fixed position
4.4.1	Insulation medium for panel	SF6 gas or Dry air in sealed metallic tank
4.4.2	Breakers	SF6 gas or Vacuum type (with disconnecter & earth switch)
4.4.3	load break switches	SF6 gas or Vacuum type (With Earth Switch)
4.5	Arc interruption chamber for breaker	i) Separate for each breaker ii) Arc interruption chamber of breakers shall be separate

Technical Specification For 11 kV Motorized Ring Main Unit

		from the main insulated tank.
4.6	Maximum dimensions for a 3 way panel (1 CB + 2 LBS), without FRTU Panel	
4.6.1	Width (measured from front)	1250 mm
4.6.2	Depth	800 mm
4.6.3	Height	2000 mm
4.7	FRTU	FRTU shall be provided integrated with RMU in the LV compartment completely wired along with Dual SIM auto change over Modem suitable for communicating with 4G, GSM network of any service provider and also have facility to communicate with available Optical fiber network. Vendor shall demonstrate the data communication of FRTU and modem with MCC/Existing SCADA for approval of owner in the Pre Order technical evaluation stage. FRTU shall be EMI free and EMC compatible. For detailed specification of FRTU, I/O requirements , refer our enclosed standard specification of FRTU
4.8	Modem	As per Modem Specifications given in Annexure G

5.0 RMU panel construction

5.1	Panel type	CRCA/GI Metal enclosed, framed, Compartmentalized panel construction. CRCA thickness shall be 2 to 2.5 mm subject to type test report from CPRI/ERDA.{R1}. Sheet thickness below 2 mm in any part of RMU shall not be accepted
5.2	Service Location	Indoor, non air conditioned environment / Outdoor with continuous ambient temperature of 50 deg C and shall be suitable for external climatic condition Resistant to water ultraviolet radiation (Canopy for outdoor application)
5.3	Mounting	Free Standing
5.4	Overall Enclosure Protection	IP4X minimum, vermin proof IP 54 (For outdoor duty)
5.5	Doors	Front access with anti theft hinge arrangement, Minimum three hinges. Hinges arrangement shall ensure that door cannot be removed.
5.6	Covers	Bolted (stainless steel) for rear access, with handles. Support for handle shall be provided at suitable place on RMU body. All the accessible bolts / screws shall be vandal proof. One set of required Special tools per RMU (if any) shall be in the scope of supply. All kind of nuts and bolts must be stainless steel

Technical Specification For 11 kV Motorized Ring Main Unit

5.7	Construction	(Stainless steel tank. 3.0 mm thickness shall be based on validated type tests for 21kA 1sec IAC test and 21kA, 3sec short ckt tests.)
5.8	Base frame	Base frame shall be made with 75mm ISMC/ISA channel for both Indoor and Outdoor type RMU. Proper Bolted fixing arrangement shall be provided for erection on RCC foundation. Also, base frame shall be painted with 2 coats of anti rust red oxide and 2 coats of bitumen paint shall be provided. {R9}Adjustable HDPE clits as cable supporting clamps for each power cable (to suit the cable size from 150 to 400 sq mm PILC / XLPE cable. Exact size shall be provided during drawing approval stage.), also cleat shall be adjustable vertically.
5.9	Lifting lugs	Four numbers
5.10	Cable Entry	Bottom 3mm metallic, removable type & split type in two parts, with 1no. 90 mm diameter knocks out punch/hole in the centre. Hole arrangement shall be done up to 11Kv, 3cx400 sqmm cable. (For double cable boxes, Un-drilled gland plate to be supplied. Approval should be taken for the same during drawing submission)
5.12	Cable type & size	3CX150 / 240 / 300/400sq mm Aluminum conductor XLPE/ PILC with armor & PVC outer sheath
5.13	Terminals for 11 kV cable termination	Suitable for Ring Type Bimetallic lug along with reducer/adaptor check nuts/bolts for different type lugs sizes as per annexure F
5.13.1	Right angled boots	Single piece cold shrink type (Minimum 20mm spacing between boots preferred)
5.13.2	Brass Nut bolt	Shall be suitable for all kind of lugs of cable size 11Kv, 3cx150 to 11kv, 3cx400 sqmm (Reducer to be provided to fit the nuts/bolts for all kind of lugs with all the bushing and all kind of nuts/bolt shall be the part of supply)
5.13.3	Bimetallic washers	Required (Not applicable for silver quoted bushing)
5.13.4	Termination type	suitable for heat shrinkable type
5.13.5	Termination height	For Indoor / Outdoor : Min. height from top of the gland plate to bushing center shall be 900mm
5.14	Bus bar	Copper with sleeve (Sizing Calculation to be submitted in support of its Guaranteed S.C. rating / Capability) {R1}
5.14.1	Bus bar continuous rated current	630amp (at designed 40 deg. C ambient)
5.14.2	Bus bar short time withstand capacity	21 KA for 3 sec

Technical Specification For 11 kV Motorized Ring Main Unit

5.14.3	Bus bar support insulator material	SMC / DMC resin
5.14.4	Maximum temperature rise above reference ambient 40 deg C	In line with Table 3 of IEC62271-1
5.15	Earth bus bar	Tinned Copper flat sized for rated fault duty for 3 sec
5.16	Earth bus internal connection to all Noncurrent carrying metal parts	By 2.5sq mm copper flexible wire, Earth connection point maximum 1 meter away from cable test facility
5.17	Earth bus external connection to owners earth	Studs on both sides with holes for M10 bolt +hardware to readily receive purchaser earth connection
5.18	Cooling arrangement	By natural air without fan
5.19	Panel internal wiring	Multi strand flexible color coded PVC insulated Cu wire 1 sq mm (SCADA) / 2.5 sq mm (for CT's) 1100 volt grade (AC-black, DC – grey, Earth – green) with ferrules at both ends.
5.20	Hardware (Nut, bolts & handle)	Stainless steel (Except termination nut-bolts which are Brass)
5.21	Gasket	Neoprene rubber
5.22	Marshalling terminal blocks	1 Sq mm, Nylon 66 material, Disconnecting type terminal blocks shall be provided. 20% spare in each row of TB.
5.23	Panel cover fixing bolts	Allen head 6mm with hexagonal slot Seals shall be provided between the Panel and removable covers to avoid theft. The seals shall be opened/broken by using specific equipment.
5.24	Padlock facility	Required for all earth switches & all handles
5.25	Bushings for future extensions of RMU	LHS extensible. Should be duly insulated & covered with metallic covers in unused condition, In addition a removable boot cover shall be provided on the extensible bushings.
5.26	Explosion vents	To ensure operator's safety, design should ensure that gases / flames generated during flash over / blast in any of the compartment, must not come out from the front of RMU as well shall not go to adjacent cable compartment. AFLR Internal arc test report (for Cable compartment & other compartments) must be submitted to support above, along with RMU GA drawing indicating these vents. There shall not be any type of holes, gaps etc on the walls of cable termination compartment.

Technical Specification For 11 kV Motorized Ring Main Unit

5.27	SF6 Gas Annual Loss	< 0.1% of total mass. Pressure of SF6 gas shall be above the operating limit throughout the life of the equipment.
5.28	VPIS	VPIS shall be provided with terminals facility for phasing purpose.VPIS sensor shall be installed on screened bushing NO/NC Contact shall be provided with VPIS for taking the Live line indication status to remote SCADA through FRTU. {R1}
5.29	Push Buttons	On/Off PBS shall be shrouded / covered to prevent accidental operation.
5.30	Internal Arc Classification	Shall comply to the requirements of IEC 62271-200, Accessibility type AFLR .Operators of equipment shall be protected against the effects of an arcing fault in any of the MV compartment at all times , including while carrying out the maintenance works on other compartments

6.0 Load break switch (LBS) / Isolator

6.1	Type	Three poles operated simultaneously by a common shaft
6.2	Arc interruption in dielectric medium	SF6 or Vacuum
6.3	Operation	3 position operation
6.3.1	Operating mechanism for close / open	Motorized LBS Each motor shall be provided with separate MCB or Local-Remote switch.
6.3.2	Manual operation	Possible without removal of motor
6.4.1	Addition / removal of motor	Without overhaul of operating mechanism
6.4.3	Motor rated voltage	24V DC
6.5.1	Battery type & size	1. Li-ion battery(LIB) 2. Battery provided in enclosure shall be rated for 10 close & 10 open operations of LBS / CB + 2 hrs back up for SCADA FRTU load (10watt).®
6.5.2	Battery charger rating	Two chargers of rating 10A each with parallel connection
6.5.3	Battery charger configuration	With auto changeover between two chargers using 10Amp diodes
6.5.4	MCBs at charger input & output supply	Required 2nos for AC Incoming supply. All the MCBs shall be easily accessible for operation, with proper labeling.
6.5.5	Charger temperature rise at heat sink at full load for 2 hours	Maximum 55 deg C above ambient of 40 deg C
6.5.6	DC power supply for FRTU	24v DC +/- 1 volt thru 2 Amp MCB
6.5.7	Battery charger cooling	Natural without any fans

Technical Specification For 11 kV Motorized Ring Main Unit

	method	
6.5.8	Individual LBS DC Control	Required with MCB
6.6.1	Continuous rating of LBS	630 Amp at design 40 deg C ambient
6.6.2	Short time withstand capacity	21 KA for 3 sec
6.7	Fault making capacity	50 kA peak
6.8	Minimum number of operations at rated current (as per IEC 62271-102)	Mechanical Endurance – Class M1(1000 operations) Electrical Endurance – Class E3 (100 operations)
6.9	Minimum number of operations at rated fault current (as per IEC 62271-102)	Class E3 (Min 10 operations)
6.10	Fault passage indicator (FPI) (Earth fault and over current protection type)	To be provided on each and every LBS for RMU. FPI shall be earth fault and over current protection type and shall be suitable for remote load monitoring at SCADA for LBS {R1}
6.10.1	Earth Fault and over current Indicator	CBCT – Split open type suitable for mounting without disconnection of cable for EF. Phase sensor – 3 Nos. for short ckt. purpose with mounting arrangement
6.10.2	Connection of CT sensors with FPI	Cable connection of FPI with CBCT/phase CTs shall be of pre moulded type on the CBCT side. Cable shall be 2.5 sq.mm cu cable
6.10.3	Fault Passage Indicator (Earth fault and over current protection type)	Digital type and shall operate as the current exceeds the set value. Flash indication for identifying faults with red LED with one flash for every one sec. Test & rest button 1 NO + 1 NC potential free contact for remote indication FPI power supply unit shall use lithium battery with minimum life of 1000 blinking hours , so that FPI shall continue to function even after main feeder has tripped. FPI shall be powered by 24V DC in all motorized RMUs and shall be suitable for remote load monitoring at SCADA for LBS {R1}
6.10.4	Data by Purchaser	
6.10.4.1	System Fault Level	2kA – 8.75kA
6.10.4.2	Type of Grounding	Solidly Grounded
6.10.4.3	Fault clearing time	100ms
6.10.4.4	Cable Type	PILC / XLPE , 150 sq.mm to 400 sq.mm
6.10.4.5	Earth Fault Indicator	

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6.10.4.5.1	Sensing Current	50 to 400A
6.10.4.5.2	Sensing Time	30 to 100 ms in steps of 10ms.
6.10.4.5.3	Reset Time	0.5 -1-2-3-4 hr
6.10.4.5.4	Resetting Facility	a) Self rest after reset time b) Self rest after restoration of voltage c) Manual d) Remote resetting
6.10.4.5.5	Contact Rating	1A at 230 V
6.10.4.5.6	Degree of Protection	IP 54
6.10.4.5.7	Mounting Arrangement	Surface or Flush Mounting
6.10.4.5.8	Ambient Temperature	-20 to 55 Deg C
6.10.5.5	Short Ckt indicator	
6.10.5.5.1	Sensing Current	200 to 1200 A
6.10.5.5.2	Sensing Time	30 to 100 ms in steps of 10 ms
6.10.5.5.3	Reset time	0.5-1-2-3-4 hr

7.0 Circuit breaker (CB)

7.1.1	Type	Three pole, operated simultaneously by a common shaft
7.1.3	Circuit breaker - CB	For controlling cable feeder, manual and remote operation. Remote trip operation by SCADA
7.2	Arc interruption in dielectric medium	Vacuum Bottle
7.3.1	NA	NA
7.3.2	Operating mechanism - CB	Manual and Motorized spring charged stored energy type, remote electrical close / open operation possible.
7.3.3	Addition / removal of motor	Without overhaul of operating mechanism
7.3.4	Motor rated voltage	24V DC
7.4	Emergency trip / open push button	On panel front with Protective flap to prevent any accidental tripping of breaker.
7.5.1	Continuous rating at design 40 deg C ambient	630amp
7.5.2	Short time withstand capacity	21 KA for 3 sec
7.6	Minimum number of operations at rated current (as per IEC 62271-100)	Mechanical Endurance – Class M1(2000 operations) Electrical Endurance – Class E2
7.7	Fault making capacity	50 KA peak
7.8	Fault breaking capacity	21 KA Minimum
7.9	Maximum number of operations at rated	Electrical Endurance – Class E2 . To be guaranteed by manufacturer with authorized lab test reports

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	Fault current (as per IEC 62271-100)	
7.10	Breaker status auxiliary contact	2NO + 2NC wired to terminal block
7.11	Current transformer	<ol style="list-style-type: none">1. 75-400 / 1 amp for TCB/ FCB. {R9}2. Considering three core cable terminations, mounting flexibility shall be provided for CT's (in horizontal & vertical direction both). Additionally, CAUTION marking (by sticker/ paint) shall be provided to avoid CT's installation above the screen of cable. (I.e. earth potential point.)3. Position of CTs inside compartment shall be adjustable in vertical and horizontal direction
7.12	CT accuracy class	5P10 minimum
7.13	Protection relay	<p>Self powered, Microprocessor based Numerical relay (with LCD display), IDMT over current and earth fault protection with high set element, manual reset type Relay mounting flush to panel front</p> <p>Display shall be powered with 24V DC or 230V AC for all motorized RMU</p> <p>RS-485 Port to be provided on the Relay for remote communication of the parameters to the SCADA through FRTU over MODBUS Protocol. Necessary internal wiring also shall be done between Relay and FRTU.</p> <p>Licensed software shall be provided for Relay communication with Laptop along with necessary cables for interconnection between Laptop and Relay (Based on requirement).</p> <p>Appropriate wiring to be done to connect all the relays to the FRTU. {R1}</p>
7.14	Relay auxiliary contacts for remote indication	<p>Potential free contact 1NO + 1NC wired to terminal block</p> <p>RS-485 Port to be provided on the Relay for remote communication of the parameters to the SCADA through FRTU over MODBUS Protocol. Necessary internal wiring also shall be done between Relay and FRTU.</p> <p>Licensed software shall be provided for Relay communication with Laptop along with necessary cables for interconnection between Laptop and Relay (Based on requirement)..</p> <p>Appropriate wiring to be done to connect all the relays to the FRTU. {R1}</p>
7.15	Shunt trip 230v AC (for WTI, OTI trip & door limit switch of Dry type transformer) & for remote trip from SCADA.	To be wired to terminal blocks (If the functional requirement is achieved by the Protection relay, then shunt trip is not required.

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7.16	Breaking Timing	40 to 60 ms {R1}
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8.0 Earth switch (ES)

8.1	Type	Three Pole, operated simultaneously by a common shaft, for each Circuit breaker & Load break switch.
8.2	Switching in dielectric medium	Dry Air in sealed medium or SF6 gas
8.3	Operating mechanism for close, open and Earth	Manual
8.4	Fault making capacity	50 kA
8.5	Auxiliary contacts	1NO+1NC wired to terminal block
8.6	Disconnect switch (if provided in series with vacuum bottle)	Desirable to be located on purchaser cable connection side of vacuum bottle
8.7	Minimum number of operations at no load (as per IEC 62271-102)	Mechanical Endurance – Class M0(1000 operations)
8.8	Making capacity endurance of earth switch (as per IEC 62271-102)	Class E2 (Min 5 operations)

9.0 Requirements of sealed housing live parts

9.1	Enclosure/Tank	Stainless steel enclosure suitable for IP67. Non ferrite & Non magnetic grade stainless of minimum 3.0 mm thickness. Stainless steel enclosure welding shall be robotic welding type.
9.2	SF6 gas pressure low alarm	To be given along with NO and NC Contracts
9.3	Provision for SF6 gas filling	To be given (For 'sealed for life' design of RMU, this is not applicable)
9.4	Provision for SF6 gas pressure indication	Manometer with integrated pressure density switch and temperature compensation required.
9.5	Arc interruption method for SF6 breaker / Load break switch	Puffer type / rotating arc type
9.6	Potential free contacts for SF6 gas pressure low	1NO +1NC

Technical Specification For 11 kV Motorized Ring Main Unit**10.0 Operational interlocks**

10.1.1	Interlock type	Mechanical. All interlocks shall be preferably guarded by flap , so as to prevent insertion of handle for wrong operation
10.1.2	Load break switch & respective earth switch	Only one in 'close' condition at a time
10.1.3	Circuit breaker & respective earth switch	Only one in 'close' condition at a time
10.2	Prevent the removal of respective cable covers if load break switch or circuit breaker is 'ON'	Electrical / Mechanical
10.3	Prevent the closure of load break switch or circuit breaker if respective cable cover is open	Electrical / Mechanical
	NA	NA
10.4	Cable test plug for LBS/CB accessible only if Earth switch connected to earth	Mechanical
10.5	Prevent motorized operation of LBS / CB during manual operation	Electrical / Mechanical Electrical signal shall cut-off completely during manual operation. If LBS fail to operate, the supply to motor shall be disconnected after certain time period to prevent burning of motor due to continuous supply.
10.6	Prevent motorized operation of more than one LBS / CB at a time	Necessary feature (Electrical)

11.0 Indication & signals (for SCADA / Local)

11.1	Operation counter on front / Inside the RMU LT chamber	To be provided for each LBS & Circuit breaker, with minimum four digits & non re-setable type
11.2	Cable charge status indication for all LBS & CB	Capacitor type voltage indicators with LED on all the phases (Shall be clearly visible in day light)
11.3	Spring charge status indication	On front for breaker
11.4	Earth switch closed indication (For Each LBS)	On front
11.5	Load break switch ON/OFF indication	Green for OFF / Red for ON

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11.6	Circuit breaker On/OFF indication	Green for OFF / Red for ON
11.7	Circuit breaker protection relay operated on fault	Flag
11.8	Fault passage indication	Flag
11.9	Status signals to SCADA-to be wired to marshalling terminal block	2NO + 2NC
11.9.1	LBS close / open	potential free contacts
11.9.2	LBS & CB Earth Switch close /open	potential free contacts
11.9.3	Battery charger Fail	potential free contacts
11.9.4	CB close / open	potential free contacts
11.9.5	Auto trip	potential free contacts
11.9.6	FPI operated	potential free contacts
11.9.7	SF6 gas pressure low	potential free contacts
11.9.8	Local/Remote Switch	Required
11.9.9	Spring Charge Status	Potential free contacts
11.9.10	Ready to Close Signal to control centre to indicate all interlocks are OK	Potential free contacts
11.9.11	Battery Health Monitoring Unit	Required
11.9.12	Auxiliary Circuit Healthy	Potential free contacts
11.9.13	Breaker Panel Disconnect Close/Open	Potential Free contacts
11.9.14	FRTU Door open	Potential Free Contacts
11.9.15	Interlock Card Operation fail	Potential Free Contacts
11.9.16	Command Acknowledgement	Potential free Contacts
11.10.1	Commands from SCADA- to be wired to marshalling terminal block	LBS close / open
11.10.2		CB close / open
11.10.3		FPI Reset
11.10.4	RS 485 MODBUS output of Protection relay	Required
11.10.5	Interlock Card Remote Reset	Required

Technical Specification For 11 kV Motorized Ring Main Unit**12.0 Mimic diagram, labels & finish**

12.1	Mimic	1. Mimic diagram (Shall not be accepted with Stickers) 2. On panel front with description of function & direction of operation of handles/buttons
	Operating Instructions	Operating instruction chart and Do's & Don'ts in English/Hindi / local language to be displayed on left / front side of panel enclosure on anodized Al Sheet 16SWG, duly affixed on panel. Sticker shall be provided for termination process along with required torque, feeder label.
12.2	Name plate on panel front	Fixing by rivet only
12.2.1	Material	Anodized aluminum 16SWG / SS
12.2.2	Background	SATIN SILVER
12.2.3	Letters, diagram & border	Black
12.2.4	Process	Etching
12.2.5	Name plate details	Month & year of manufacture, equipment type, input & output rating, purchaser name & order number, guarantee period, Model no, SLD
12.3	Labels for meters & indications	The label shall be riveted and not pasted on the panel compartment door. Preferable the labels shall be engraved on the plate. {R1}
12.4	Danger plate on front & rear side	Anodized aluminum 16 SWG with white letters on red background
12.5	Painting surface preparation	Chemical 10 tank process
12.6	Painting external finish	Powder coated epoxy polyester base grade A, shade -RAL 7032, uniform thickness 60 micron minimum
12.7	Painting internal finish	Powder coated epoxy polyester base grade A, shade -white, uniform thickness 60 micron minimum

13.0 Quality assurance

13.1	Vendor quality plan	To be submitted for purchaser approval
13.2	Inspection points in quality plan	To be mutually identified & agreed
13.3	Quality – Process Audits	BRPL shall carryout vendor process audits.
13.4	Field quality plan	Bidder to submit field quality plan along with the bid
13.5	Spare part list	Bidder to submit detailed spare part list along with the bid
13.6	Maintenance manual	Bidder to submit maintenance manual along with the bid
13.7	Approved sub vendor /make List	Please refer Annexure-I. Any deviation from make without written approval of BRPL shall not accept at any stage of

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contract.

14.0 Inspection & testing

14.1	Type test	<ol style="list-style-type: none"> Equipment of type tested quality only, including internal arc test (AFLR) on various compartments like cable chamber, SF6 gas tank etc. Type test certificate along with AFLR internal test report from CPRI/ERDA/Any other reputed independent international Lab equivalent or better than CPRI/ERDA to be submitted along with offer for scrutiny. Type test more than 5 years old will not be acceptable. In case type test is more than 5 years old, bidder shall conduct type test from CPRI/ERDA/Any other reputed independent international Lab equivalent or better than CPRI/ERDA as per standard without any cost implication to BRPL. In this regards if BRPL want to witness the test , all the expenses of BRPL inspector shall be borne by bidder. <u>Bidder to submit following test report for DC charger.</u> <ol style="list-style-type: none"> temperature rise test voltage regulation test
14.2	Routine test	As per relevant Indian standard
14.3	Acceptance test	<p>To be performed in presence of purchaser at manufacturer works. BRPL may carry out integration of the FRTU/Modem and BRPL SCADA during Inspection stage. OEM to carry out the configuration of both Modem and FRTU in this case to establish connection between FRTU and SCADA. SIM shall be provided by BRPL{R1}</p> <ol style="list-style-type: none"> Physical inspection & BOM, wiring check Insulation resistance test (Before & after HV test) HV test for one minute, Operation & interlock check Measurement of resistance of main circuit Voltage Indication check Functional testing of Fault passage Indicator for Alarm Primary current injection test for each circuit breaker feeder with relay Breaker closing & opening time measurement Temperature rise test Functional test of FRTU Motor Operation

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		13. Partial Discharge
		14. Raw material docs verification

15.0 Shipping, Handling and Site support

15.1	Packing Protection	Against corrosion, dampness, heavy rains, breakage and vibration
15.2	Packing for accessories and spares	Robust wooden non returnable packing case with all the above protection & identification Label
15.3	Packing Identification Label (Anodized Aluminum Plate)	On each packing case, following details are required:
		i. Individual serial number
		ii. Purchaser's name
		iii. PO number (along with SAP item code, if any) & date
		iv. Equipment Tag no. (if any)
		v. Destination
		vi. Manufacturer / Supplier's name
		vii. Address of Manufacturer / Supplier / it's agent
		viii. Description (Configuration of RMU; e.g. 1CB + 2 ISO, Motorized / Non Motorized, Extensible / Non Extensible) and Quantity must be prominently displayed at least 3 sides of packing box & on top.
		ix. Country of origin
		x. Month & year of Manufacturing
		xi. Case measurements
		xii. Gross and net weights in kilograms
		xiii. All necessary slinging and stacking instructions
15.4	Shipping	The seller shall be responsible for all transit damage.
15.5	Handling and Storage	1. Manufacturer instruction shall be followed. 2. Detail handling & storage instruction sheet / manual to be furnished before commencement of supply.

16.0 Deviations

16.1	<p>a) Deviations from this specification shall be listed separately by bidder clause wise (as mentioned in Annexure-K) 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.</p> <p>b) In the absence of any separate list of deviations from the bidder with bid as well as written confirmation from BRPL on deviations, it will be assumed by the Buyer that the</p>
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Seller complies with the Specification fully.
 c) 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.

17.0 Drawings/Documents and Software Submission

17.1	To be submitted along with bid	The seller has to submit following:
17.1.1	GA / cross sectional drawing of product showing all the views / sections	
17.1.2	Detailed reference list of customers using the offered product during the last 5 years with similar design and rating	
17.1.3	Completely filled GTP	
17.1.4	Manufacturer's quality assurance plan and certification for quality standards	
17.1.5	Type test reports for the type, size & rating of product / equipment offered	
17.1.6	Complete product catalogue and Manual.	
17.1	Recommended spare parts and consumable items for five years of operation and spare parts catalogue with price list	
17.2	All documents as per clause 13 of this specification	
17.3	After award of contract, Seller has to submit following drawings for buyer's Approval (A) / Reference (R)	
17.3.1	Program for production and testing (A)	
17.3.2	Guaranteed Technical Particulars (A)	
17.3.3	GA drawing along with civil foundation details.	
17.3.4	Schematic and wiring drawings for all components	
17.3.5	Terminal arrangement & cable box details including gland plate arrangement etc	
17.3.6	Bill of material	
17.3.7	Detailed loading drawing to enable the buyer to design and construct foundations	
17.3.8	Transport / Shipping dimensions with weights, wheel base details, un tanking height	
17.3.9	Detailed installation and commissioning instructions	
17.3.10	quality plan	
17.4	Submittals required prior to dispatch	
	-Inspection and test reports, carried out in manufacturer's works	
	-Test certificates of all bought out items	
	-Operation and maintenance Instruction as well as trouble shooting charts/ manuals	
17.5	Drawing and document sizes	Standard size paper A3, A4
17.6	Number of Documents required at different stages shall be per Annexure-A	
17.7	1. As Built Drawings. (One set of As Built drawing to be provided with each RMU during dispatch. As Built drawing shall be provided to BRPL in soft copy) 2. IO termination chart shall be provided along with the schematic drawing for approval. IO Termination chart shall be provided on the inside of FRTU Compartment door. 3. The FRTU and modem Configuration file for every FRTU shall be shared with BRPL after successful on-site integration with SCADA.	

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	4. FRTU and modem licensed software to be provided to BRPL. Any future software upgrades and support to be provided to BRPL without any cost implication till warranty period. 5. FRTU and modem features brochure and tutorial for configuration to be provided to BRPL for reference during configuration for their engineers {R1}
Note :	Duly signed & stamped copies of the drawings / documentation are required to be submitted to BRPL for approval along with deviation sheet.

18.0 Equipment ID

- A Slot shall be provided on the Compartment door at a clearly readable height from the base level of FRTU compartment. This slot shall be provided with a Fibre card which shall be accessible from inside only but shall be visible outside. Equipment ID shall be painted/printed on the Fibre Card and
- Equipment ID shall be painted on any appropriate face of RMU at a clearly readable height from the base level. Front recommended type face for the signage is True type or Post script
- Font Size: All painting should be in UPPERCASE. Recommended height of 50 mm with spacing between alphabets of 3 mm.
- Total No's of Character: 18
- Height of Font: 50 mm
- Height of Base: 100 mm
- Spacing between alphabets: : 3 mm
- Paint: Base coat – Dense Yellow. Letters – Black Quick Drying paint 2 coats.
- Equipment ID shall be separately provided by BRPL
- Equipment ID printing shall complete at factory by seller on each and every motorized RMU before dispatch.

19.0 BATTERY HEALTH MONITORING UNIT

- I. BHMU will have Auto and Manual test facility. In Auto Mode it ensures battery automatic discharge at preset set period with 100W discharge resistor along with suitable algorithm to check the healthiness based on rate of discharge.
- II. In manual Mode PB provided for battery testing.

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- III. Provision for Bypass mode pof BHMU also required.
- IV. Output contacts :230V/24V DC -5A
 - a. Battery Fail: 1 CO b.Test In process
- V. Indications:
 - b. BHMU healthy b. Battery Fail c. Battery Low d.Test On.
- VI. Make :as per annexure- I

Annexure A Scope of supply**1.0 The scope of supply shall include following**

- 1.1 Design, manufacture, testing at manufacturer works before dispatch, packing, delivery and submission of all documentation the 11kv Ring Main Unit (RMU).
- 1.2 11kV RMU shall be as per scheme enclosed as Annexure E.
- 1.3 FRTU along with necessary software's as per detailed specification in Annexure H
- 1.4 Supply of Modem (Dual SIM, Auto Change Over, 4G, and GSM) for FRTU communication with Control Centre as per specification in Annexure G. SIM card shall be provided by BRPL.
- 1.5 Battery, Battery Charger and BHMU
- 1.6 Configuration of 11kV RMU shall be as per Purchase Requisition.
- 1.7 Testing & Commissioning of all motorized RMUs at site before charging is included in the scope of vendor including all operational checks, LV wiring checks, battery / charger checks, VPI , FPI, self powered relay, FRTU and SCADA integration. Vendor shall depute the service team with 1 day prior notice from owner.
- 1.8 FRTU customization, parameterization along with integration of FRTU with Control Centre has to be carried out at all sites by vendor engineer.
- 1.9 Guarantee Period for RMU along with FRTU & Modem: 66 months from the date of supply or 60months from date of commissioning, whichever is earlier.
- 1.10 Service Performance Requirements During Guarantee Period:

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- a) RMU including battery charger: Complaint to be attended on urgent basis and to be resolved within 24hrs, 1 day from intimation. Necessary spares may be maintained by vendor service team at Delhi.
 - b) FRTU: After reporting of FRTU modules compliant / failure, within 24 hours FRTU modules shall be replaced by vendor at site. Spare cards / modules shall be maintained by the vendor at Delhi during the guarantee period.
 - c) Modem: After reporting of Modem compliant / failure, within 24 hours Modem to be rectified / replaced by vendor at site. Spare modems if required shall be maintained by the vendor at Delhi during the guarantee period.
- 1.11 Each RMU shall be supplied with 2 sets of Operating Handle.
- 1.12 All the accessories mentioned above shall be supplied along with RMU's as a composite unit. Inside the composite unit, battery and battery charger shall be inbuilt inside RMU compartment and FRTU, modem shall be inbuilt inside LV compartment. Refer Annexure-J for drawing.
- 1.13 Supplier scope includes training of BRPL team – 4 batches (each batch with 4-6 engineers or team member as per BRPL requirement.) for minimum 3 days each at factory as well as at BRPL site for erection, testing commissioning and maintenance trouble shooting mechanism of Motorized RMU including Automation part. This shall be carried out 1 week from date of 1st shipment/ dispatch. Supplier shall also provide training for Self Powered relay & FRTU at respective manufacturer' factory as well as at BRPL site for minimum 3 days for BRPL team – 4 batches (each batch with 4-6 engineers or team member as per BRPL requirement.) ..This is applicable for each and every P.O. of Motorized RMU's.
- 1.14 Unit price for Conversion kit should be offered separately for converting the RMU from single cable termination design to double cable termination design, at site.
- 1.15 BOQ as following –

Sr No	Purchaser Equipment Tag No / SAP code	RMU standard configuration Type	Unit	Quantity
1		<i>Example – Type A2</i>	No	<i>e.g. 1</i>
2		<i>Example – Type R5</i>		
3				
4				

Technical Specification For 11 kV Motorized Ring Main Unit**2.0 Submission of documents**

	Along with offer	For Approval after award of contract	Final after approval
Documents as given in clause no 17 of specification	3 copies + 1 soft copy on CD	4 copies + 1 soft copy on CD	6 copies + 1 soft copy on CD for all type of documents

3.0 Delivery schedule

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

Annexure B Technical particulars (Data by purchaser)

Sr No	Description	Data by purchaser
1.	Reference design ambient temperature	40 deg C
2.	Maximum ambient temperature	50 deg c for Delhi
3.	Relative humidity	e.g. 85% for Delhi
4.	Seismic zone	e.g. 4 for Delhi
5.	Extensibility of RMU on both side is required -	Yes
6	Minimum ambient temperature	0 deg C

Annexure C Guaranteed Technical Particulars (Data by Supplier)

Bidder shall furnish the GTP format with all details against each clause.

Bidder shall not change the format of GTP or clause description.

Deviation sheets shall be submitted separately along with company seal and sign. Deviation mentioned in submitted GTP or any other documents except deviation sheet shall not be considered as a deviation.

Sr. No.	Description	Data to be filled by Manufacturer
1	11 kV RMU (as per scope of supply annexure A)	Separate GTP to be filled for each type of RMU
2	Equipment make	
	Equipment type / brand name	
3	Conformance to design standards as per specification clause no 2.0 –	Yes/No

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4	Conformance to specification clause no 3.0 to 17.0 –	Yes/No
5	If NO for pt 3 or pt 4 above, Submission of deviation sheet for each specification clause no –	Yes/No
6	Panel overall dimensions in mm	
	Width (measured from front)	
	Depth	
	Height	
7	Panel weight in kg	
8	Panel extensible on RHS sides	Yes
9	Panel enclosure protection offered	
10	Panel tested for internal arc (Cable & other compartments) –Yes / No	
11	Heat generated by the panel in Kw	
12	Insulation level for complete panel	
12.1	Impulse withstand (kV peak) -70kvp min	
12.2	Power frequency withstand (kV rms) – 28kV min	
13	Bus bar	
13.1	Material & grade	
13.2	Bus bar cross section area in sq mm	
13.3	Bus bar rated current in amp i) at designed 40 deg.C ambient ii) at 50 deg.C ambient	
13.4	Max temperature rise above reference ambient of 40 deg C	
13.5	Short time current withstand capacity for 3 seconds (in KA)	
13.6	Bus bar clearances in mm P-P / P-E	
13.7	Bus bar with insulation sleeve / barriers	

Technical Specification For 11 kV Motorized Ring Main Unit

13.8	Bus bar support insulator type	
13.9	Bus bar support insulator voltage class	
13.10	Bus bar support insulator minimum creepage distance / mm	
13.11	Earth bus bar material	
13.12	Earth bus bar size	
14	Circuit breaker type – SF6 or VCB	
14.1	Rated voltage & frequency	
14.2	Rated current in amp	
14.3	Rated breaking current – KA rms symmetrical	
14.4	Short time withstand capacity in KA for 3 sec	
14.5	Rated making current - KA peak	
14.6	Breaker total opening time at rated breaking capacity (in milliseconds)	
14.7	Number of breaks per pole	
14.8	Total length of contact travel in mm	
14.9	No of circuit breaker operation cycles (close & open) guaranteed at rated current, Electrical endurance class	25% rated current -
		50% rated current -
		75% rated current -
		100% rated current -
14.10	No of breaker opening operations guaranteed at rated fault current, Electrical Endurance Class	
14.11	No of breaker mechanical operation cycles (close & open) guaranteed at zero current , Mechanical endurance class	
14.12	Contact material	
14.13	Operating mechanism – trip free	

Technical Specification For 11 kV Motorized Ring Main Unit

	Manual Spring charge type	
14.14.1	Spring charging motor rating– Watt	
14.14.2	Spring charging motor rated Dc voltage	
14.14.3	Closing coil wattage & rated DC voltage	
14.14.4	Trip coil wattage & rated DC voltage	
14.15	Transformer CT class, ratio &Vk	
15	Load break switch type – SF6 or VCB	
15.1	Rated voltage & frequency	
15.2	Rated current in amp	
15.3	Load break switch total opening time at rated current (in milliseconds)	
15.4	Number of breaks per pole	
15.5	Total length of contact travel in mm	
15.7	No of LBS close & open operation cycles guaranteed at	25% rated current -
		50% rated current -
		75% rated current -
		100% rated current -
15.8	No of LBS making operations guaranteed at rated fault current, Electrical endurance class	
15.9	No of LBS close & open operations guaranteed at zero current, Mechanical endurance class	
15.10	Contact material	
15.11	Operating mechanism type	
15.12	Operating motor voltage with acceptable % variation	
15.13	Minimum permissible SF6 gas pressure (For SF6 type RMU only)	
15.14	Capacitor type cable voltage indication	Yes / No

Technical Specification For 11 kV Motorized Ring Main Unit

	provided?	
15.15	Operation counter provided	Yes/ No
15.16	Motor Details Parameter	
16.1	Disconnect switch continuous rating (Amp)	
16.2	Disconnect switch Short time withstand rating -20kA for 3 sec minimum	Yes / No
16.3	One LBS open operation possible in the event of loss of SF6 gas	Yes/No
16.4	DC charger rating in amps – min 10 Amp Dual	Yes
a	MCB rating at 230v AC input of charger	Amp
b	MCB rating at 24v DC output of charger	Amp
c	Charger heat sink temperature rise (max 55 deg C above ambient 40 deg C)	
d	Voltage variation in 24v Dc output for FRTU	(Max +/-1 V)
e	Charger with natural cooling (no cooling fans)	Yes/No
f	Charger tested for input supply voltage regulation test (input variation 150v-250v, output Dc voltage variation +/- 1 volt max)	Yes/No
g	Charger temperature rise test certificate submitted	Yes/No
16.5	DC battery rating in Ah – 20Ah standard	Yes/No
16.6	DC charger changeover – Diode rating 10A min	Yes/No
17.1	Cable termination – Height of power terminal from gland plate	Mm
17.2	Torque required for tightening terminal lug	
18	Mimic diagram, labels & finish as per cl	Yes / No

Technical Specification For 11 kV Motorized Ring Main Unit

	no 12	
19	Submission of RMU / component catalogue	Yes/No
20	Unit price for Conversion kit offered separately for converting the RMU from single cable termination design to double cable termination design	Yes / No
21	Earth Switch	
21.1	Minimum number of operations at no load- Mechanical Endurance class	
21.2	Making capacity endurance of earth switch – Electrical endurance class	
22	Self Powered Relay – Make / Model	As per Annexure-I
22.1	CT Input	
22.2	IDMT Setting Range 4 element – Over Current & Earth fault & steps	Overcurrent- Earth Fault- Instantaneous O/C- Instantaneous E/F-
22.3	Operating Time	Over Current – IDMT Instantaneous
22.4	Pick up Current	
22.5	Resetting Current	
22.6	Relay Burden	
22.7	Time Accuracy	
22.8	Tripping Coil O/P – type & duration	
22.9	Fault Current Display	
22.10	No of Fault Current Latching with time stamping	
22.11	Display Facility / Type	
22.12	Operational Indicators	
22.13	Potential Free Output Contacts	

Technical Specification For 11 kV Motorized Ring Main Unit

22.14	Thermal Withstand Capacity of Relay	
23	Fault Passage Indicator (shall be for both earth fault and over current protection)	
23.1	CBCT	
a	Type	
b	Mounting Arrangement	
c	CT to indicator connection	
d	ID of sensor	
e	Make	As per Annexure-I
23.2	Phase CT – LBS	
A	Type	
B	Mounting Arrangement	
C	CT to indicator connection	
D	ID of sensor	
23.2	Earth Fault Indicator make	As per Annexure-I
a	Sensing Current (i) Earth Fault (ii) Short Ckt Indicator	
b	Sensing Time (i) Earth Fault (ii) Short Ckt Indicator	
c	Indication	
d	Reset Time (i) Earth Fault (ii) Short Ckt Indicator	
e	Resetting Facility	
f	Output Contact	
g	Contact Rating	
h	Aux Power Supply	
i	Degree of Protection	
j	Mounting Arrangement	

Technical Specification For 11 kV Motorized Ring Main Unit

k	Ambient Temperature	
l	Make	As per Annexure-I
24	Current Transformer- Make	As per Annexure-I
24.1	Ratio	
24.2	Burden	
24.3	Accuracy Class	
25	Voltage Presence Indicator- Make / Model	As per Annexure-I
26	FRTU	
26.1	Make & Model No	As per Annexure-I
26.2	No of DI Modules	
26.2.1	Type I – 1CB + 2ISO	
26.2.2	Type 2 – 2CB + 2ISO	
26.3	No of DO Modules	
26.3.1	Type I – 1CB + 2ISO	
26.3.2	Type 2 – 2CB + 2ISO	
26.4	No of AI Modules	
26.4.1	Type 1/ Type 2	
26.5	Make of Protocol converter	As per Annexure-I
26.6	Modem	Make -As per Annexure-I
	Type – 4G, GSM, Dual SIM Auto Change Over Facility Speed – 800/1900 MHZ	Yes / No Yes / No
26.7	Interposing Relay with freewheeling diode	
	Make	As per Annexure-I
	Rating	
	Model No	
26.8	Terminal Blocks, Disconnecting type fuses make	As per Annexure-I

Technical Specification For 11 kV Motorized Ring Main Unit

Bidder / Vendor seal / signature

Name of the bidder	
Address of bidder	
Name of contact person	
Telephone no & email id	

Annexure-D Recommended spares

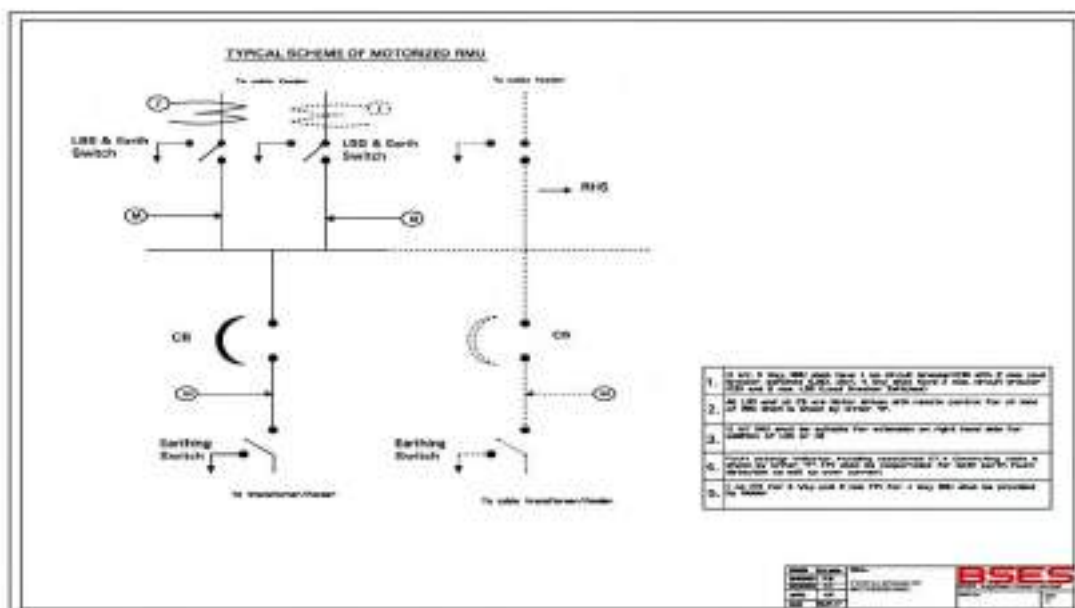
List of recommended and mandatory spares are as following

Mandatory spares are the part of supply along with RMU.

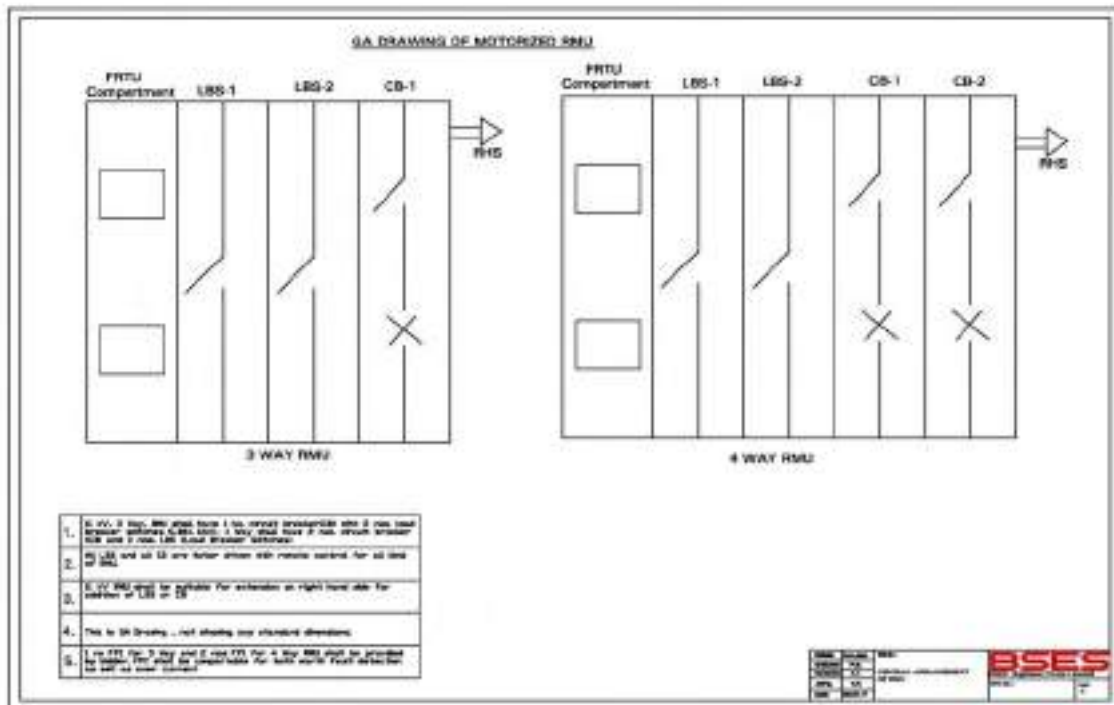
Sr No	Description of spare part	Unit	Quantity
1	Battery Charger set for RMU – Dual	No	10
2	FPI (over current and earth fault)	No	10
3	VPIS	No	10
4	Manometer with pressure indicator switch	No	10
5	Motor Kit for LBS and Circuit Breaker	No	10
6	Self Powered Relay (communicable)	No	10
7	Aux Relays	No	10 no.s of each type
8	Aux Switches	No	10 nos. of each type
9	Modem (4G, Dual SIM, Auto change Over)	No	5
10	CPU with Power Supply Card,I/O Adapter Board, rack etc	No	5
11	DO Card – 8 DO	No	5
12	DI Card -16DI	No	5
	Mandatory Spares {R1}		
1	High Gain Antenna	No	5
2	FRTU	No	1 no. of each type
3	HRC Fuses for Aux Transformer	No	20
4	Single Phase Aux Transformer	No	1

Note-Any additional spares, if required shall be separately listed by bidder and same shall be taken approval from BRPL during bid evaluation.

Annexure E Typical scheme of RMU



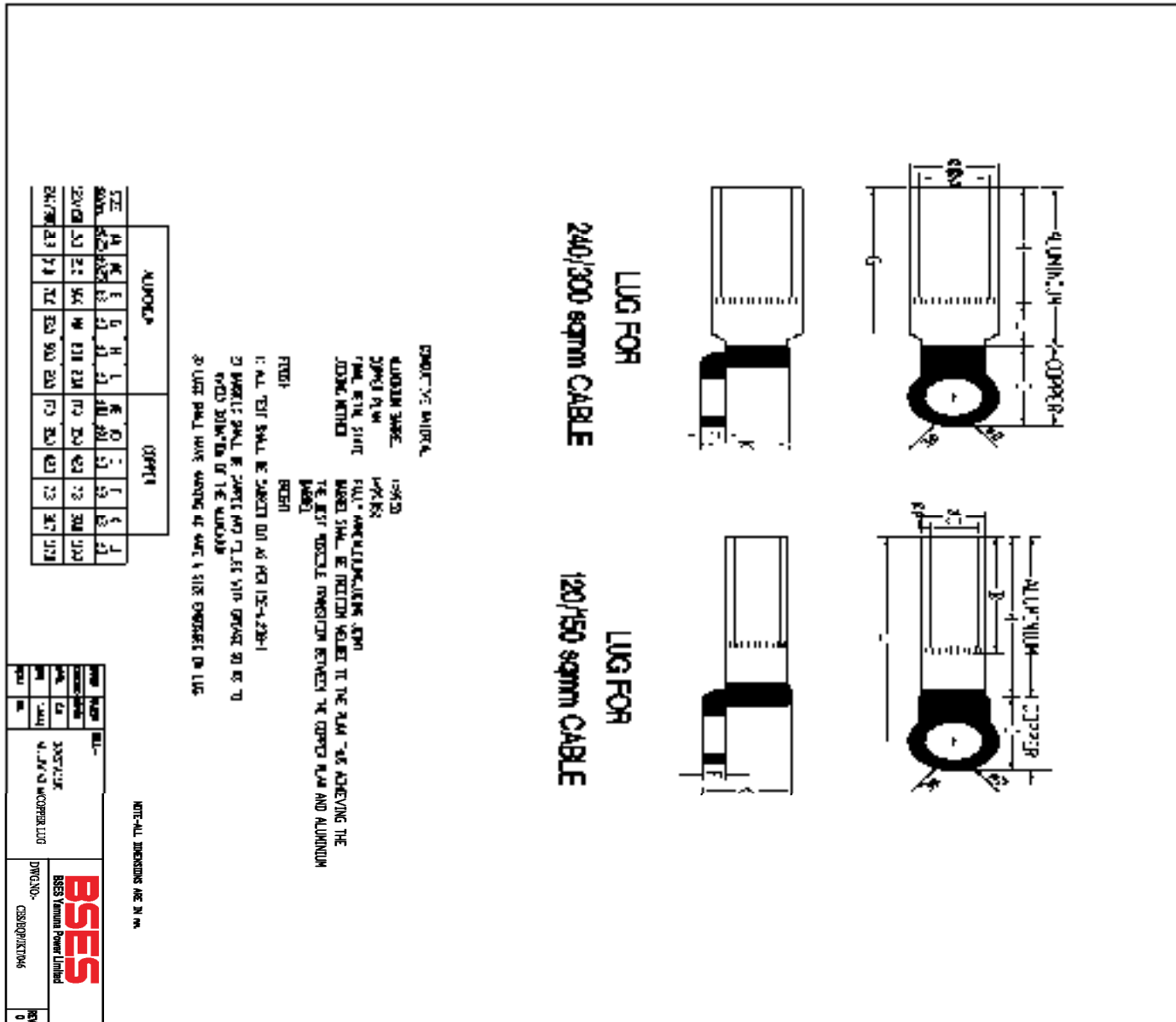
Technical Specification For 11 kV Motorized Ring Main Unit



- a) 11kv RMU shall have circuit breakers (CB) with Load break switches (LBS) as per configuration defined in Purchase Requisition.
- b) Motor drive for LBS or CB is shown by letter 'M'.
- d) 11kv RMU shall be suitable for extension on RHS for addition of LBS, CB.
- e) Fault passage indicator (FPI) including associated CT & connecting cable is shown by letter 'F'.

Technical Specification For 11 kV Motorized Ring Main Unit

Annexure F Drawing of Bimetallic Ring Type Lug



Annexure G Specification for Modem

Modem	: 4G GSM (800/1900 MHZ), (Dual SIM auto change over-optional.) Modem should be able to send a power failure signal in case when battery/battery charger fails before shutting down. {R1}
Make-	As per Annexure-I

Technical Specification For 11 kV Motorized Ring Main Unit

RUIM Interface	: External RUIM 3.0V
SMS	: Supports Text
Data	: Data circuit Asynchronous and non transparent Up to 153.6 kbps Auto baud rate (2400, 4800, 9600, 19200, 38400, 57600 bps) Fixbaud rate (300, 600, 1200, 9600, 115200 bps)
AT Commands Interface	: RS-232 port for supporting AT commands, PPP Protocol
Communication Interface	: Remote management features like telnet & remotely download facility.
LED Indications	: Power ON, Network
Connectors / Switches	: RS-232 Serial, RUIM Card Holder, DC power connector, SMA Antenna connector, Make shall be As per Annexure-I
Power Supply	: 6 – 30V DC (with reverse current protection)
Enclosure	: Aluminium Extrusion
Mounting	: DIN Rail Mounting
Temperature	: Operating (-10 to 65 Degree Centigrade)
Antenna	: : 12 dB High gain multi directional antenna with 15Mtr wire to be provided . Provision for taking antenna wire outside to be provided. Adequate accessories for mounting Antenna at appropriate Sub-station location (Roof/wall) for trouble free operation such as wall mounting bracket, roof mounting bracket etc. {R1}
Accessories	: a) 1 Meter cable for connecting to external DC power source (5V – 30V) b) Standard RS232 serial data cable(1 Meter)
SIM Capability	: The Modem shall be provided with GSM 4G compatible. Dual SIM Capability along with auto change over facility between the two SIM may be provided as a optional. {R1}

Annexure G(1)
SERVICING AND WARRANTY REQUIREMENT- EQUIPMENT SUPPLY
(11KV RING MAIN UNIT)

INDEX

- 1.0 Purpose**
- 2.0 Applicability**
- 3.0 Priority**
- 4.0 Liability**
- 5.0 Warranty Requirements**
- 6.0 Process Requirements**
- 7.0 Documents/records/report submission**
- 8.0 Qualification requirement for service engineers**
- 9.0 Safety**
- 10.0 Communication**
- 11.0 Changes/revision management**

Technical Specification For 11 kV Motorized Ring Main Unit**1. Purpose**

This document is prepared to specify the servicing requirement and Warranty / Guarantee handling procedure in case of difficulty that arises in the supplied equipment within the useful service life of the equipment being procured by BRPL Rajdhani Power Limited.

2. Applicability

It is applicable to any equipment supplied directly or indirectly for installation / use in BRPL Rajdhani Power Limited.

3. Priority

This document which include service, warranty / guarantees management / handling procedures shall be considered a final in case of any contradiction with other contractual document.

4. Liability

- i) Supplier shall be liable to arrange OEM qualified service engineers as and when required by BRPL Rajdhani Power Limited to attend defects, trouble shooting to restore equipment health to ensure 100 % capacity availability.
- ii) OEM shall be liable to provide essential spares at reasonable price for entire lifespan of the equipment.
- iii) Service call shall be attended within reasonable time frame as mentioned in this document.
- iv) Service cannot be denied by supplier/OEM till completion of useful life of the equipment.
- v) The commercial liability shall be restricted to supply/service contract provision.

It will be liability of manufacturer /vendor tie up with accessories / component manufacturer to full fill requirement stipulated this document.

5. Warranty Requirements

Technical Specification For 11 kV Motorized Ring Main Unit

- i) The equipment failed / malfunctioned within stipulated warranty period shall be attended free of cost for the reasons not attributed to BRPL Rajdhani Power Limited.
- ii) The cost incurred for service, spares, transportation, consumable and manpower / labour shall be borne by supplier.
- iii) OEM is bound to send service engineer to site on request for troubleshooting promptly.
- iv) There is no cap on number of visit or spare replacement required to repair / trouble shoot the problem in the equipment during warranty period.
- v) Each break down / problem reported shall be analysed scientifically to establish the root cause of breakdown.
- vi) In case it is established that any component or accessories is not performing satisfactorily or causing repeated failure due to poor performance, manufacturing mistakes, design mistakes or not suitable to our environment condition applicable to NCR region, the OEM shall be liable to rectify or replace the same in all equipment supplied to BRPL irrespective of warranty period.
- vii) In case if RMU supplier is not OEM of the equipment / accessories, the supplier will be liable to tie up with OEM to provide service / spares to meet warranty / servicing requirement stipulated in this documents.
- viii) Irrespective of onsite or workshop repairing, it will be responsibility of OEM to maintain work quality to ensure no compromise on performance and useful life of the equipment.

6. Process requirements**6.1 Complain Registration.**

- i) Supplier to provide communication details for complaint registration in O&M Manual, on website as well as shall be printed on the equipment. In case of changes, same shall be communicated to BRPL.
- ii) BRPL will register complain through a e-mail / telephonic call to the call centre / service centre

Technical Specification For 11 kV Motorized Ring Main Unit**6.2 Confirmation and Service time Schedule.**

- i) All timing will be counted from date of call registration by BRPL till restoration of equipment health at respective site in operation condition satisfactory of BRPL engineer.
- ii) Service call confirmation & service engineer visit schedule shall be provided within two hour for working hour call (09:00AM to 06:00PM, Monday to Saturday) and before 10 AM next working day for off working hour calls.
- iii) Emergency trouble shooting calls - within 12 Hrs including spare arrangements.
- iv) Normal trouble shooting call - within 48 Hrs.
- v) On site repairing / component replacement - within 7 days.
- vi) OEM workshop repairing - within 30 days including returning to BRPL stores.
- vii) Replacement of complete RMU - within 45 days.
- viii) The service engineer shall intimate necessary requirement to attend call along with confirmations

6.3 Site visit & Investigation.

- i) The OEM shall depute qualified and experienced engineer to carryout trouble shoot as well as testing and collecting necessary data / details essential for root cause analysis.
- ii) The service engineer shall collect preliminary details to understand and estimate the spare requirement, shutdown time requirement from our respective area engineer whose details will be provided along with service call.
- iii) The necessary tools shall be carried by service engineer attending calls.
- iv) Service engineer to get call attendance certificate from respective area BRPL engineers.
- v) Service engineer to intimate necessary precaution required to prevent repetition of problem to respective area BRPL engineer as well as CES Team.

Technical Specification For 11 kV Motorized Ring Main Unit

- vi) Detailed technical report (root cause analysis) to be submitted to CES Team for records and analysis against each call.

6.4 Recommendation.

- i) Shall be based on scientific study / test results only.
- ii) Shall cover root cause analysis for failure.
- iii) Shall cover spares / component list for repairing.
- iv) Shall cover time requirement.
- v) Shall cover site preparation / condition requirement.
- vi) Other critical measures essential for quality work.

6.5 On Site Repairing.

- i) All site repairing shall be under supervision of OEM engineer and shall meet all OEM recommendation to ensure quality of work.
- ii) All spares arrangement shall be carried out well in advance to minimize outage time. The list must be shared with CES team
- iii) Necessary repairing process to be intimated to CES team in advance. It shall include in process & final quality and performance checks / test.
- iv) The repairing process shall be certified by OEM design / quality expert.
- v) Detailed time schedule and spares arrangement details shall be submitted to CES team for necessary planning.
- vi) The repairing work shall be witness by BRPL CES engineer, who may insist in process / performance checks / test in addition to above if felt essential.
- vii) If BRPL engineer observed any quality problem / skill problem, may insist for repairing at OEM facility.

6.6 Repairing at OEM facility.

Following requirement shall be fulfilled during OEM workshop repairing work: -

- i) During site inspection, if service engineer felt necessary to send equipment to OEM facility, the same shall be organized by OEM.

Technical Specification For 11 kV Motorized Ring Main Unit

- ii) In case if BRPL felt that site repairing is not up to the required quality or felt necessary to analyze cause of failure, the same shall be organized by OEM.
- iii) Equipment unpacking, testing and opening for analysis inspection shall be carried out in presence of BRPL engineer. It shall be intimated to BRPL at least 3 days in advance for necessary travel arrangement.
- iv) If cause of failure observed due to design mistake / manufacturing mistakes, the same shall be rectified in all other similar design equipments without any cost to BRPL.
- v) OEM to intimate the final testing for inspection. BRPL may depute engineer or third party representative to carryout inspection / testing before dispatch.
- vi) Dispatch shall be carried out only after BRPL clearance.
- vii) Necessary lifting, shifting, loading / unloading & transportation arrangement shall be in the scope of OEM / supplier.
- viii) A document required essential for lifting and shifting of equipment will be intimated at least two days in advance.

6.6 Witness / Inspection stages.

Even though OEM is liable for overall quality of work, BRPL may witness / Inspection following activity:-

- i) On site inspection, repairing/replacement work.
- ii) Testing / inspection equipments / any accessories / component to establish the cause of failure.
- iii) Opening of equipment for internal part inspection.
- iv) Final testing/inspection before despatch.
- v) Testing / checking of the evidence causing failure / problem.

Note: It will be responsibility of OEM / Supplier to establish with facts, figure, photographs, and evidence to prove that cause of failure not attributed to design.

7 .0 Documents / records / report submission

Technical Specification For 11 kV Motorized Ring Main Unit

The following be recorded and provided to BRPL by OEM against each call / repairing / rectification works for BRPL clearance and future reference:-

- i) Root cause analysis report.
- ii) All test report.
- iii) Minutes of meeting.
- iv) Spares / accessories test report / calibration certificates.
- v) Proof of expenditure for cost incurred to BRPL.
- vi) Copy of transportation documents.
- vii) All technical details of parts / accessories being replaced.

8.0 Qualification requirements for service engineers

- i) All work must be carried out by only qualified, experience engineer certified by OEM. BRPL may request qualification and experience details if felt necessary.

9.0 Safety.

- i) All necessary personal protective equipments requirement for the personal and labour will be in the scope of OEM / supplier.
- ii) It will be liability of OEM / Supplier to meet the necessary safety norms , standards, rules & regulation .
- iii) BRPL may audit the same during on site work.

10.0 Communications.

For better coordination, single channel communication must be followed. BRPL and OEM / Supplied to communicate to each other their team for communication time to time in case of any changes.

At present, all warranty related communication is to be done with CES team.

11.0 Changes / revision management.

Necessary approval of O&M analytic cell is essential for changes in this document. In case if any stack holders do not agree or wish to amend its content may send request to BRPL O&M analytic cell for approval. The request will be in effect only on consideration and authorized release of revision in document by O&M analytic cell.

Specification for FRTU

ANNEXURE-H: FRTU DETAILS**Index**

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Technical Specification For 11 kV Motorized Ring Main Unit**Record of Revision**

Sl. No.	Clause no.	Descriptions	Revised No	Old Revision

1.0.0 Feeder Remote Terminal Units

This specification encompasses the requirements for Feeder Remote Terminal Units (FRTU's) for acquisition of real time status and control functions associated with selected 11 kV Ring Main Units (for sites where 11 kV/415 V distribution transformers or capacitors are installed). Make of FRTU shall be As per Annexure-I.

1.1.0 FRTU Architecture

The FRTU's shall have an architecture that supports convenient installation, maintenance and expansion features. Their configuration shall include a central processing module, I/O module, time / date facilities, data storage capacity etc.

1.1.1 Central Processing Module

The central processing module (CPM) shall handle all protocol emulation, perform data acquisition, and execute control requests. It shall accept commands from the master station, perform address recognition, assemble response messages in accordance with the received command messages, and transmit these messages to the SCADA/DMS master station. The CPM shall also provide interfaces for a time standard and a test set.

The CPM shall have user configurable routines / procedures to carry out connection establishment, link failure detections and reconnection after failures for dialup connectivity. The parameters viz: user name & password, baud rate, no. of retries after link failure shall be user configurable.

The CPM shall manage communications between all other functional modules of the FRTU and shall determine the integrity of the FRTU. The processor shall provide diagnostic information in the message structure that the SCADA/DMS shall monitor. A flag shall be set if the FRTU performs a restart for any reason including power failure.

The CPM shall be programmable in a high level language like C. BRPL shall be able to program the FRTU and manage the FRTU database from the FRTU test set and download parameters and configuration data from the SCADA/DMS system.

1.1.2 I/O Module

Each I/O module shall be capable of interfacing with digital inputs, control output points and combinations of point types. I/O modules shall be replaceable without reprogramming, redefinition of configuration parameters or rewiring.

Technical Specification For 11 kV Motorized Ring Main Unit

A control disable switch shall be provided within each I/O module. When the switch is in the control position, the SCADA/DMS or test set shall have control of the digital control outputs. When the switch is in the disable position, the digital control outputs shall be disabled. A status input contact shall be available to monitor the position of this switch. The switch position shall be reported to the SCADA/DMS system. The required number of points shall be the responsibility of the Contractor.

1.1.3 FRTU Time and Date Facility

The FRTU shall have an internal clock for data collection coordination and time tagging. This shall include support for feeder fault detection. The FRTU internal clock time shall be maintained within hundred (100) millisecond of the same time reference used by the respective SCADA/DMS. The FRTU synchronization shall be accomplished by the communication protocol.

1.2.0 Functional Requirements

The FRTU's shall include all hardware, software, and firmware necessary to meet the Input/Output(I/O) point requirements including input and output cards and output relays.

1.2.1 Input / Output Point Types

The FRTU's shall include facilities for handling status input and control output points. Requirements for each type of I/O point are described in the following sub-sections.

1.2.2 Status Inputs

The Contractor shall supply the necessary sensing voltage, current limiting, input isolation, and bounce filtering for all status inputs. The debounce time period for each status input shall be individually configurable. The input circuit of the status input modules shall be optically isolated from the external signal. In addition, each input circuit shall include an LED indicator next to the circuit terminations to show the status of the associated input contact.

The state of each status point shall be reported to the SCADA/DMS on a contention basis. That is, a status point shall not be reported unless the point state has changed from the last scan. The FRTU shall also report the state of selected status points upon receipt of a demand scan request from the SCADA/DMS.

The FRTU's shall include the following types of status input points:

Technical Specification For 11 kV Motorized Ring Main Unit

- 1) Single Contact, Two-State Status: For single contact, two-state status points, a single contact shall represent both states of the monitored device. One position of the contact shall indicate an alarm or failure condition, while the opposite state of the contact shall indicate the normal condition.
- 2) Double Contact, Two-State Status: For double contact, two-state status input points; separate contacts shall be provided for representing each state of the monitored device. One contact shall indicate an OPEN condition of the monitored device. The other shall indicate a CLOSED condition. The contacts shall be treated as a complimentary pair. Conflicting contact positions (e.g., either indicates CLOSED or OPEN) shall be labeled INVALID.

1.2.3 Control Outputs

The FRTU's shall include on/off device control points to support control actions initiated from the SCADA/DMS master stations. The FRTU's shall perform on/off control actions using complimentary pairs of contact outputs. One contact output shall perform the ON control action, and a second output contact shall perform the OFF control action. The FRTU's shall be designed such that only one output in a complimentary pair can be activated at a time. For single point indications FRTU shall also support single command output.

To support the above capabilities, the FRTU's shall include momentary control outputs as required by the feeder device being controlled. Each momentary control output shall provide a contact closure (pulse) that shall have programmable pulse duration. The pulse duration shall be adjustable on an individual point basis from 0.1 to 60 seconds in increments of 0.01 seconds.

FRTU control outputs shall be equipped with high power relays with free-wheeling diodes that are integral to the FRTU so that external auxiliary control relays are not required. The associated high and low control power shall be obtained from the dc power supply in the switch. The voltage rating of the control output contacts shall be 24 V DC. All control outputs shall be capable of driving a load of eight (8) amps at the primary control voltage with provision for an additional NO contact for DI status of Command Execute Acknowledgement wired up to terminal blocks. External auxiliary control relays are not preferred, but may be applied if integral relays do not satisfy the above ratings. These relays shall be supplied by the Contractor.

All control points shall follow a Select - Check back – Before - Operate (SCBO) procedure for control operation. The SCBO procedure shall be equivalent to the following:

1. The point selection command is received from the SCADA/DMS master station.
2. The FRTU checks that no other point is selected.
3. The FRTU selects the addressed point and transmits a selection confirmation to the SCADA/DMS.

Technical Specification For 11 kV Motorized Ring Main Unit

4. The FRTU starts the command receipt timer and checks that only the required point remains selected and no other points become selected.
5. The operate command is received from the SCADA/DMS.
6. The FRTU verifies the operate command and energizes the selected control point relay for a predetermined time.

Point selection shall be canceled automatically following the completion of the control action, and re-selection of the point shall be required for subsequent control actions.

1.2.4 Input / Output Point Counts

The FRTU's shall be equipped to handle the I/O point requirements as per each FRTU types described in Sr.No. 1.9 of index.

All I/O channels provided (used as well as additional / spares) irrespective of immediate application shall be wired from FRTU I/O card along with interposing relays for DOs to the associated terminal strips in the cabinet with proper segregation and identification of Digital inputs and Digital outputs.

It shall be possible to expand the FRTU capacity by an additional twenty percent (50%) of the initially delivered (including spares) I/O points by providing space for adding cards and terminations at future date.

1.2.5 Analog Inputs

FRTU shall be able to capture Analog values from current & voltage transducers and communicate the Analog Measured Information (AMI) to control centre through communication media in the intervals of 10 minutes.

Unipolar and bipolar analog measurements shall be collected by the AI cards. Input to the cards shall be programmable for various mA and V input ranges.

1.2.6 Programmable Logic Control (PLC)

The FRTU shall be provided with a PLC Module. The PLC module shall have access to the controlling process via its process interface imaged in the FRTU process DB actualized by the internal communication. That allows to use nearly all process information from direct connected process signals as well as from process data points received via serial communication line. Control information for actuators to the process will be handled in the same way from the PLC to the physical output signals etc. The overall transaction time for a PLC task is therefore to be given by the PLC cycle time plus the update time between the process actuators and sensors and the PLC's FRTU process DB.I

Technical Specification For 11 kV Motorized Ring Main Unit

Programming of the PLC program is to be done by a specific PLC programming tool. The integration of the PLC task and the link between the IO interfaces of the PLC to the real process signals is to be supported by FRTU Configuration Utility together with the PLC programming tool.

More than one PLC task shall be active. The FRTU shall allow to have more than one PLC module in the FRTU running.

1.2.7 FRTU Data Communications

The communication between the FRTU's and BCC/MCC shall be through all 4G GSM cellular network using Wireless VPN. Alternatively FRTU's shall also communicate with BCC/MCC wherever all 4G GSM cellular communication/Optical fiber network is available. The FRTU's shall support communications using the IEC 608705-104 and Modbus set of protocols. Contractor shall provide Interoperability document specifying all the sets of parameters / functions implemented by its device. The message security defined in the protocol should be fully implemented, and if needed later, a convenient means of changing the communication protocol in the field should be provided.

The FRTU's shall have three (3) number serial ports, one port used for communication with slave device and one port for communication with BCC and MCC, and one RS485 port for Modbus communication with IEDs. The FRTU shall also have one Ethernet port for diagnostic and communication with MCC / BCC in addition to the serial ports. Each of the serial ports shall be individually selectable in RS-232 or RS485 mode and for operation from 9,600 to 38,400 bps. FRTU's shall support communication with redundant masters installed at both BCC and MCC ie. 4 masters. The FRTU shall support IEC 61131-3 PLC programming for incorporation of peer to peer communication & achieve Self Healing Grid (SHG) automation logic.

1.2.8 Wifi Connectivity for local access

An inbuilt wifi communication modem shall be offered in FRTU for local access via hand held devices (Tablet / smart phone / etc..). It shall be secured by means of

- Activation/deactivation from the SCADA
- SSID visibility configurable
- Passphrase
- Automatic disconnection by timeout

1.2.9 Cyber Security

In order to secure all controls and data acquisition, the FRTU shall be designed to be compliant with NERC and IEC62351-5 requirements. The FRTU shall support secure access based on RBAC, with the possibility to configure the roles.

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Local and remote access connection shall be secured for maintenance (locally and remotely)

1.3 FRTU Enclosures

FRTU enclosure shall be provided integrated with the RMU as a single composite unit. A separate compartment for the FRTU shall be provided with protection class in accordance with RMU IP class. The enclosure shall be fabricated using 2-2.5 mm thick CRCA/GI sheet and powder coated using 10 tank process. The shade shall be same as the RMU. No access to the FRTU Compartment shall be given from the RMU back side. All the equipments housed in FRTU Compartment shall be accessible from front. The FRTU enclosure back side shall be bolted with SS Bolts.

3 Nos keys for the FRTU Compartment shall be provided along with the RMU. {R1}

The dimensions shall be suitable to accommodate FRTU CPM and I/O modules, power supply accessories, terminal blocks, communication modem with power adaptor, Ethernet switch for FO connection and ease of intra-panel wiring/termination and maintenance thereafter. Suitably sized PVC perforated channels to be used for routing intra-panel wiring.

The front access door shall be hinged on cabinet with a common lock & key arrangement.

Removable type gland plates shall be provided at bottom of enclosure with 8-12 nos. knock out holes suitable for CBW01 gland for control cable entry. Provision of entry shall be kept for extending GSM modem antenna outside the enclosure. Alternately BRPL shall also have an option to mount communication switch connecting to optical fiber network.

Suitable ventilation, if necessary forced ventilation, and louver with dust filters shall be provided to maintain operating temperature under permissible limits of electronic components.

Contractor shall indicate gross weight of FRTU in GA drawing.

Alternately Fiber Reinforced Plastic (FRP) enclosure with suitable thickness and dimension may also be quoted.

1.4 FRTU Power Supply

Power supply for FRTU shall be on 24V DC system which would be made wired from Battery Charger system to FRTU cabinet.

The main DC circuits shall be protected by incoming circuit breakers. Each circuit shall be tapped through single pole MCBs so as to provide an individual DC feed to each of the I/O modules,

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modems and protocol converters. Contractor shall provide maximum power consumption data of each of the type of FRTU.

Type 3 Pluggable Surge Protection Device in accordance with IEC 61643 with KEMA & UL approval must be installed at the incoming power supply of FRTU. DIN Rail Mounted Suitable Surge Protection must be installed on all communication lines (Ethernet/RS 485)

1.5 FRTU Test Systems

The Contractor shall supply FRTU test systems for performing the functions listed below. Portable computers shall be used for this purpose. The FRTU test system shall comply with the following requirements:

- 1 Each test system shall support all maintenance aspects: verifying proper operation, troubleshooting, reconfiguring, and setting operational parameters for the FRTU's.
- 2 The test systems shall support all functional capabilities of the FRTU's, including functions which are not explicitly required in these Technical Specifications and functions which may not be included in the delivered FRTU's.
- 3 It shall be possible to use a test system locally at the site of the FRTU under test, and also remotely wherever access can be obtained to the communication channel of the FRTU.
- 4 All the required data rates shall be easily selectable.
- 5 It shall be possible to use the test systems to monitor communications between the respective SCADA/DMS and the FRTU's by selecting specific data streams, or portions of such data streams, both to and from FRTU. The data shall be displayed in a form that is easy for the user to interpret.
- 6 It shall be possible to connect the test system directly to the FRTU and to use the test system to perform all necessary FRTU management and expansion functions, monitor all stored data, monitor FRTU inputs, exercise FRTU outputs, and diagnose and troubleshoot the FRTU. It shall also be possible to use the test system as a local user interface at the FRTU location.
- 7 No programming skills shall be required to use the field test system. Interactive procedures relying mostly on pull down menus shall be used. The user shall not be required to type in commands, and shall be prompted when data entry is needed.
- 8 The test system shall be ruggedly constructed and suitable for field work and transportation in trucks. All cables, connectors, equipment, and documentation associated with their operation shall be included and stored either within the test system package or in suitable separate containers.

The test systems shall operate on internal battery and 220 V. AC, 50 Hz

1.6 Software / Firmware

The term software is used in this Technical Specification to mean software or software implemented through firmware. All software shall be implemented according to the Contractor's latest established design and coding standards. Complete and comprehensive documentation shall be provided for all software. Contractor may consider providing windows based software as it is preferred for its user friendliness. All the related software and related communication ports shall be provided to BRPL by OEM with latest version till warranty period without any cost implications to BRPL.

1.6.1 General

A real-time non-proprietary operating system that is capable of managing the FRTU applications shall be provided.

This software shall provide automatic restart of the FRTU upon power restoration, memory parity errors, hardware failures, and manual request. The software shall initialize the FRTU and begin execution of the FRTU functions without intervention by the SCADA/DMS master station. All restarts shall be reported to the SCADA/DMS.

The software shall be prepared in a high level language and shall be documented in detail. No separate licensing charges or agreements shall attach to the FRTU software or its underlying operating system.

In order to easily support the system under continuously changing site conditions all protocol, configuration, and application data must be contained in easily programmable non-volatile memory such as Flash EPROM.

The FRTU design shall be independent of any communication protocol that would impose restrictions on the flexibility or functionality of the FRTU. Protocol changes shall be accomplished by software/firmware changes only.

ALL FRTU cards to be coated with conformal coating for protection against weather related deterioration.

FRTU to have capability of reporting to four distinct IP addresses of same or different domains.

1.6.2 Diagnostic Software

Software shall be provided to continuously monitor operation of the FRTU and report FRTU hardware errors to the SCADA/DMS. The software shall check for memory, processor, and

Technical Specification For 11 kV Motorized Ring Main Unit

input/output errors and failures. It is desirable that internal diagnostics be sufficiently detailed to detect malfunctions to the level of the smallest replaceable component.

The FRTU shall facilitate isolation and correction of all failures and shall include features that promote rapid fault isolation and component replacement. All functional module nodes shall be designed with integrated on-line diagnostic functions. The results of these diagnostics shall be reported to the central processing module. The central module shall store this information and report it to the SCADA/DMS as permitted by the protocol. FRTU shall be able to access from remote (BCC/MCC) for down loading configuration.

1.7 FRTU Testing

1.7.1 Type Tests

The FRTU controller shall be KEMA /CPRI/ERDA Certified and in accordance with IEC 255-4, 255-5, 255-6, 801-2, and 801-3 to demonstrate that the FRTU's comply with the ratings stated in these standards. As a minimum, certificates for the following type tests shall be furnished:

1. Dielectric test
2. Impulse voltage withstand test
3. High frequency disturbance test
4. Thermal requirement test
5. Mechanical requirement test
6. Limiting dynamic value test
7. Contact performance test
8. Electromagnetic radiation susceptibility test
9. Electrostatic discharge susceptibility test
10. EMI free & EMC Compatible

1.7.2 Routine Tests

The FRTU's shall pass the Manufacturer's standard routine tests in accordance with the referenced standards.

In addition to the tests described in the IEC standards, the routine tests and test report of the FRTU's shall include the following:

1. Visual tests to confirm that construction and sizing requirements have been met.

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2. Rigorous testing of each input and output function of the FRTU's. This shall include the fault detection and the disturbance data storage functions as well as the operation and performance of the FRTU time and date facilities.
3. Verification of the use of the FRTU test equipment for maintenance and testing.
4. Verification of the ability to download parameters and configuration data from the SCADA/DMS master station.
5. Verification that FRTU software and firmware support FRTU sizing and expansion requirements.
6. Verification of successful communications (i.e. protocols) at all the required data rates.
7. Testing for secure operation, including verification that: a) Communication errors are detected. b) SCBO procedures are properly performed for control outputs. c) No erroneous control operation occurs and no incorrect data is generated when power is turned on or off or when operating on low battery voltage.

1.8 FRTU Spares:

Bidder shall supply spares for 5 years trouble free operations as per the spares list given in this tech spec.

1.9 FRTU Types:

FRTU's are categorized as type 1 to 7 in this specification, according to their DI/ DO/AI Channel requirements as indicated in the annexure –1. FRTU shall be modular construction type.

1.10 High Gain Antenna

Scope :

: 12 dB High gain multi directional antenna with 15Mtr wire to be provided . Provision for taking antenna wire outside to be provided. Adequate accessories for mounting Antenna at appropriate Sub-station location (Roof/wall) for trouble free operation such as wall mounting bracket, roof mounting bracket etc. {R1}

Annexure –1: Guaranteed Technical Particulars

FRTU Types	Digital Input Channels	Digital Output Channels	Analogue Channels
1	24	8	6
2	32	16	6
3	48	24	6
4	64	32	6

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5	80	40	6
6	96	48	6
7	112	32	6

(Vendors shall furnish the General Technical Particulars along with their offer. Any kind of deviation along with offer shall be listed and submitted separately clause wise as per the deviation format given in this specification for approval of BRPL. Deviation shall not be considered which mentioned in any other submitted bid documents)

Sr. No.	Description	Buyer's Requirement	Vendors Data
1	Vendors Name		
2	Guarantee period	5 yrs.	
3	Make of FRTU base module	As per Annexure-I	
4	No. of DI modules		
	Type 2	2 x 16	
5	No. of DO modules		
	Type 2	2 x 8	
6	No. of AI modules		
	Type 1 to 2	1x 6	
7	Dimensions &Weight of FRTU		
	Type 2	Vendor shall Provide	
8	Make of protocol converter	As per Annexure-I	
9	Interposing relay with freewheeling diode		
	Make	As per Annexure-I	
	Capacity	>8 A	
	Model	CR-P with 2C/O contacts / Eqv	
10	AC & DC MCB	As per Annexure-I	
11	Terminal Blocks	As per Annexure-I	
12	Disconnecting type fuses make	As per Annexure-I	
13	Enclosure		
	Sheet steel thickness	As per type test design	
	Painting process	10 tank and powder coating	
	Construction of steel according to IEC 529 , index of protection	IP52	

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	Shade	RAL-7035	
	Louvers with filters	2 Nos	

Annexure – 2: IO List {R1}

Signals List for Motorized RMU						
Digital Inputs	Equipments	Signals	DI for 3Way		DI for 4Way	
	Isolator	Isolator ON	DI1, DI2	2	DI1, DI2	2
		Isolator OFF	DI3, DI4	2	DI3, DI4	2
		Earth Status	DI5, DI6	2	DI5, DI6	2
		FPI operated	DI7, DI8	2	DI7, DI8	2
		Local/Remote	DI9, DI10	2	DI9, DI10	2
		VPIS Status	DI11, DI12	2	DI11, DI12	2
	Circuit Breaker	CB ON	DI13	1	DI13, DI14	2
		CB OFF	DI14	1	DI15, DI16	2
		Disconnecter Open	DI15	1	DI17, DI18	2
		Disconnecter Close	DI16	1	DI19, DI20	2
		Earth Status	DI17	1	DI21, DI22	2
		Ready to Close Signal to control centre to indicate all interlocks are OK (including spring charge and trip ckt healthy)	DI18	1	DI23, DI24	2
		Auto Trip	DI19	1	DI25, DI26	2
		Local/Remote	DI20	1	DI27, DI28	2
		SF6 Low	DI21	1	DI29	1
		VPIS Status	DI22	1	DI30, DI31	2
	Common Signals	Battery Charger-1 Fail	DI23	1	DI32	1
		Battery Charger-2 Fail	DI24	1	DI33	1
		Command Acknowledgement	DI25	1	DI34	1
		Battery Health Monitoring Unit/Battery in Trouble	DI26	1	DI35	1
		FRTU Door Open	DI27	1	DI36	1

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		Interlock Card operation Fail	---	0	---	0
		Auxiliary Circuit Healthy (Control Ckt healthy)	DI28	1	DI37	1
		MOG Alarm from field	DI29	1	DI38, DI39	2
		WTI Alarm from field	DI30	1	DI40, DI41	2
	APFC	APFC Incomer MCCB Trip	DI31	1	DI42, DI43	2
		APFC Fan MCCB Trip+Other common alarm	DI32	1	DI44, DI45	2
			total	32	total	45
		Spare DI		8		3

Signals List for Motorized RMU

Digital Outputs	Signals	DO for 3 way		DO for 4Way	
	Isolator ON	DO1, DO2	2	DO1, DO2	2
	Isolator OFF	DO3, DO4	2	DO3, DO4	2
	FPI Reset	DO5, DO6	2	DO5, DO6	2
	CB ON	DO7	1	DO7, DO8	2
	CB OFF	DO8	1	DO9, DO10	2
	Inteerlock card remote reset	DO9	1	DO11	1
	Modem interlock card remote reset	DO10	1	DO12	1
	Modem Remote Reboot	DO11	1	DO13	1
	FRTU Remote Reboot	DO12	1	DO14	1
	Auto Trip Reset	DO13	1	DO15	1
		total	13	total	15
	Spare DO	DO14-DO16	3	DO16	1

Analog Inputs	LT Palm Temp	AI1
	Oil Temp of Trf.	AI2

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	Oil Level	AI3
	Spare	AI4 to AI8

Serial Port	DT Energy Meter Data	SP1
	Relay of RMU (Both relays to be connected to FRTU in case of 4 Way RMU)	SP2

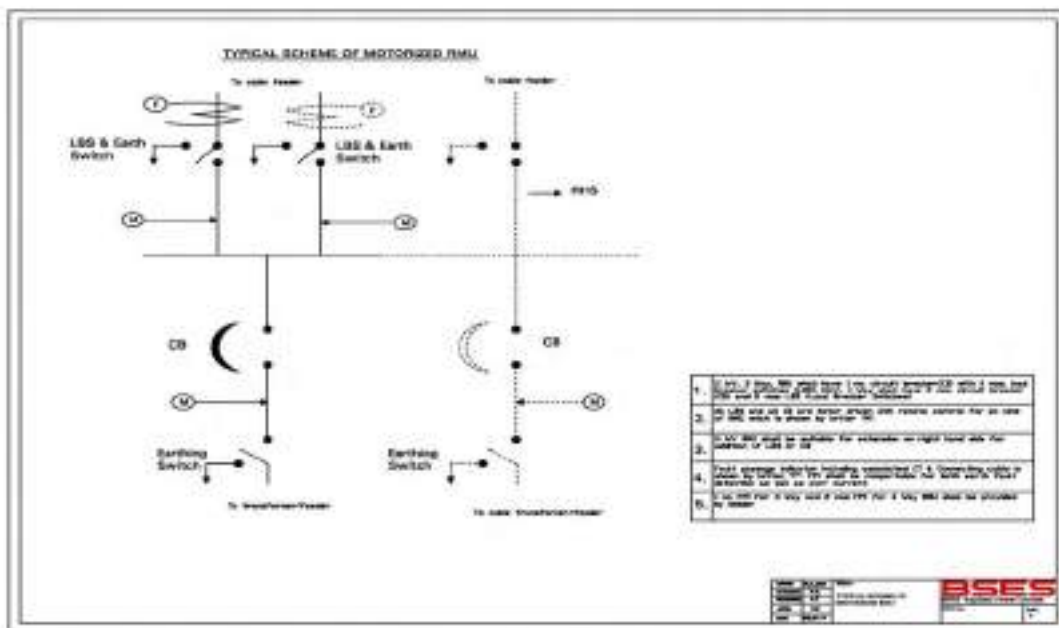
Annexure-I : Make List

Make List of RMU's Accessories		
Sl. No.	Descriptions	Make
1	Relay (Self Power+ External DC Supply+ Communicable) {R1}	Ashida (ADR241S-761),
2	CT and Aux PT {R1}	Narayan Power Tech (NPT)/Gilbert Maxwell, Pragati ,Nortex
3	FRTU	Schneider - HUA/HUBI ABB - RTU520 CG - USP-020i Wago (Model-750) Phoenix (ILC 171 ETH 2TX)
4	Interposing relay with freewheeling diode	ABB/Tyco/OEN
5	FPI(Both for Earth fault and Over current protection)	EMG/Schneider/SIEMENS/C&S
6	CBCT (Both for Earth fault and Over current protection)	EMG/Schneider/SIEMENS/C&S
7	Boot	3M/Raychem/K.D.Joshi
8	Modem (GSM 4G+) {R1}	Nomus
9	Battery	GOGATE/Allan
10	Battery Charger (2 nos. For each RMU with free wheeling diode)	GOGATE/Allan
11	Wire	Polycab/Havells/Finolex/KEI
12	AC & DC MCB	SIEMENS/Havells/C&S/ Schneider

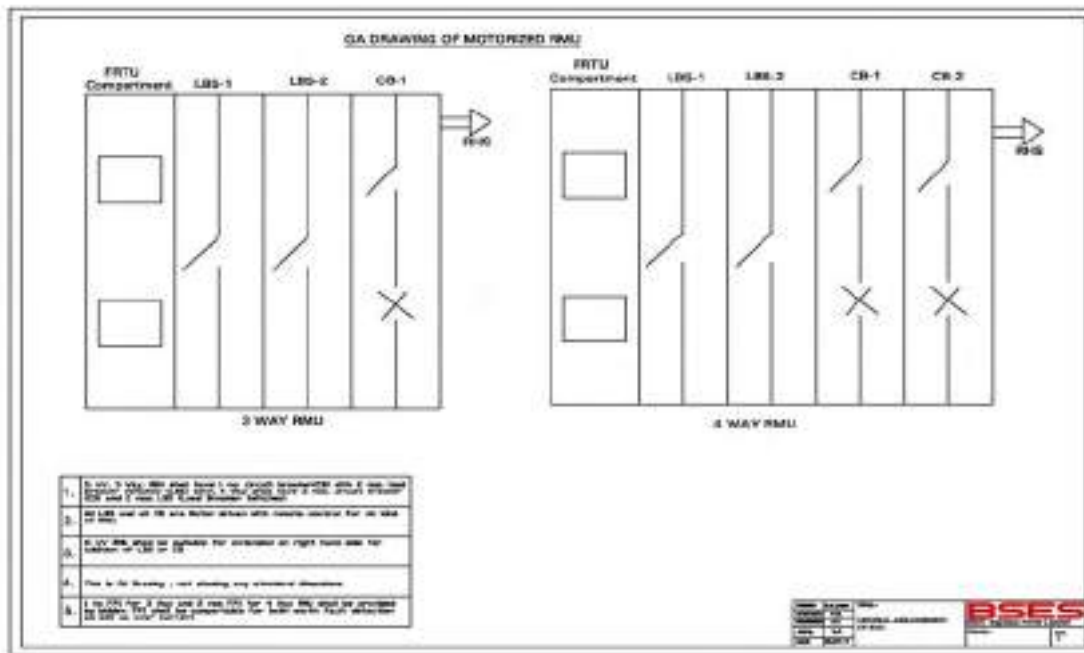
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13	Disconnecting type fuses	Connectwell/Wago/Phoenix/Elmex
14	TB (disconnecting type)	Connectwell/Wago/Phoenix/Elmex
15	Protocol converter	ABB/Tyco/OEN
16	DC power connector	Wago/Havells/Connectwell
20	Vacuum Interrupter{R1}	CG/ ABB/Schneider/SIEMENS/Any other type tested (CPRI/ERDA)make
21	Battery Health Monitoring Unit	GOGATE/Allan

Annexure-J: Composite RMU Drawing



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Annexure-K: Deviation Sheet Format

(To be filled in by Vendor with submission of Offer)

We hereby confirm compliance of our product / system with BRPL Technical Specifications / GTP / BOQ / QAP / Approved Drawings, if any (strike off whichever not applicable) – in all respects / subject to the following Deviations listed below till closing of contract.

[illegible]

Special Requirement:

Sl. No	Descriptions
1	Animated video for ETC guide of RMU shall be submitted to BRPL before delivery of first lot
2	Relay Protection setting (min 10%)
3	All the communicable accessories shall have Latch contact

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Sl. No	Descriptions
4	NO/NC contact for manometer shall be provided
5	--Bidders shall have additional RMU readily available of each type to replace under warranty faulty RMU in case it is repairable at OEM factory --In case of under warranty failure and if the faulty RMU is repairable only at OEM factory, bidder has to replace the faulty RMU during lifting with new/operatable same type of RMU within the time period mentioned in the tech spec warranty clauses. --BRPL shall not issue any RMU from their assests for replacement activity. In case of delay, penalty shall be imposed as per this corrigendum sl no 9 --After Warranty period completion (5 years), these clause shall not be applicable to OEM
6	Sample RMU
6.1	1 sample RMU of each type shall be manufactured as per BRPL specification after award of PO. BRPL will do the routine testing and inspection of the sample RMU and if found satisfactory as per BRPL specification, BRPL will give clearance/ approval for bulk manufacturing
6.2	During inspection of the sample RMU, BRPL may ask the vendor to modify/change the design as per BRPL requirement including the make of accessories mentioned in the specification. OEM is liable to modify the design irrespective of the offer submitted during tender stage. However, BRPL will not ask for the requirement beyond the technical specification.
6.3	The lead time required to arrange the accessories/ to modify the design required as per BRPL requirement shall be in the account of bidder.
6.4	BRPL is not liable to bear any extra cost out of the PO for the approval of sample RMU and the bulk quantity afterwards.
6.5	The sample may be used in BRPL network based on fulfilment of technical requirement and BRPL approval. Else fesh RMUs as per the approved sample shall be supplied in line with PO quantity.
6.6	During bulk manufacturing and PO execution, BRPL may ask necessary changes to be done (if required). Bidder is liable to provide the required changes as per the BRPL requirement irrespective of the offer / design given during tendering stage without any cost implication to BRPL. However, BRPL will not ask any changes out of BRPL Technical specification
7	Warranty clause's terms & conditions mentioned in the technical specification Annexure- G(1), Clause no-6.2 shall be strictly followed by the OEM, in the event of violation of warranty clauses, BRPL is liable to impose penalty with 1% of RMU unit rate per day basis (Unit rate shall be considered as per the PO)
8	Submission of Type test report (not more than 5 years from the date of tender opening date) of internal arc for 1 sec (AFLR 20kA for 1 sec) from CPRI/ERDA is mandatory with 3 way RMU

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Sl. No	Descriptions
9	Complete Civil foundation Drawing along with sectional view (RCC casting shall be followed) and BBS shall be submitted by bidders along with drawing
10	Submission of 3nos as built drawing to BRPL before dispatch of first lot of material is mandatory. Also one set of as built drawing shall send with each unit of supplied RMU. Proper holding arrangement to be provided to place as built drawing inside the RMU.
11	Test bushing feature-The bushing of RMU must have the feature of "Test Bushing".
12	Broken conductor feature in relay-The relay must have the feature of detecting change in impedance (negative phase sequence over current) <u>Aux-PT for Outdoor RMU Only {R1}</u>
13	<u>1. Cast Resin, Single Phase Auxiliary Power transformer to be provided. Turns ratio – 11kV to 230V</u> <u>2. 230V AC supply to be provided to RMU battery charger for power supply</u> <u>3. Minimum VA Burden – 500VA</u> <u>4. HRC Fuses to be provided on HT and MCB to be provided on LT Side of the Aux. Transformer</u> <u>5. Aux Transformer to be placed on LHS of RMU</u> <u>6. Resin material type shall be cycloaliphatic</u> <u>7. CPRI/ERDA type test report shall be submitted for review and same shall not be older than 5 years. In case of type test report is more than 5 years old, type test shall be conducted form CPRI/ERDA without any cost implications to BRPL.</u> <u>8. GA drawing for auxiliary voltage transformer arrangement along with schematic diagram, ratings and fuse details to be submitted for approval</u>




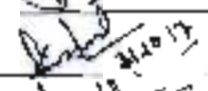

TECHNICAL SPECIFICATION

FOR

LAYING OF 66 KV / 33 KV / 11 KV / 11 KV GRADE
PVC / XLPE CABLES

Specification no: GN101-03-SP-05-03

BSES RAJDHANI POWER LTD

Prepared by	Pronab Bairagi		Rev : 03
Reviewed by	Amit Tomar		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	<p>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:</p> <ul style="list-style-type: none">-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	<ul style="list-style-type: none">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 sizes 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 adequate shored by wooden planks and bracing to avoid trench cave-ins which would cause injury to the persons and also damage the cables laid.</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	----	

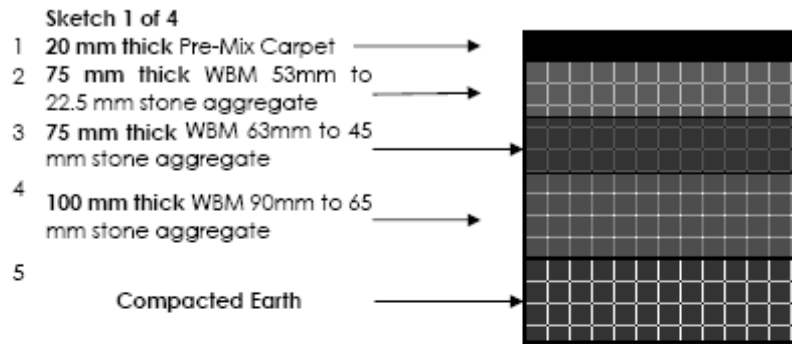
Reference value for DC High voltage Test.

Annexure # 3 – CABLE TRENCH DETAILS

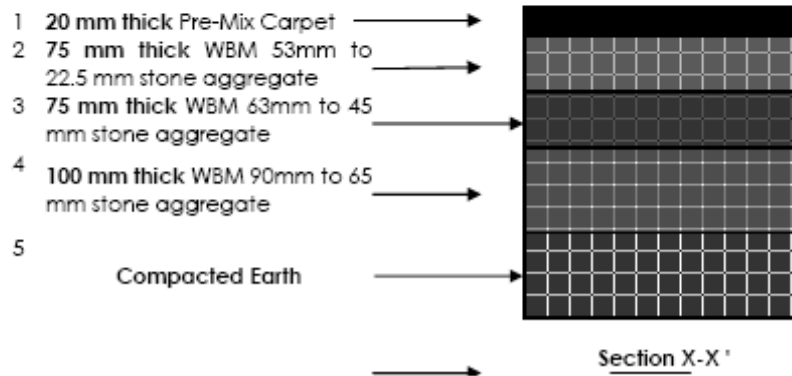
S. No.	Cable Size	Trench		Cable Trench drawing reference
		Width (mm)	Depth (mm)	
1	1.1 kV LT Cables			
a	3.5Cx150 mm ² - Single Circuit	400	875	A – 1 (Drg. # 9)
b	3.5Cx150 mm ² - Double Circuit	400	875	A – 1 (Drg. # 9)
c	3.5Cx150 mm ² - Triple Circuit	400	875	A – 1 (Drg. # 9)
d	3.5Cx300 mm ² - Single 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)

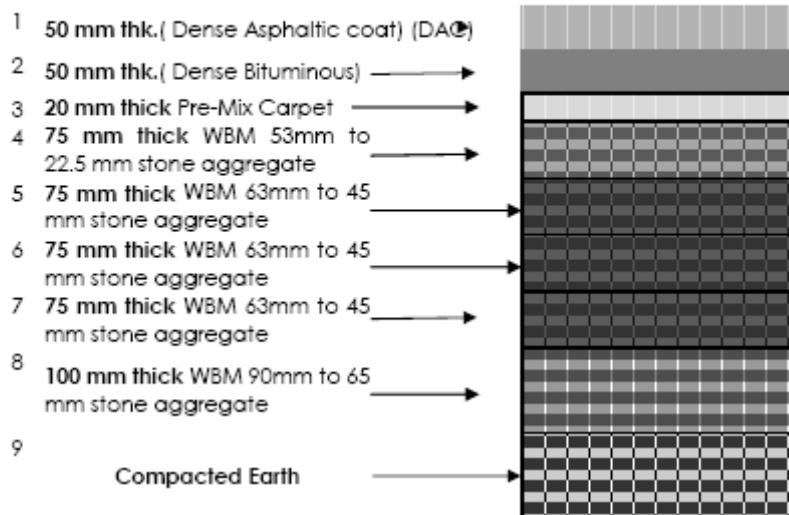


Sketch 2 of 4 **30' - 00" FEET WIDE ROAD (ROAD TYPE II)**



Sketch 3 of 4

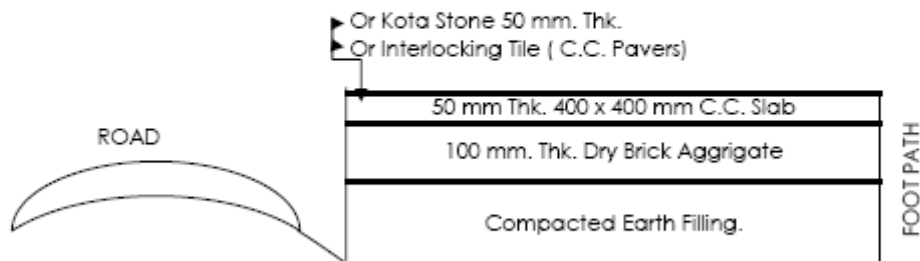
40'-00" TO 60'-00" FEET WIDE ROAD



Section A-A'

Sketch 4 of 4

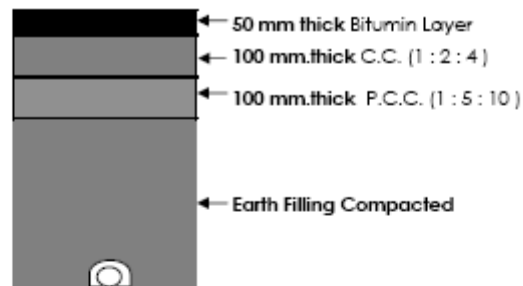
General drawing for cases other than roads.



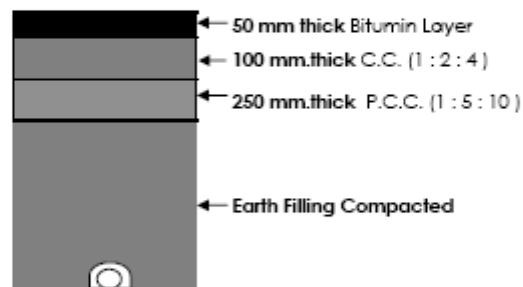
Details of Foot Path Along roads under PWD & MCD.

Annexure # 5 – Road Restoration Sectional Drawing

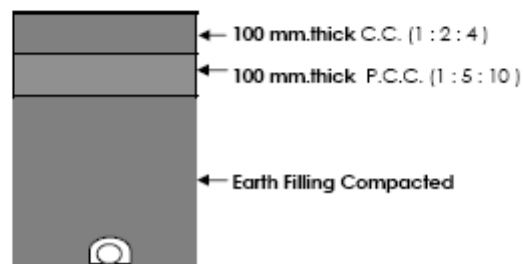
ROAD RESTORATION SECTIONAL DRAWINGS



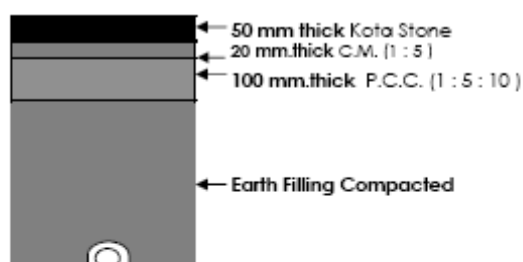
Bituminous Road Type - I (Category 1 & 2) Road width 20 to 30 feet and 30 to 40 feet.



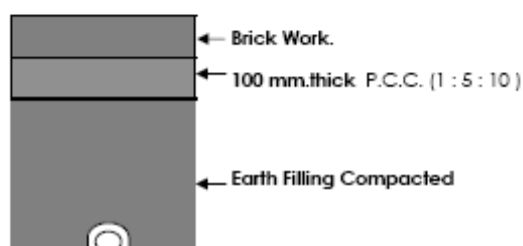
Bituminous Road Type - II (Category 3)



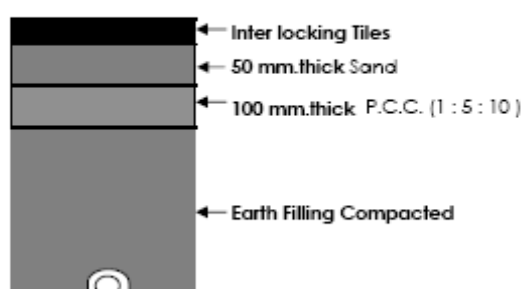
Cement Concrete Road



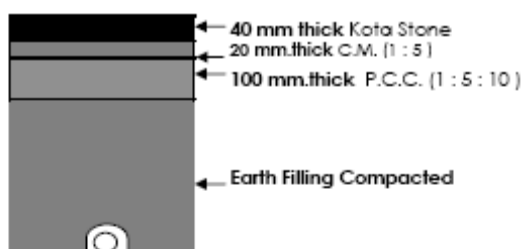
Kota / Rajasthan stone Road



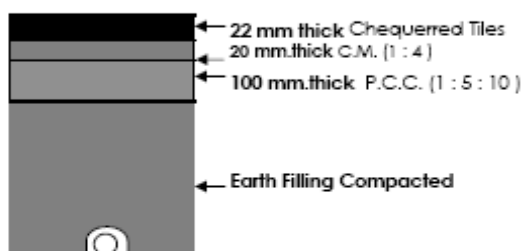
Brick Road



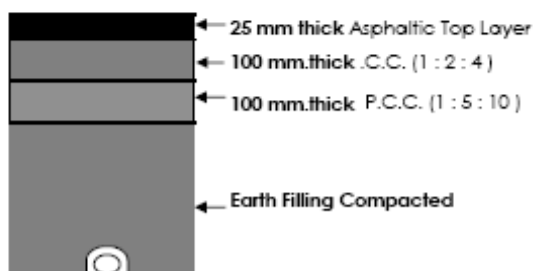
Interlocking Paving Tiles



Agra stone Road .



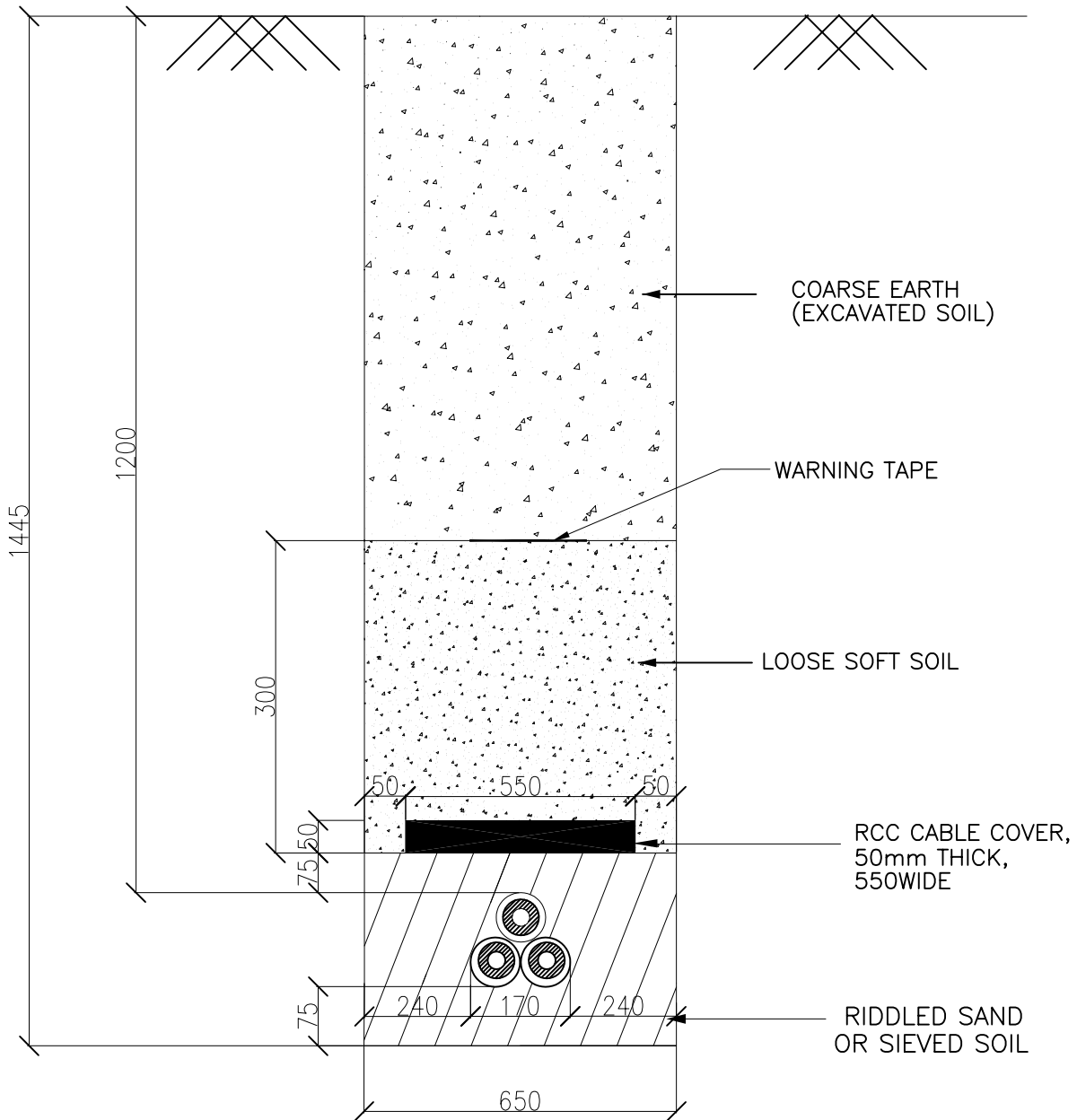
Chequerred Tiles .



Asphaltic Road .

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

DRAWING # 1



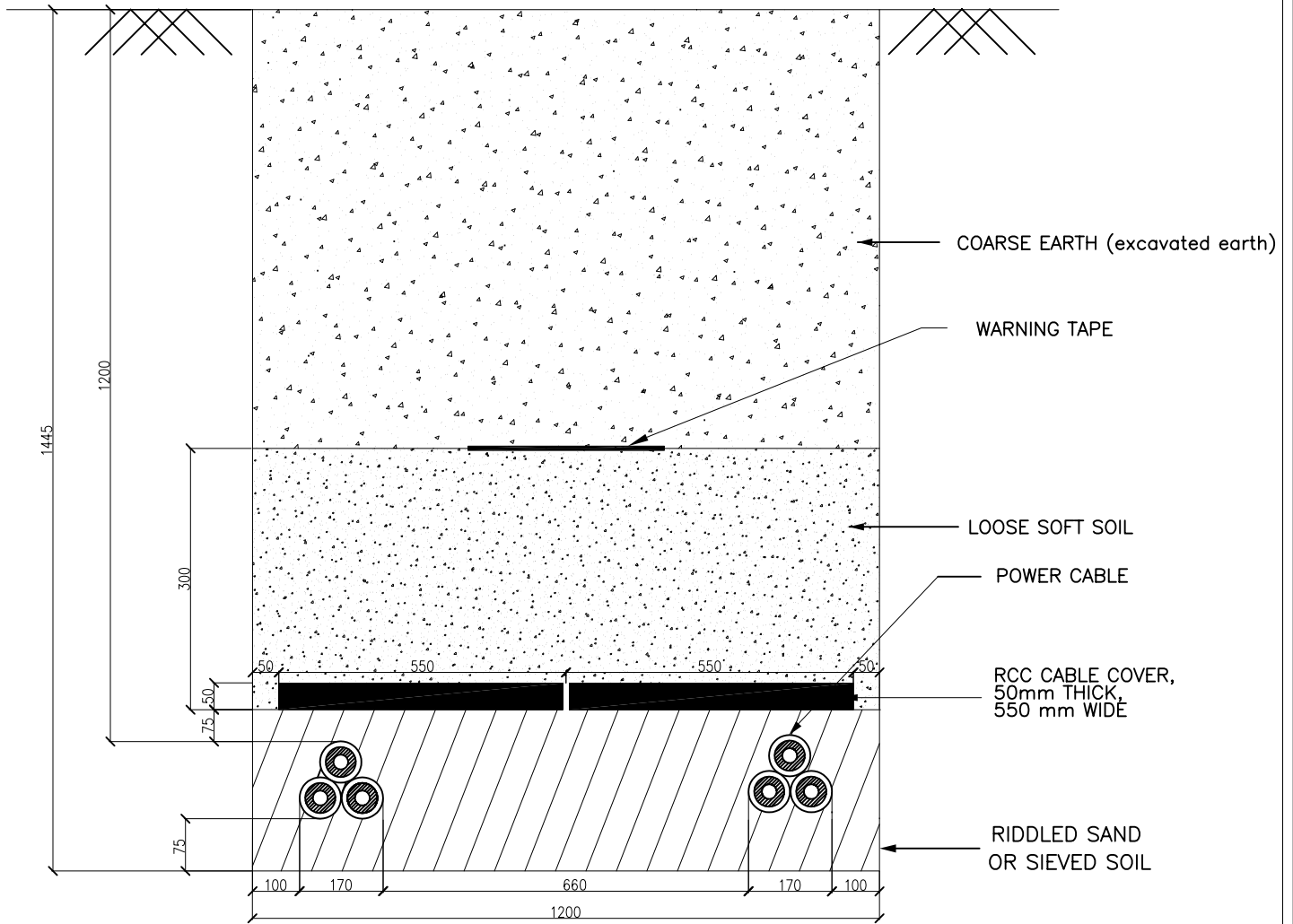
TYPICAL DETAILS FOR 66KV BURIED CABLE FOR SINGLE CIRCUIT
TYPE – B 4

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

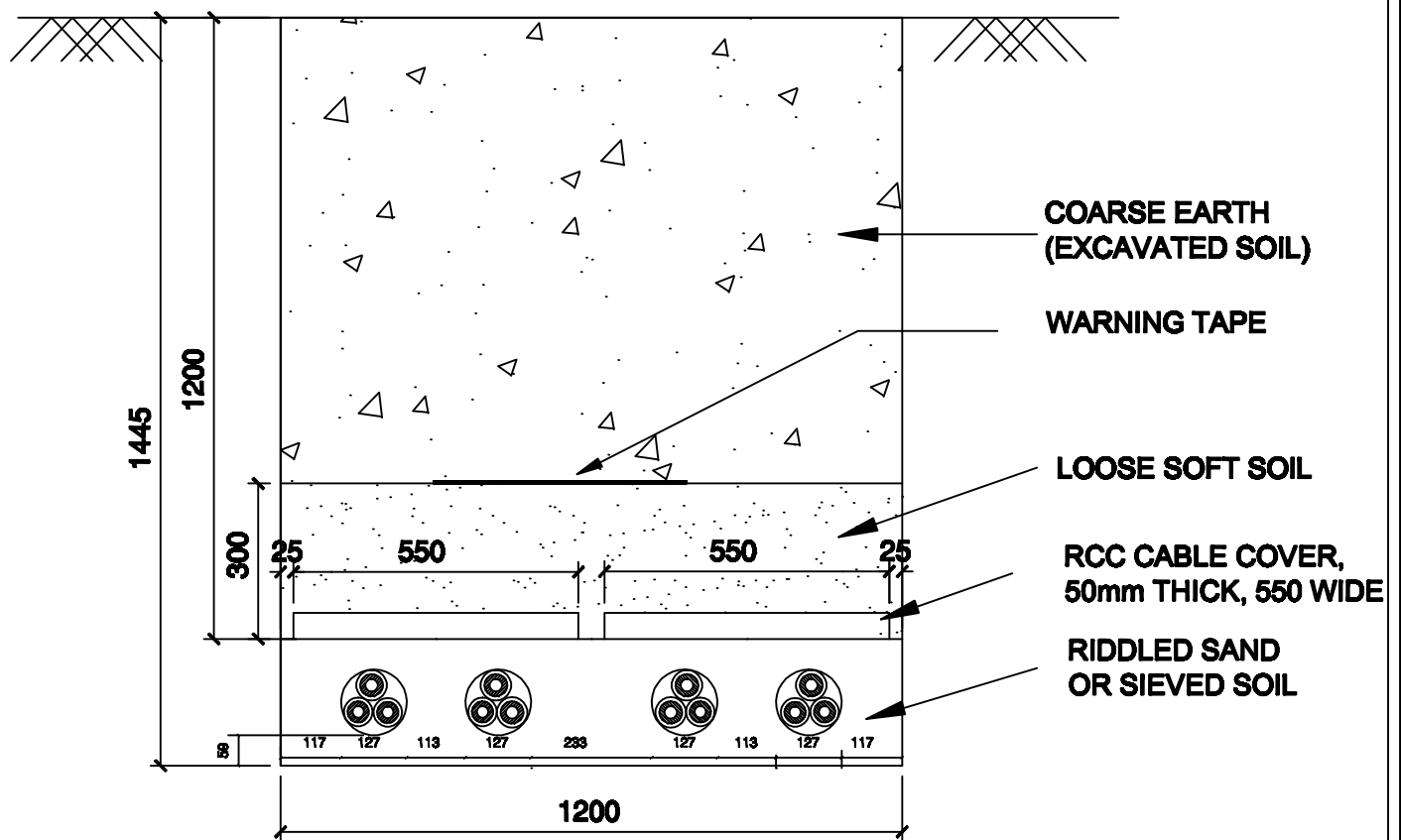
DRAWING # 2



TYPICAL DETAILS FOR 66KV BURRIED CABLE FOR TWO CIRCUIT
TYPE – C 2


DRAWN	DS	TITLE:— TRENCH DRAWING FOR 1C X 630 Sq. mm 66KV DOUBLE CIRCUIT XLPE CABLE	BSES	
CHECKED	SGD			
APPD.	D.GUHA			
DATE				
SCALE				
			REV. 00	

DRAWING # 2 A

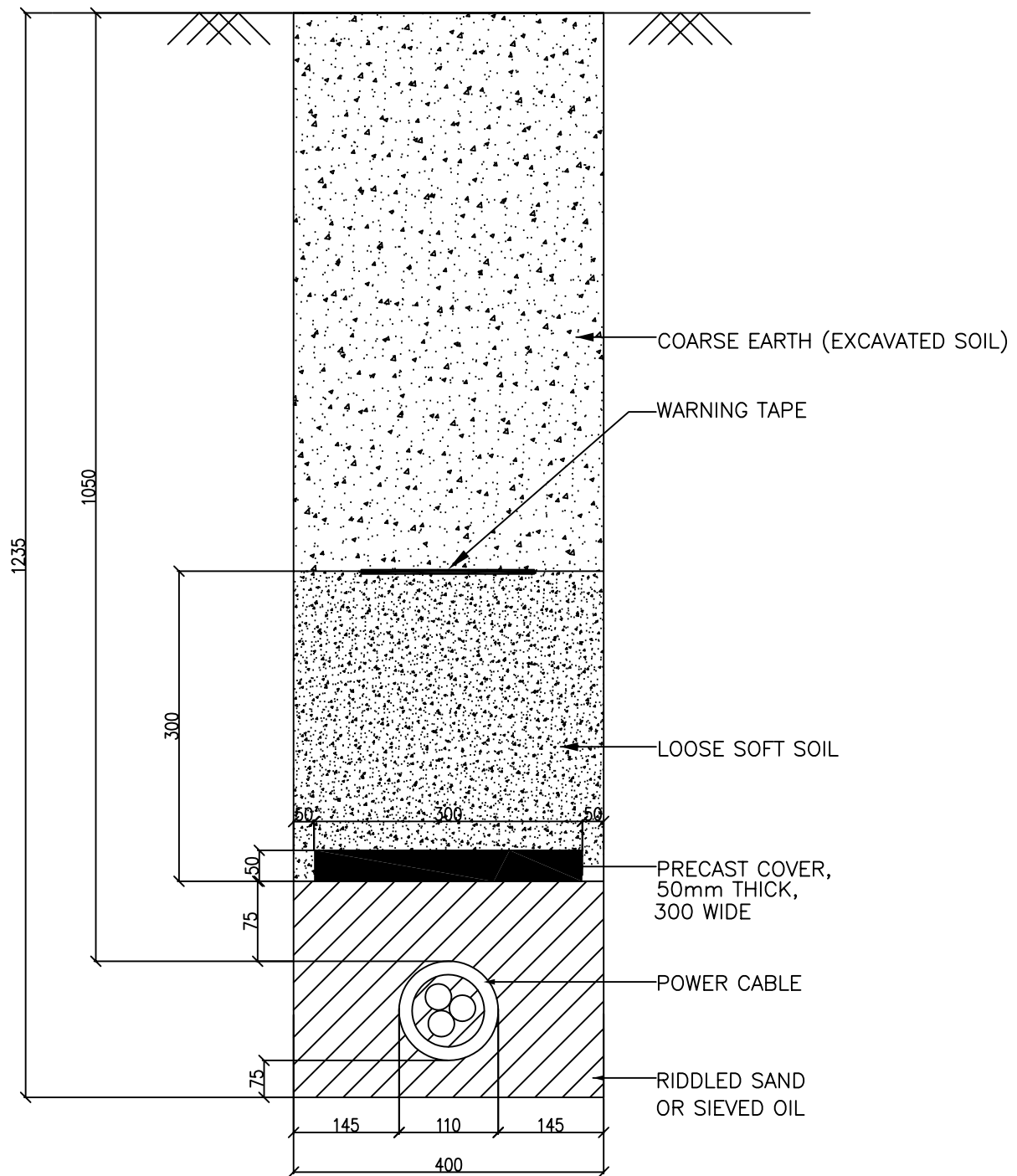


**TYPICAL TRENCH SECTION DETAILS FOR 66KV SINGLE
CORE 300 Sq. mm. BURIED CABLE FOR DOUBLE CIRCUIT**

TYPE - C 2

DRAWN	SAURABH	TITLE:-		BSES Rajdhani Power Limited
CHECKED	A.S	TYPICAL TRENCH SECTION DETAILS		
APPD.	K.S	FOR 33KV SINGLE CORE 200 mm		
DATE	09.01.15	BURNED CABLE FOR DOUBLE CIRCUIT		
SCALE				
				REV. 00

DRAWING # 3



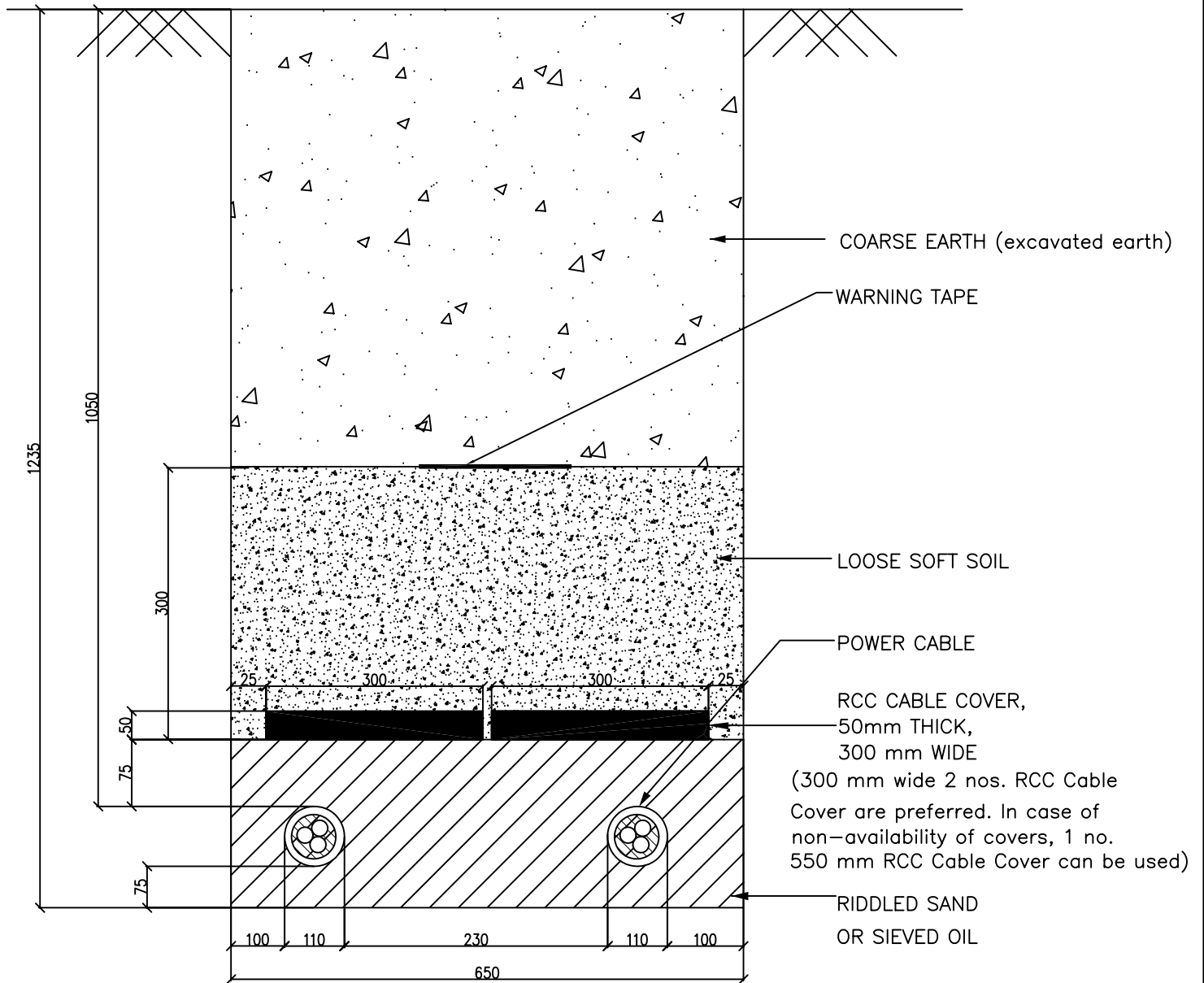
TYPICAL DETAILS FOR 33KV BURIED CABLE FOR SINGLE CIRCUIT
TYPE - A 3

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

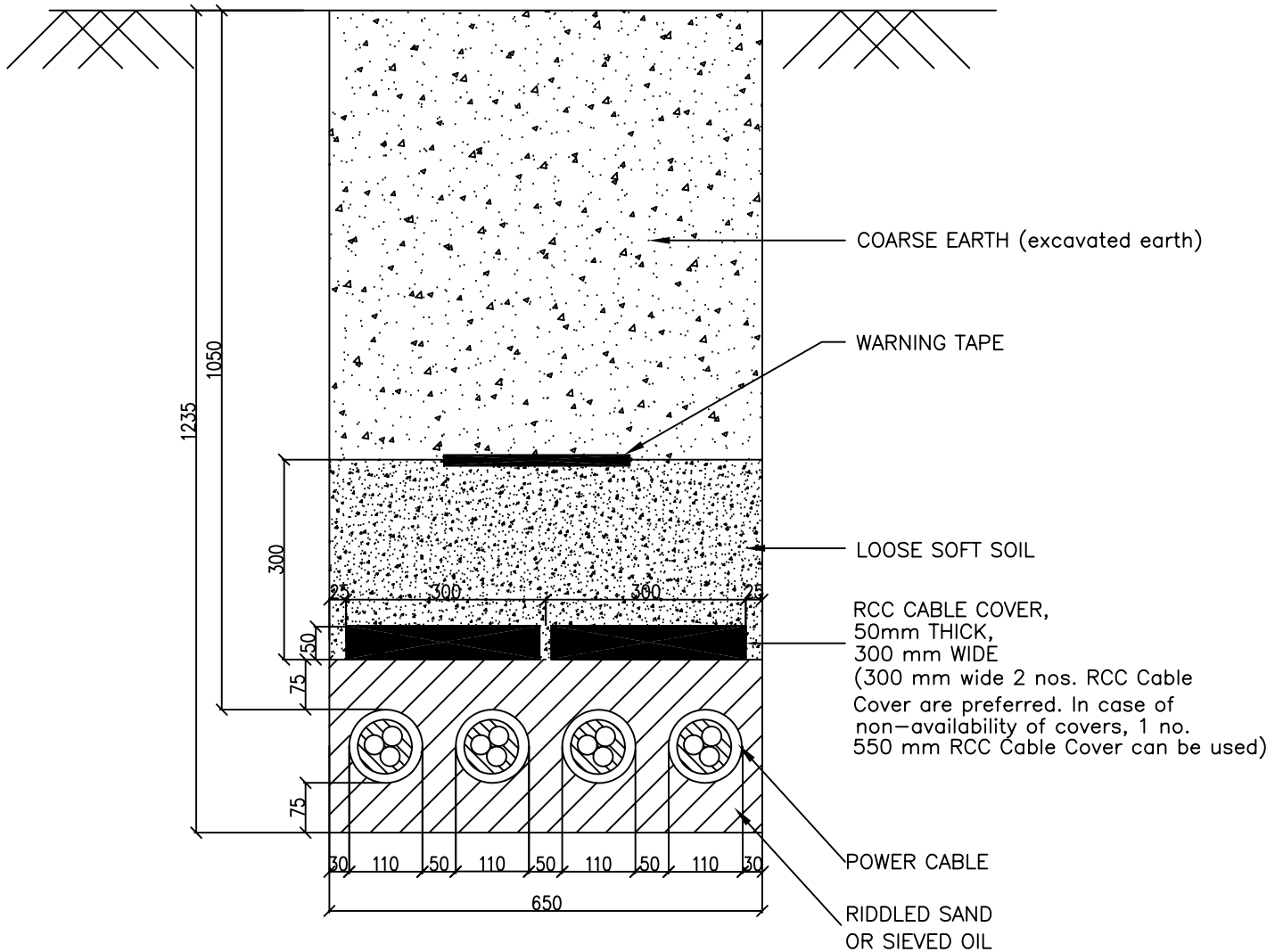
DRAWING # 4



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

DRAWN	DS	TITLE:--	BSES	REV. 00
CHECKED	SGD	TRENCH DRAWING FOR		
APPD.	D.GUHA	3C X 400MM2, 33KV		
DATE		DOUBLE CIRCUIT		
SCALE		XLPE CABLE		

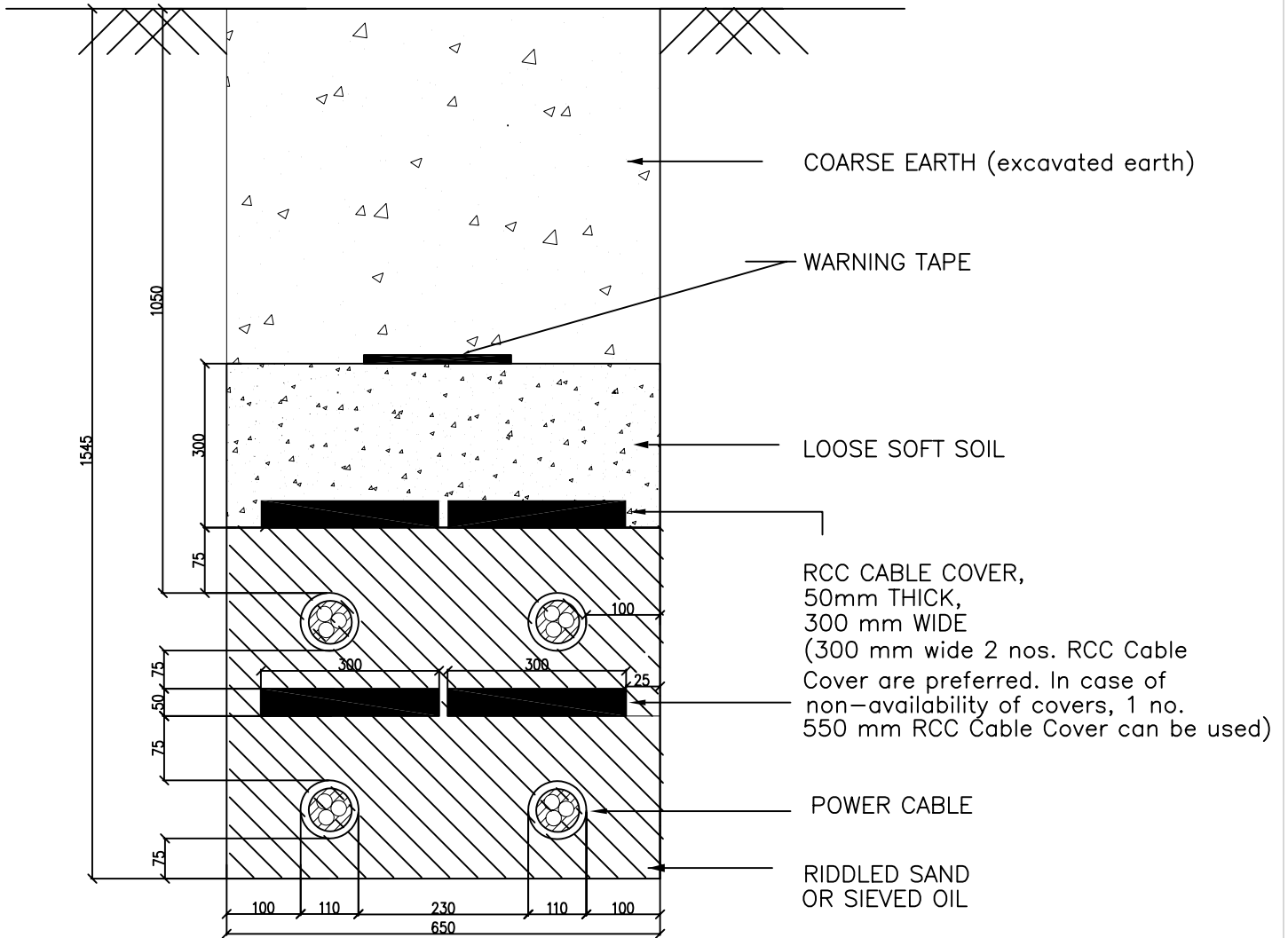
DRAWING # 5 A



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

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

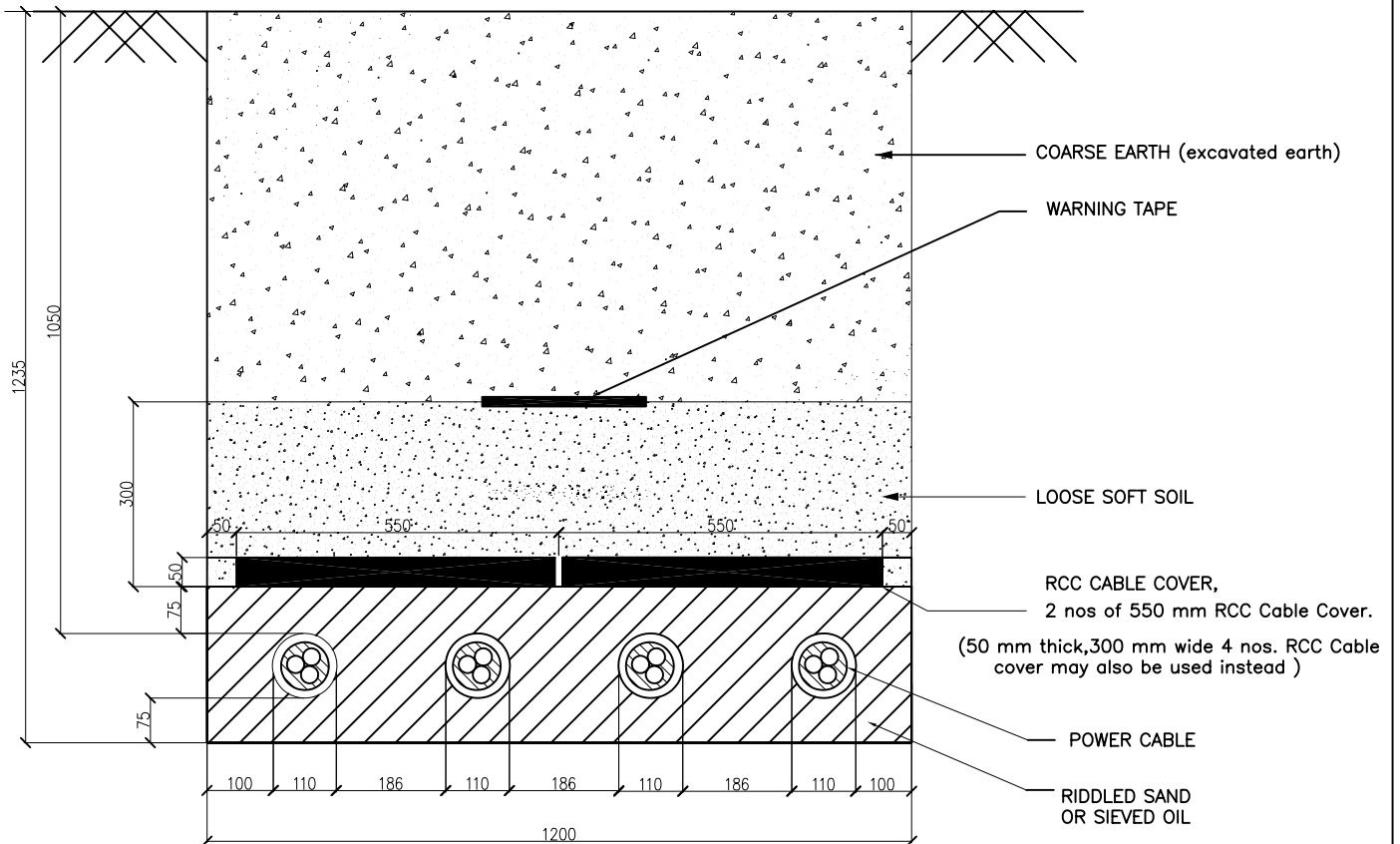
DRAWING # 5 B



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

DRAWN	DS	TITLE:–	<div>BSSES</div>
CHECKED	SGD	TRENCH DRAWING FOR	
APPD.	D.GUHA	3C X 400MM2, 33KV	
DATE		FOUR CIRCUIT	
SCALE		XLPE CABLE	
			REV. 00

DRAWING # 5 C



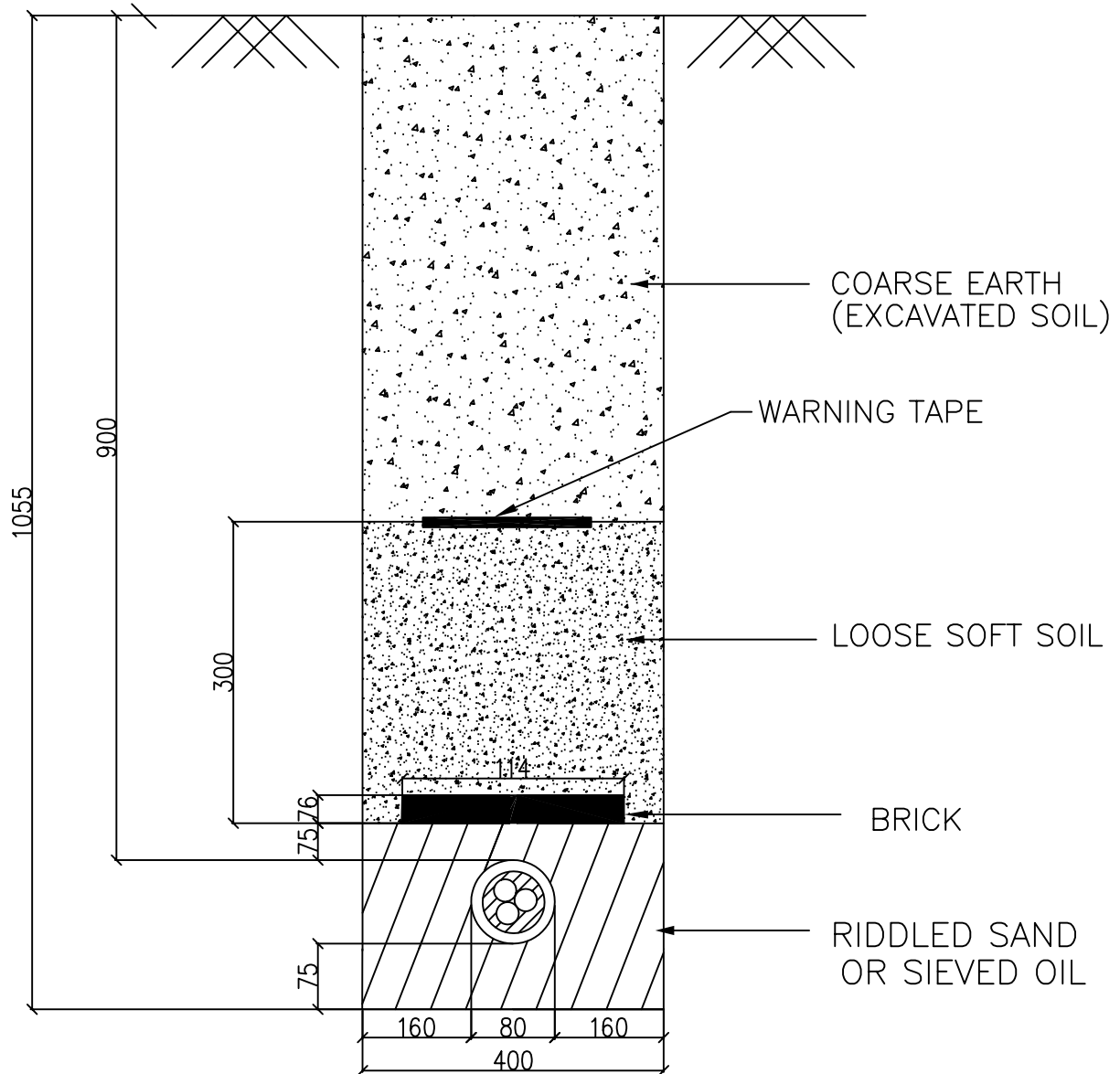
TYPICAL DETAILS FOR 33KV BURIED CABLE FOR FOUR CIRCUIT
TYPE – C 1

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



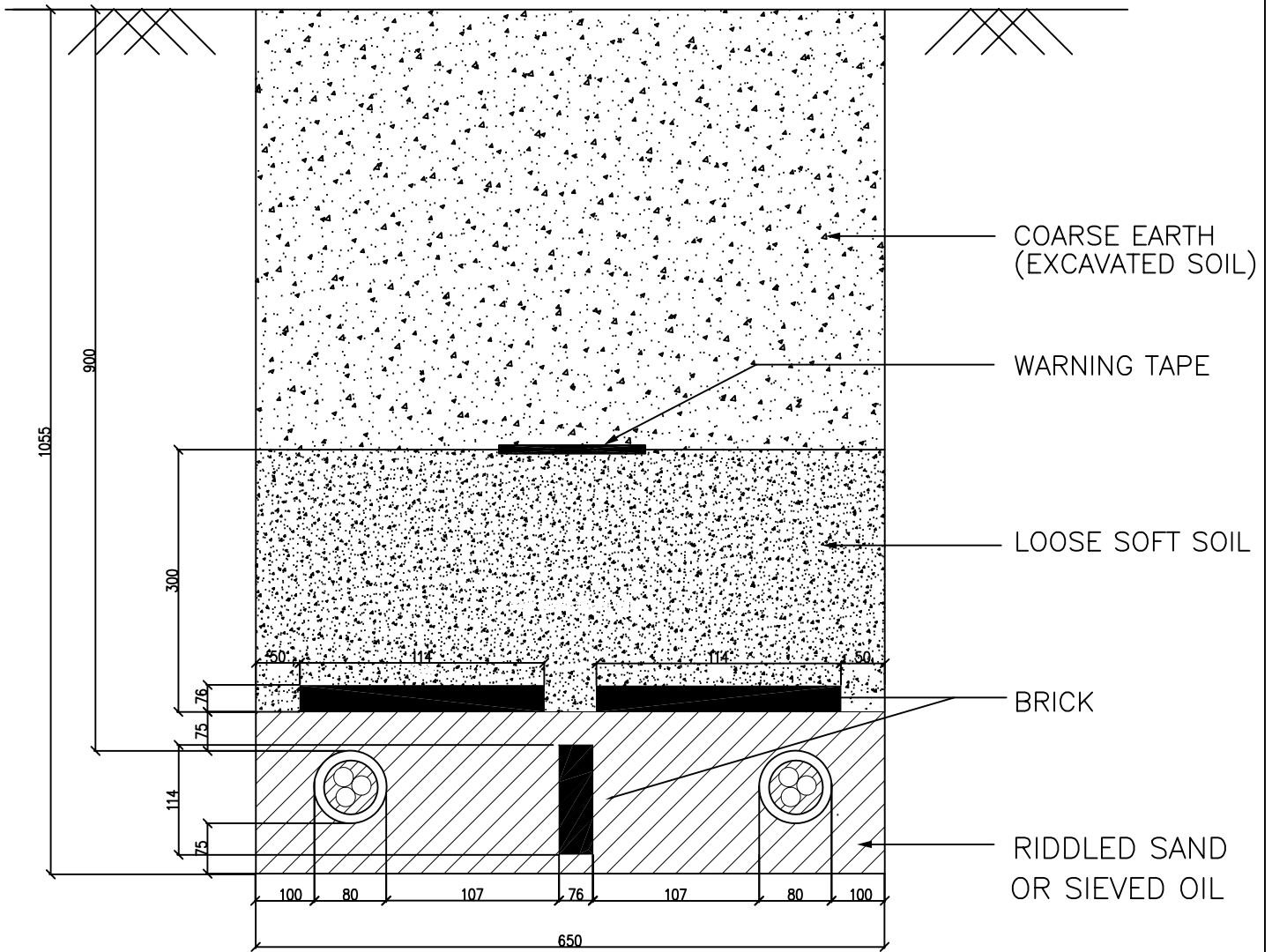
TYPICAL DETAILS FOR 11KV BURRIED CABLE FOR SINGLE CIRCUIT
TYPE – A 2

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



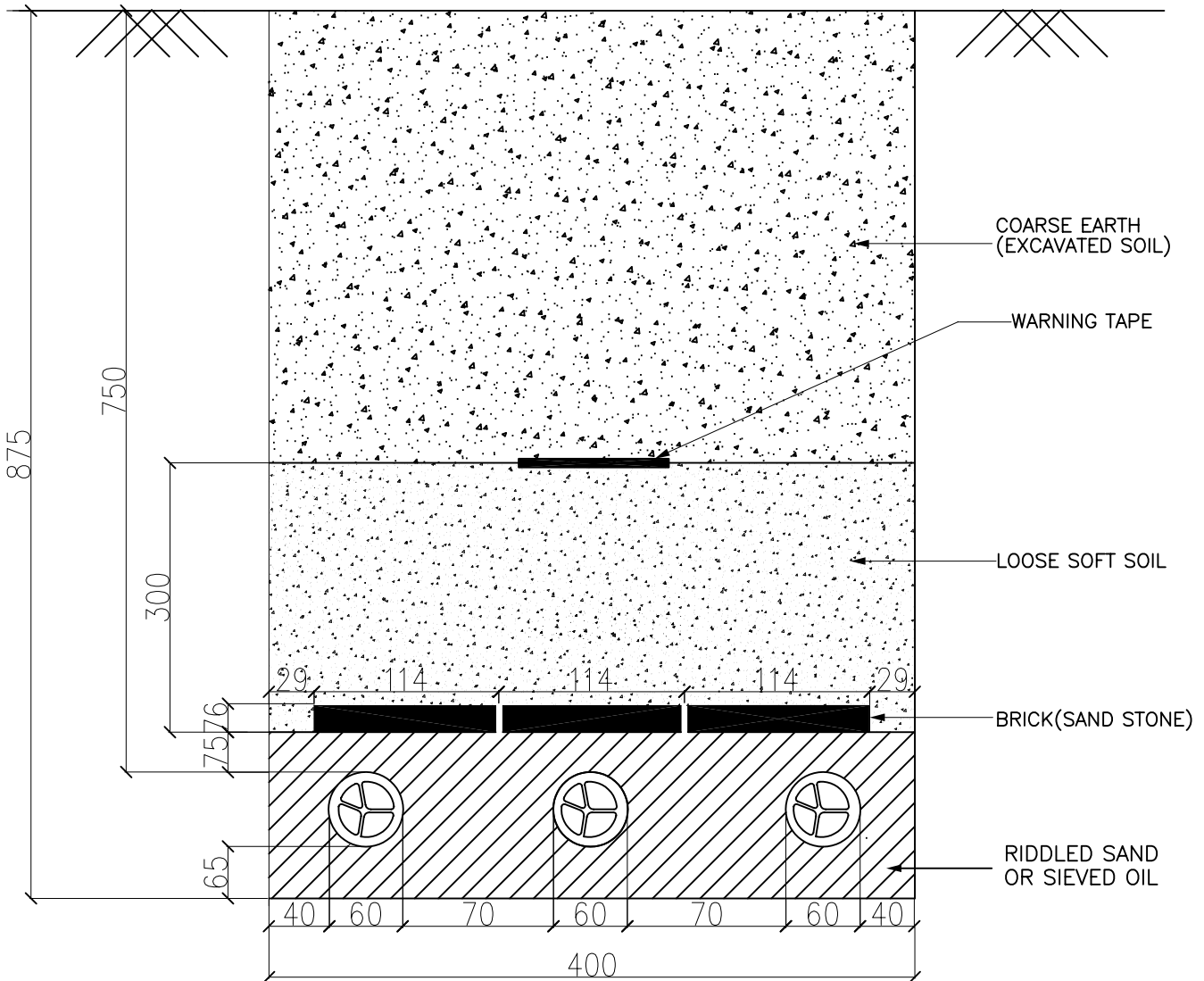
TYPICAL DETAILS FOR 11KV BURIED CABLE FOR TWO CIRCUIT
TYPE – B 1

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

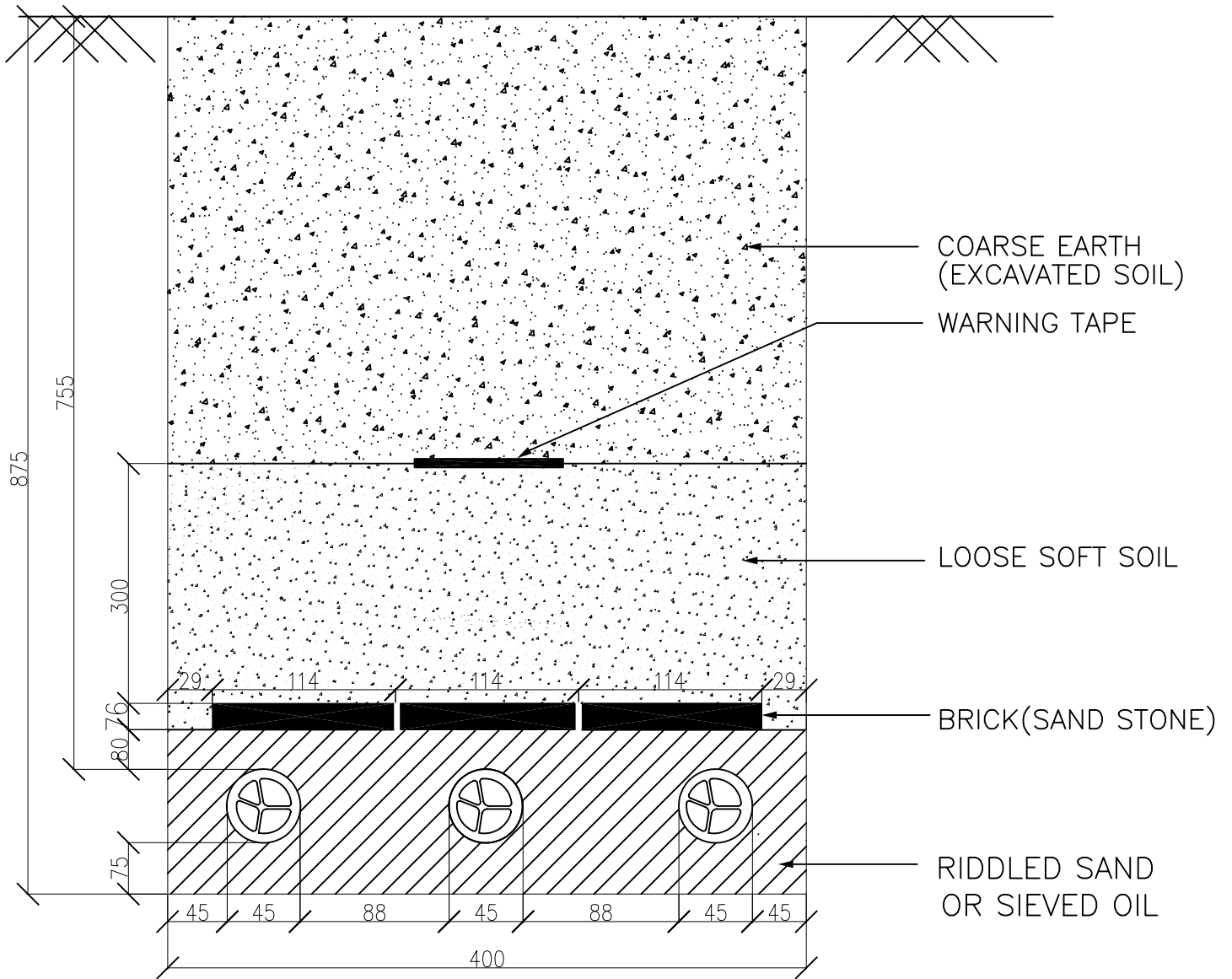
DRAWING # 8



TYPICAL DETAILS FOR 1.1KV BURIED CABLE
TYPE – A 1

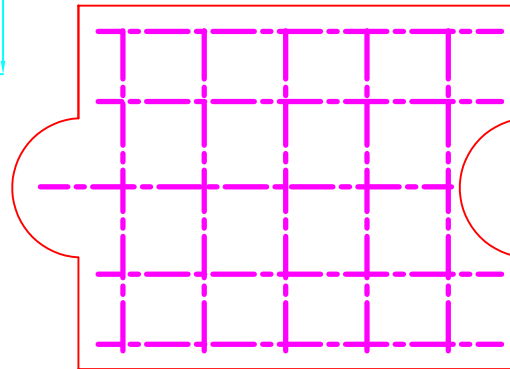
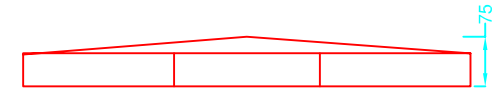
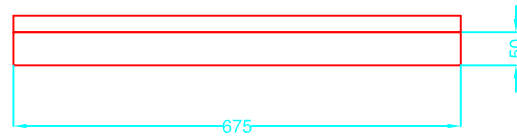
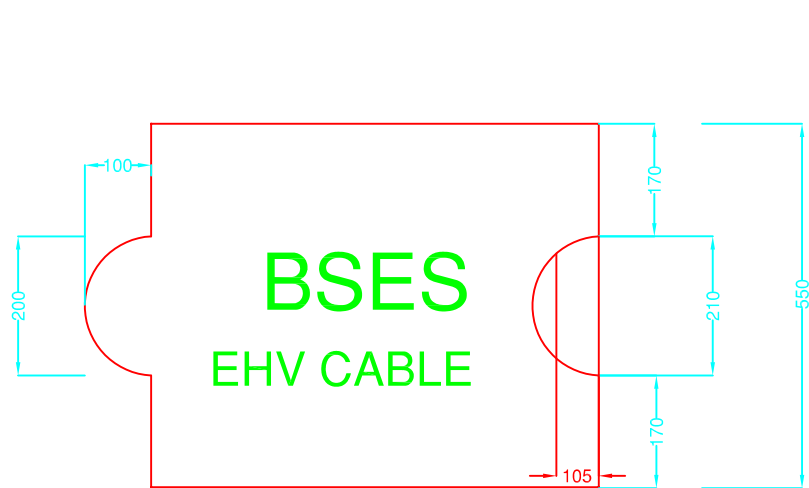
DRAWN	DS	TITLE:-	<div>BSES</div> <div>REV. 00</div>
CHECKED	SGD	TRENCH DRAWING FOR	
APPD.	D.GUHA	3.5Cx300Sqmm 1.1 KV	
DATE		XLPE CABLE	
SCALE			

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			

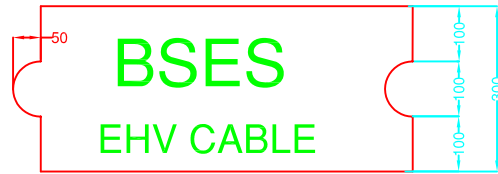


NOTE -

- (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.

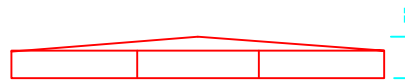
1. STEEL ROD - AS PER IS 432/1139
2. CONCRETE MIX SHALL BE NOT LESS THAN M200 GRADE AS PER IS 456.
3. MOULDING SHALL BE WITH COMPACTION NOT LESS THAN 7 MN/Sq.m.(70 kgf/Sqcm)



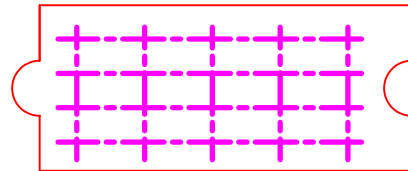
PLAN



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

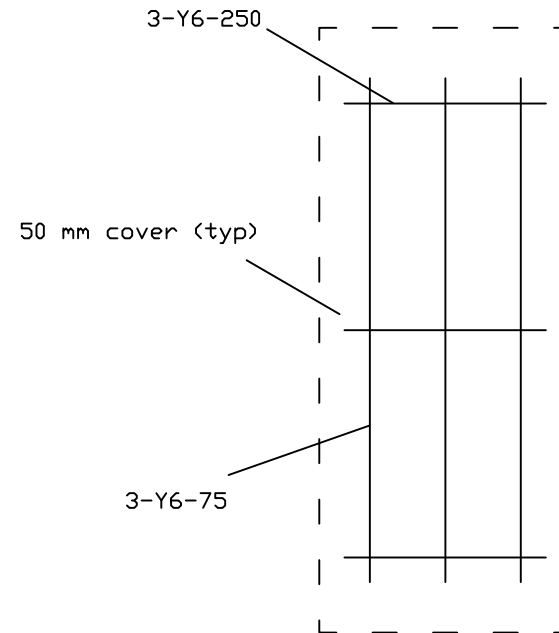
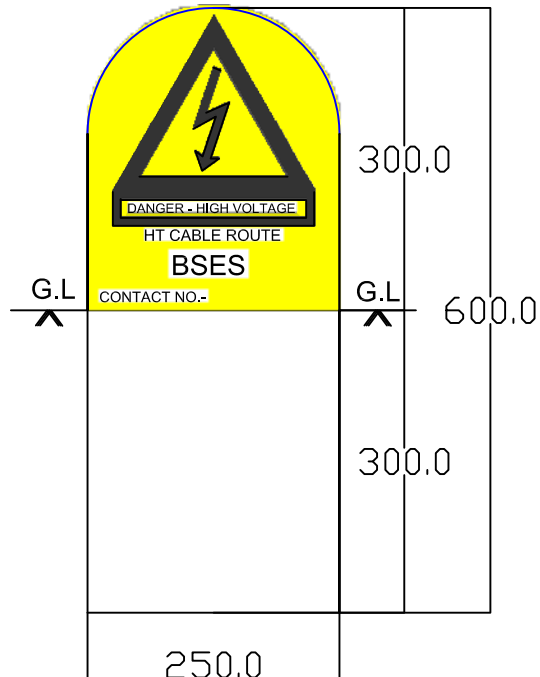
- Mask
- Jacket
- Shoes
- First Aid Box etc.

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:-

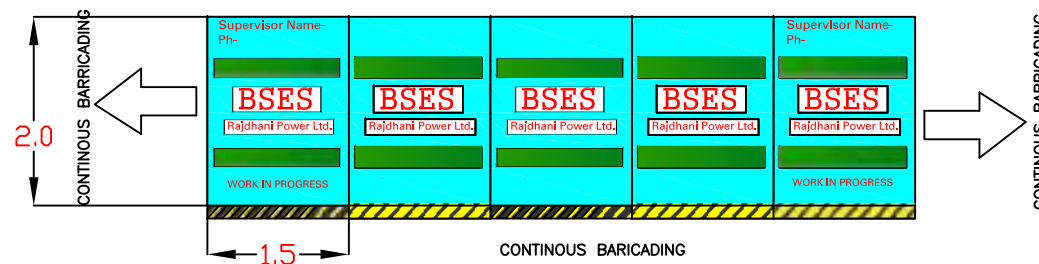
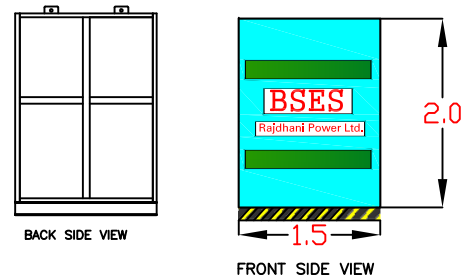
1	RCC Cable route marker with 6 mm Dia. Road and M25 concrete grade.
2	The litter/number shall be engraved on both the side route marker.
3	All dimentions are in mm unless specified.
4	Thickness of RCC shall be 75mm.
5	Yellow colour shall be visible above ground level.
6	Each route marker to be placed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

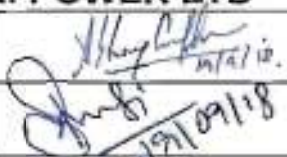
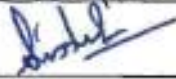

(However, HDPE pipe size with less than 1.5XOD of cable shall not be allowed at any stage)

BSES

TECHNICAL SPECIFICATION OF CHEMICAL EARTHING

Specification No- GN101-03-SP-63-01

BSES RAJDHANI POWER LTD

Prepared by	Abhay Gupta	 19/09/18	Rev : 01
	Pronab Bairagi		
Reviewed by	Amit Tomar	 19/09/18	Date : 19-Sep-18
Approved by	K. Sheshadri	 19/09/18	Page : 1 of 19
Registered Office: BSES Bhawan, Nehru Place, Delhi - 110019			

TECHNICAL SPECIFICATIONS OF CHEMICAL EARTHING**TABLE OF CONTENTS**

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TECHNICAL SPECIFICATIONS OF CHEMICAL EARTHING

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**

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-

TECHNICAL SPECIFICATIONS OF CHEMICAL EARTHING

- 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 BRPL area. Mesh resistance shall not cross 5ohm and that shall maintain throughout the warranty period without any maintenance.
- c) Max. soil resistivity at BRPL area is 100ohm-mtr.

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 17.2 mm dia shall be used. Copper bonded rod shall be UL certified and type tested from CPRI/ERDA which are mandatory. Copper coating shall be 260 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.
3. Inspection joint which shall be used for testing of pit resistance
4. Heavy duty Polyplastic cover for Earth pit
5. Copper bonded steel conductor (18mm dia) 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

TECHNICAL SPECIFICATIONS OF CHEMICAL EARTHING

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. BRPL 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 sustainability shall be 30.68 KA for 1 sec
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
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 BRPL requirements,

TECHNICAL SPECIFICATIONS OF CHEMICAL EARTHING

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 GI strip shall be used for equipments connection
2. Copper bonded conductor (18mm) shall be laid 500mm below FGL for mesh formation
3. The connection of GI flat (50x6) with the Copper bonded electrode/Rod shall be done by Exothermic welding joint (L.T or Cross)
4. The connection of GI flat (50x6) with equipments (with the earthing provision given by equipment OEM) shall be done by M12 GI bolt. GI Bolt shall be provided by OEM of Earthing.
5. In case the copper bonded rod/GI flat is to cross any obstruction, it shall be laid 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 aluminum 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 0.2 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.

TECHNICAL SPECIFICATIONS OF CHEMICAL EARTHING

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.
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

TECHNICAL SPECIFICATIONS OF CHEMICAL EARTHING**5.0 TESTS****5.1 GENERAL**

BRPL reserves the right to inspect the material at the time of tests. All tests shall then be performed in the presence of BRPL 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 than 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 BRPL sample at CPRI/ERDA without any cost implication to BRPL.

5.2 ACCEPTANCE TESTS

1. Visual examination test
2. Dimensional verification
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 BRPL 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 BRPL in this regard shall be final. BRPL at its own discretion may also cancel the order at the risk and cost of the manufacturer if the material fails twice in the type test.

TECHNICAL SPECIFICATIONS OF CHEMICAL EARTHING

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. BRPL 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

BRPL 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. BRPL may ask original type test report to verify soft copy. BRPL will not receive any hard copy for their office record. BRPL will give final dispatch clearance after validating type test report.
5.5.2	Record of routine test reports shall be maintained by the Manufacturer at their works for periodic inspection by the BRPL'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 BRPL.

6.0 INSPECTION

6.0.1	BRPL 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 BRPL informed in advance of the time of starting and of the

TECHNICAL SPECIFICATIONS OF CHEMICAL EARTHING

	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 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.
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. BRPL 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.

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.
7.1.6	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

TECHNICAL SPECIFICATIONS OF CHEMICAL EARTHING

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	BRPL 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 BRPL 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 BRPL'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 BRPL.

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-

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

Document Submission

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

Legend:

GTP : Guaranteed Technical Particulars

TECHNICAL SPECIFICATIONS OF CHEMICAL EARTHING

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

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	<ul style="list-style-type: none"> • PO number and date • SAP item code • Manufacturer's name • Buyer's name
9.0.4	Delivery Schedule	<ul style="list-style-type: none"> • Delivery period Start Date : From date of LOI / LOA • Delivery period End Date : As agreed with manufacturer • Material 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.

TECHNICAL SPECIFICATIONS OF CHEMICAL EARTHING

		<ul style="list-style-type: none">• Marking• Material description• Type• Dimension• PO number and date• SAP item code• Total weight• Manufacturer's name• Buyer's name• Month and year of manufacturing• Storage type
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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. 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.

10.0.2 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.

10.0.3 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-

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

ANNEXURE-A GUARANTEED TECHNICAL PARAMETERS

TECHNICAL SPECIFICATIONS OF CHEMICAL EARTHING**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	BRPL 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	
5	Copper coating thickness	250 micron	
6	UL marking	Yes/No	
7	CPR/ERDA Type tested		
8	Length of Pipe	3 mtr	
11	Size of copper cladded rod	18mm	
12	Coating thickness (Min)	250Microns(min)	
13	Earth enhancing material	25kg/bag	
14	Plyplastic cover	Yes/no	
15	Exothermic Joint	L.T and cross joint	
16	Exothermic accessories	Yes/no	
17	GI Nuts and bolts	Yes/no	
18	Make of steel	SAIL /ESSAR/ TATA	
19	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	
17	Colour Coding	BLUE colour band at both ends	

TECHNICAL SPECIFICATIONS OF CHEMICAL EARTHING**TECHNICAL DATASHEET FOR EARTHING**

S.No.	Parameter	BRPL requirement	Vendor data
19	Details of Drawings submitted		
20	Chemical composition Test	As per IS 1239-1	
21	Test	As per IS 1239-1	

Technical Requirement

Sl no	Descriptions	Bidders Data
A	1) Mesh resistance shall be less than 5 ohm	
	2) Fault current sustainability shall be 30.68 KA for 1 sec	
	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.	
	6) Copper bonded rod and copper clad steel shall be CPRI/ERDA tested and UL marked	
B	1) Minimum dimension of copper bonded rod shall be 17.2 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) Copper Bonded steel (18mm dia)	
	8) 50x6 GI Strip	

TECHNICAL SPECIFICATIONS OF CHEMICAL EARTHING

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 mm GI strip shall be in bidder scope- for connection of equipments	
		7) Laying of copper cladded rod below 500mm depth for formation of mesh	
		8) Chemical earthing kit (copper bonded rod, chemical and polyplastic pit cover) installation	

11.0 SCOPE DEMARCAION

Supply:

Sl no	Descriptions	BRPL	Vendor	Remarks
1	Chemical Earthing Kit (Copper Bonded Rod, 25 kg chemical and Polyplastic Pit Cover)	X	✓	
2	Copper Bonded Steel conductor for mesh formation	X	✓	
3	Exothermic Joint	X	✓	
4	Exothermic Joint Accessories	X	✓	
5	50X6 GI Strip	✓	X	
6	GI Bolt required for connecting the GI strip with equipment	X	✓	

Services:

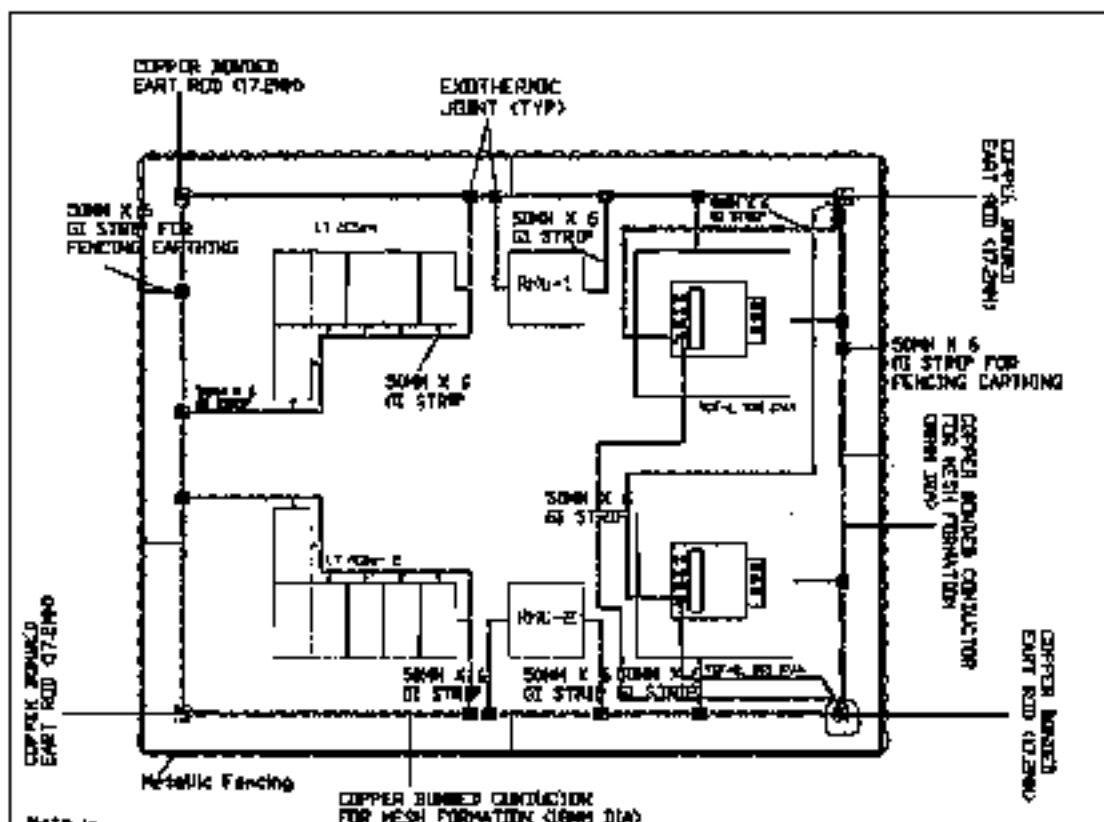
Sl no	Descriptions	BRPL	Vendor	Remarks
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TECHNICAL SPECIFICATIONS OF CHEMICAL EARTHING

Sl no	Descriptions	BRPL	Vendor	Remarks
1	Transportation of all kind of materials from BRPL 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 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 BRPL 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	✓	


TECHNICAL SPECIFICATIONS OF CHEMICAL EARTHING

ANNEXURE-B: GENERAL ARRANGEMENT DRAWING OF CHEMICAL PLANTING



Note :-

1. Earthing kit shall consist of 1724mm Copper Bonded Rod , 25KG Chemical per Bag,Poly Plastic Pitt Cover.
2. All the Joint at High side shall be Exothermic Joint
3. 30x6 GI Strip shall be used to connect the equipment to Mesh.
4. GI Bolt shall be used to connect the GI Strip with equipment.
5. Copper Bonded Steel shall be used to form the Mesh.

DESIGN	SUNIT	TITLE:— GA DRAWING OF CHEMICAL EARTHING	 BSES BSES Rajdhani Power Limited DIME No.: BSES-DL-1411, 2d REV. 1
CHECKED	P.R		
REVIEWED	A.T		
APPR.	S.K		
DATE	10.08.18		

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TECHNICAL SPECIFICATIONS OF PPES ITEMS (DANGER PLATE)

TECHNICAL SPECIFICATIONS**OF****PPES ITEMS (DANGER PLATE)****BSES RAJDHANI POWER LTD.**

Prepared by	Naved Ahmad	<i>Naved Ahmad</i> <i>04/05/18</i>	Date:	04.05.2018
Reviewed by	Amit Tomar	<i>Amit Tomar</i>	Revision	R1
Approved by	K. Sheshadri	<i>K. Sheshadri</i>	No. of Pages:	7

TECHNICAL SPECIFICATIONS OF PPES ITEMS (DANGER PLATE)

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TECHNICAL SPECIFICATIONS OF PPES ITEMS (DANGER PLATE)**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 danger plate 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 1000mtrs

TECHNICAL SPECIFICATIONS OF PPES ITEMS (DANGER PLATE)

3.0 Applicable Standards

Unless otherwise modified in this specification, the Danger notice plates shall comply with IS: 2551-1982 or the latest version thereof.

3.1 Codes & Standards

Following Indian/International Standards, which shall mean latest revision, with amendments/changes adopted and published, unless specifically stated otherwise in the Specification

Sl. No.	Indian Standard	Remarks
1.	IS:2551-1982	Visual examination
2.	IS:2551-1982	Dimensional check
3.	IS:6709-1977 (or its latest version)	Test for weather proofness
4.	IS:5-1978	crossbones in signal red colour

4.0 Requirements

4.1 Composition

This Specification covers Danger notice plates to be displayed in accordance with rule No. 35 of Indian Electricity Rules, 2003.

4.1.2 Construction

4.1.2.1 Lettering

- All letterings shall be centrally spaced
- All letterings shall be engraving type
- The dimensions of the letters, figures and their respective position shall be as per the drawing given with this specification
- The size of letters in the words in each language and spacing between them shall be so chosen that these are uniformly written in the space earmarked for them.

TECHNICAL SPECIFICATIONS OF PPES ITEMS (DANGER PLATE)

4.1.2.2 Languages

- Under Rule No. 35 of Indian Electricity Rules, 2003, the owner of every medium, high and extra high voltage installation is required to affix permanently in a conspicuous position a danger notice in Hindi and English with the sign of skull and bones.
- The type and size of lettering to be done is indicated in the specimen danger notice plates shown in the drawing with this specification.
- Adequate space has been provided in the specimen danger notice plates for having the letterings in local language for the equivalent of 'Danger', '11000' and 'Volts'

5.0 Workmanship

5.1 The plate shall be made from mild steel sheet of at least 1.6mm thick and vitreous enameled white, with letters, figures and the conventional skull and cross-bones in signal red colour (refer IS:5-1978) on the front side. The rear side of the plate shall also be enameled.

5.2 Tests: The following tests shall be carried out:

- i) Visual examination as per IS:2551-1982
- ii) Dimensional check as per IS:2551-1982
- iii) Test for weather proofness as per IS:8709-1977 (or its latest version)

6.0 Packing and Marking

The plates shall be packed in wooden crates suitable for rough handling and acceptable for rail/road transport. The box shall be marked indelibly at the back with the following information.

- a. Size and type
- b. Identification of the source of manufacture
- c. Month and year of manufacture and
- d. Property of "BRPL"

7. Inspection:

Manufacturer shall intimate the manufacturing schedule in advance. The manufacturer shall give minimum 15 days advance notice about readiness of material at their works. The material shall be inspected for conformity with BRPL specification before the same is accepted.

TECHNICAL SPECIFICATIONS OF PPES ITEMS (DANGER PLATE)

7.1 Certificates required

- Manufacturing certificates
- Test certificates
- Authorization of dealership/ distribution ship

8. Deviation

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. 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..

b) In the absence of any list of deviations from the Seller 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.

c) 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 be considered as a deviation from this tech spec at any stage of contract.

8. Drawings

<p>Notes :-</p> <p>1. THE DRAWING IS FOR GENERAL GUIDANCE ONLY. THE BIDDER SHALL BE RESPONSIBLE FOR THE CORRECTNESS OF THE DRAWING. THE BIDDER SHALL BE RESPONSIBLE FOR THE CORRECTNESS OF THE DRAWING. THE BIDDER SHALL BE RESPONSIBLE FOR THE CORRECTNESS OF THE DRAWING.</p> <p>2. THE DIMENSIONS OF THE DANGER PLATE SHALL BE AS PER IS 1564.</p> <p>3. THE DIMENSIONS OF THE DANGER PLATE SHALL BE AS PER IS 1564.</p> <p>4. THE DIMENSIONS OF THE DANGER PLATE SHALL BE AS PER IS 1564.</p>			
<p>DANGER NOTICE PLATE FOR HIGH AND EXTRA HIGH VOLTAGE INSTRUMENT</p>			
<p>DRAWN</p> <p>CHECKED</p> <p>REVIEWED</p> <p>APPROV.</p> <p>DATE</p>	<p>SUBMIT</p> <p>P.D.</p> <p>A.T.</p> <p>V.P.</p> <p>28.12.17</p>	<p>TITLE :-</p> <p>11kV Danger Plate</p>	<p>BSES</p> <p>BSES Rajdhani Power Limited</p> <p>DRAWING NO</p> <p>9999</p>

TECHNICAL SPECIFICATIONS OF PPES ITEMS (DANGER PLATE)**8. GTP**

GUARANTEED TECHNICAL PARTICULAR FOR 11KV DANGER PLATE			
Sl.No	Technical Particulars	BSES Requirement	To be filled by Bidder
1	Name of the Manufacturer.		
2	Place of the Manufacturer.		
3	Contact persons of the Manufacturer.		
4	Purchase Req.No		
5	Guarantee period.(Min)	60 Months (From date of commissioning)/66 Months (From date of receipt at purchaser's store whichever is earlier)	
6	Type of Danger plate	Steel Sheet & Strip-Cold-Rolled,Electrolytic Zinc-Coated	
7	Material used for Danger plate		
8	Dimension of Danger plate	SIZE=250mmX200mm	
9	Overall Thickness of Danger plate	>1.6mm	
10	Thickness of Steel Sheet & Strip.	AS PER IS Standard.	
11	Chemical Composition	AS PER IS Standard.	
12	Mechanical Property		
	A.Tensile Strength	AS PER IS Standard.	
	B.Elongation at Breake	AS PER IS Standard.	
13	Thickness of Electrolytic zinc-coating	AS PER IS Standard.	
14	Coating Mass	AS PER IS Standard.	
15	Fixing arrangement of Danger plate	As per drawing	



TECHNICAL SPECIFICATIONS OF PPS ITEMS (DANGER PLATE)**GUARANTEED TECHNICAL PARTICULAR FOR 11KV DANGER PLATE**

S. No.	Technical Particulars	BSES Requirement	To be filled by Bidder
16	Holes for fixing at Danger plate	6 No of Holes	
17	Diameter of holes of fixing	6mm	
18	Weight of Danger plate	As per manufacturer	
19	As per drawing note at danger plate	Yes/No.	
20	Identification Marking at plate.(Language)		
	A.English	Yes/No.	
	B.Hindi	Yes/No.	
21	Packing	Packed in wooden	
22	Test		
	A Visual examination.	IS. 5-1978	
	B Dimensional check	As Per Drawing	
	C.Test for weather-proofness	IS:8709-1971	
23	Type Test	AS PER IS Standard.	



**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

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2. CLIMATIC CONDITION	3
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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

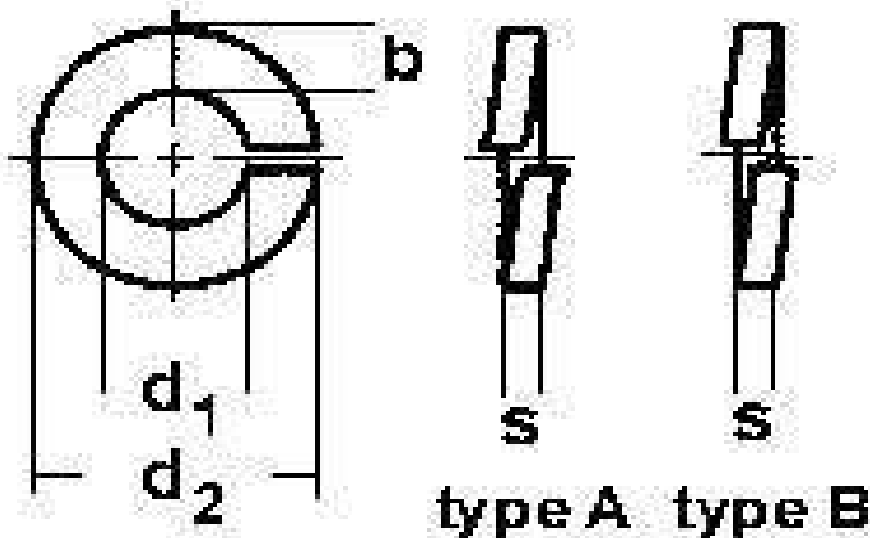
TECHNICAL SPECIFICATION OF NUT, BOLTS & WASHERS

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: -

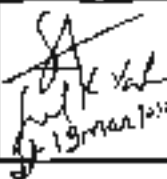

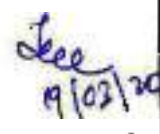
- Corrosion Protection (all items shall be hot-dip galvanised in accordance with AS 4680 or AS1214)
- Hot dip Galvanized Bolt with one Nut, two Plain Washer and one Spring Washer which is electro galvanised
- Nickel chromium plated bolts with one Nut, two Plain Washer and one Spring Washer which is electro 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

BSES**Technical Specification****for****PVC Electrical insulation Tape****Specification No.: GN101-03-SP-211-00**

Prepared by		Checked by		Approved by:		Rev	Date
Name	Sign	Name	Sign	Name	Sign		
S.K. Yadav		Amit Tomar		K. Sheshadri			19.03 2020

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1. SCOPE OF SUPPLY

This specification covers the design, manufacturing, testing & supply of PVC Electrical insulation Tape for insulation of all wires and cables splices upto 440V For strengthening and insulating Resistor, Capacitor leads in circuit boards, transformers, regulator leads etc , used for colour coding of communication cables for arresting ingress of water in telecom and optical cable joints in SRPL area.

2. SERVICE CONDITION

The PVC Electrical insulation Tape to be supplied against this specification shall be suitable for satisfactory continuous operation under the following service condition

2.1	Maximum ambient temperature(deg C)	50
2.2	Minimum ambient temperature(deg C)	0
2.3	Relative Humidity (%)	100
2.4	Maximum annual rainfall(mm)	1450
2.5	Maximum wind pressure (Kg/Sq.m)	150
2.6	Maximum altitude above sea level (Meters)	1000
2.7	Climate Condition	Moderately hot and humid (tropical climate conducive to rust and fungus growth)

3. DESIGN REQUIREMENTS

- Tape shall be based on PVC or its copolymers and shall have rubber-based, pressure sensitive adhesive
- Tape shall be Flame Retardant Cold and Weather Resistant
- Tape shall be classified for use in both indoor and outdoor environment
- Shall be compatible with synthetic cable insulations, jackets and splicing compounds

4. TECHNICAL REQUIREMENT OF PVC ELECTRICAL TAPE

S. No	PROPERTY	OUR TYPICAL VALUE
1	BIS standard	IS 7809 (Part 3, Sec 1)
2	Colour of the Tape	Black, Blue, Green, Yellow & Red
3	Width of the Tape, in cm	1.80
4	Length of the Tape, in mtr	6.5
5	Total Thickness of the Tape, in mm	0.125
6	Adhesion to Steel, in N/10 mm width (Min.)	1.6
7	Adhesion to Backing, in N/10 mm width (Min.)	1.3
8	Tensile Strength in N/10mm per width per mm thickness (Min.)	150
9	Electrical Strength at room temp. in kV/mm (Min.)	40
10	Electrical Strength after humid conditioning in kV/mm (Min.)	35

S No	PROPERTY	OUR TYPICAL VALUE
11	Flammability	Self Extinguishing
12	Electrolytic Corrosion	No Corrosion of Cu wire
13	Insulation Resistance (in ohms) (Min.)	1.0×10^{11}
14	Stability to Accelerated Aging at $65 \pm 1^\circ\text{C}$ & 80 % Relative Humidity for 96 Hrs. in 10/10 mm width	No deterioration or change in properties of the backing 1.3 N minimum
15	Temperature range (Min.)	0 to 90°C

5. INSPECTION

The material shall be inspected and tested at vendor's work as per relevant IS 7809 (Part 3, Sec 1) before dispatch by an authorized representative of the BRPL 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 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 7809 (Part 3, Sec.1) with latest amendment for approval of the purchaser.

7. INSPECTION AFTER RECEIPT AT STORE

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

8. PACKING & DELIVERY

8.1	Packing protection	Against wear and tear & corrosion
8.2	Handling instruction	To be marked on packing boxes

9. DEVIATIONS

9.1	Deviation from the specification	Deviation from the specification shall be stated in writing with the tender by reference to the specification clause/GTP and a description of the alternative offer. In absence of such a statement it will be assumed by the Buyer that the seller complies fully with this specification.
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10. DRAWING SUBMISSIONS

10.1	Along with the Bid	a) Guaranteed Technical Particulars (GTP duly filled-in) b) Test certificate c) Catalogue
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BSES

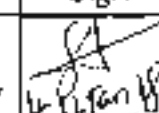

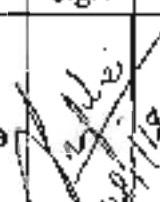

Technical Specification for

G.I. Conduit Pipes

and

Earthing Pipe

Specification no – GN101-03-SP-97-00

Prepared By		Reviewed By		Approved By		Rev	Date
Name	Sign	Name	Sign	Name	Sign		
S.K. Yadav		Amit Tomar		Vijay Panpalia		R0	11 01 18
Pronab Baragi							

TECHNICAL SPECIFICATION OF G.I. CONDUIT PIPES & EARTHING PIPE

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9. PACKING:	4
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11. GTP FOR G.I. PIPE (20 MM / 32 MM) :	6
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TECHNICAL SPECIFICATION OF G.I. CONDUIT PIPES & EARTHING PIPE
1. SCOPE OF SUPPLY

The specification covers the manufacturing, testing and inspection of G.I Conduit & Earthing Pipe

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 G.I. Conduit Pipe 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 - Specification
IS: 2633/72 & IS: 6745/72	For galvanising testing
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 1161 : 1998	Steel Tubes for Structural Purposes
IS 2629 : 1985	Recommended Practice' for Hot-Dip Galvanizing of Iron and Steel
IS 2633 : 1986	Methods for testing uniformity of coating of zinc coated articles
IS	
IS 2629 : 1985	Recommended Practice for Hot-Dip Galvanizing of Iron and Steel
IS 2500 :2000	Sampling of lot by lot

TECHNICAL SPECIFICATION OF G.I. CONDUIT PIPES & EARTHING PIPE

4. TESTS

All types of test including routine test shall be carried out according to IS: 1239-1 or its latest amendment.

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: 1239-1 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. ISI mark with CML No.
- III. Purchase no. shall be stencilled indelible link
- IV. The manufacturer's identification symbol
- V. Hot marking at every running meter Name/logo of manufacturer, ISI, class of tube i.e. L for Light colour of Band

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 to the destination.

TECHNICAL SPECIFICATION OF G.I. CONDUIT PIPES & EARTHING PIPE

10. GTP FOR G.I. PIPE (40 MM):

S. No.	Technical particular	Unit	BSES Requirement	Vendor Data
1	Name of the manufacturer			
2	Ref IS No.		IS: 1239(Part-1) 2004	
3	Type(Light , Medium, Heavy)		Light	
4	Ends (Plain/ Screwed)		Plain	
5	Size	mm	40mm NB	
6	Thickness	mm	2.90mm	
7	Max & Min outside diameter	mm	48.4 (Max), 47.8 (Min)	
8	Length of pipe	mm	06 Mtrs. ($\pm 2\%$)	
9	Mass of tube	Kg/m	3.23	
10	Tolerance on thickness	%	(+) Not limited, (-) 8%	
11	Tolerance on Mass	%	+10 %, -8%	
12	Galvanizing thickness	Gm/m ²	360gm/m ² (Min.)	
13	Tensile strength	N/mm ²	320 N/mm ² (Min.)	
14	Elongation percent	%	20% (Min.)	
15	Embossing details		Hot marking on every metre Name/ logo of manufacturer, IS No., Class, ISI monogram	Name/logo of manufacturer, PO No, ISI, Class of tube i.e L for light, Colour of Band (PO no provided in stencil)
16	Color Coding		Yellow color band	
17	Make of steel		Tata/SAIL/Reputed make	
18	Chemical composition certificate		As per Table 1 of IS:1239 (Pt-I)-2004	
19	Max. permissible variation of chemical composition		As per Table 2 of IS:1239 (Pt-I)-2004	
20	Leak proof test		5MPA for atleast 3 sec.	
21	Tests			
21.1	Test of tensile strength		As per IS:1239 (Pt-I)-2004	
21.2	Bend test		As per IS:1239 (Pt-I)-2004	

TECHNICAL SPECIFICATION OF G.I. CONDUIT PIPES & EARTHING PIPE

11. GTP FOR G.I. PIPE (20 MM / 32 MM) :

S. No.	Technical particular	Unit	BSES Requirement	Vendor Data
1	Name of the manufacturer			
2	Ref IS No.		IS: 1239(Part-1) 2004	
3	Type(Light , Medium, Heavy)		Light	
4	Ends (Plain/ Screwed)		Plain	
5	Size	mm	20mm NB/ 32 mm NB	
6	Thickness	mm	2.30mm/2.60mm	
7	Max & Min outside diameter	mm	26.9 (Max), 26.4 (Min) for 20mm & 42.5 (Max), 41.9 (Min) for 32mm	
8	Length of pipe	mm	06 Mtrs. ($\pm 2\%$)	
9	Mass of tube	Kg/m	1.38 for 20 mm & 2.54 for 32 mm	
10	Tolerance on thickness	%	(+) Not limited, (-) 8%	
11	Tolerance on Mass	%	+10 %, -8%	
12	Galvanizing thickness	Gm/m ²	360gm/m ² (Min.)	
13	Tensile strength	N/mm ²	320 N/mm ² (Min.)	
14	Elongation percent	%	12% (Min.)	
15	Embossing details		Hot marking on every metre Name/ logo of manufacturer, IS No., Class, ISI monogram	Name/logo of manufacturer, PO No, ISI, Class of tube i.e L for light, Colour of Band (PO no provided in stencil)
16	Color Coding		Yellow color band	
17	Make of steel		Tata/ SAIL/ ESSAR	
18	Chemical composition certificate		As per Table 1 of IS:1239 (Pt-I)-2004	
19	Max. permissible variation of chemical composition		As per Table 2 of IS:1239 (Pt-I)-2004	
20	Leak proof test		5MPA for atleast 3 sec.	
21	Tests			
21.1	Test of tensile strength		As per IS:1239 (Pt-I)-2004	
21.2	Bend test		As per IS:1239 (Pt-I)-2004	

TECHNICAL SPECIFICATION OF G.I. CONDUIT PIPES & EARTHING PIPE

12. GTP FOR G.I. PIPE (100 MM) :

S. No.	Technical particular	Unit	BSES Requirement	Vendor Data
1	Name of the manufacturer			
2	Ref IS No.		IS: 1239(Part-1) 2004	
3	Type(Light , Medium, Heavy)		Light	
4	Ends (Plain/ Screwed)		Plain	
5	Size	mm	100mm NB	
6	Thickness	mm	3.60 mm	
7	Max & Min outside diameter	mm	113.9 (Max), 113.0 (Min)	
8	Length of pipe	mm	06 Mtrs. (±2%)	
9	Mass of tube	Kg/m	9.75	
10	Tolerance on thickness	%	(+) Not limited, (-) 8%	
11	Tolerance on Mass	%	+10 %, -8%	
12	Galvanizing thickness	Gm/m2	360gm/m2 (Min.)	
13	Tensile strength	N/mm2	320 N/mm2 (Min.)	
14	Elongation percent	%	20% (Min.)	
15	Embossing details		Hot marking on every metre Name/ logo of manufacturer, IS No., Class, ISI monogram	Name/logo of manufacturer, PO No,ISI,Class of tube i.e L for light,Colour of Band (PO no provided in stencil)
16	Color Coding		Yellow color band	
17	Make of steel		Tata/SAIL/Reputed make	
18	Chemical composition certificate		As per Table 1 of IS:1239 (Pt-I)-2004	
19	Max. permissible variation of chemical composition		As per Table 2 of IS:1239 (Pt-I)-2004	
20	Leak proof test		5MPA for atleast 3 sec.	
21	Tests			
21.1	Test of tensile strength		As per IS:1239 (Pt-I)-2004	
21.2	Bend test		As per IS:1239 (Pt-I)-2004	

TECHNICAL SPECIFICATION OF G.I. CONDUIT PIPES & EARTHING PIPE
13.0 GTP FOR GI EARTHING PIPE DIA 40 MM X 2.50 MTR CLASS B:

S. No	Parameter	Unit	Requirement	Vendor Data
1	Name of Manufacturer			
2	Ref IS No		IS 1239 (Part-1) 2004	
3	Type (Light, Medium, Heavy)*		Medium	
4	Size	mm	40mm NB dia	
5	Thickness	mm	3.2 MM	
6	Max & Min outside diameter of tube	mm	48.8 mm (max) & 47.9 (min)	
7	Length of Pipe	Mtr	2500 MM (+ 6 mm & - NOT ACCEPTABLE)	
8	Mass of Tube	Kg/m	3.56 Kg/m	
9	Tolerance on thickness		(+) Not limited, (-) 8%	
10	Tolerance on Mass		(+/-)10%	
11	Galvanising thickness	Microns	80 Microns (min)	
12	Tensile strength		320 N/mm ² (Mpa) (min)	
13	Elongation percent	%	20%	
14	Embossing details		Hot marking on every meter Name/logo of manufacturer, ISI monogram, Color of band (Blue Color)	
15	Chemical composition certificate		Chemical composition test to be carried out on one sample and sealed by BSES representative	
16	Max permissible variation of chemical composition		As per IS 10748	
17	Tests			
17.1	Leak tightness test (Hydrostatic test)		NA	
17.2	Test on finished tube		As per IS 1239 (Part-1)	
17.3	Bend test		As per IS 1239 (Part-1)	
18	General			
18.1	Supply of 6 Nos of M10*30mm elctrogalvanised Nuts+bolts+Plain & Spring Washer		Shall be provided	
18.2	Drawing		Shall be submitted	
19	GI Strip Size	mm	50 X 6	

*Pipe may be perforated or non-perforated, BRPL may ask as per requirement. Bidder has to provide the same.

TECHNICAL SPECIFICATION OF G.I. CONDUIT PIPES & EARTHING PIPE

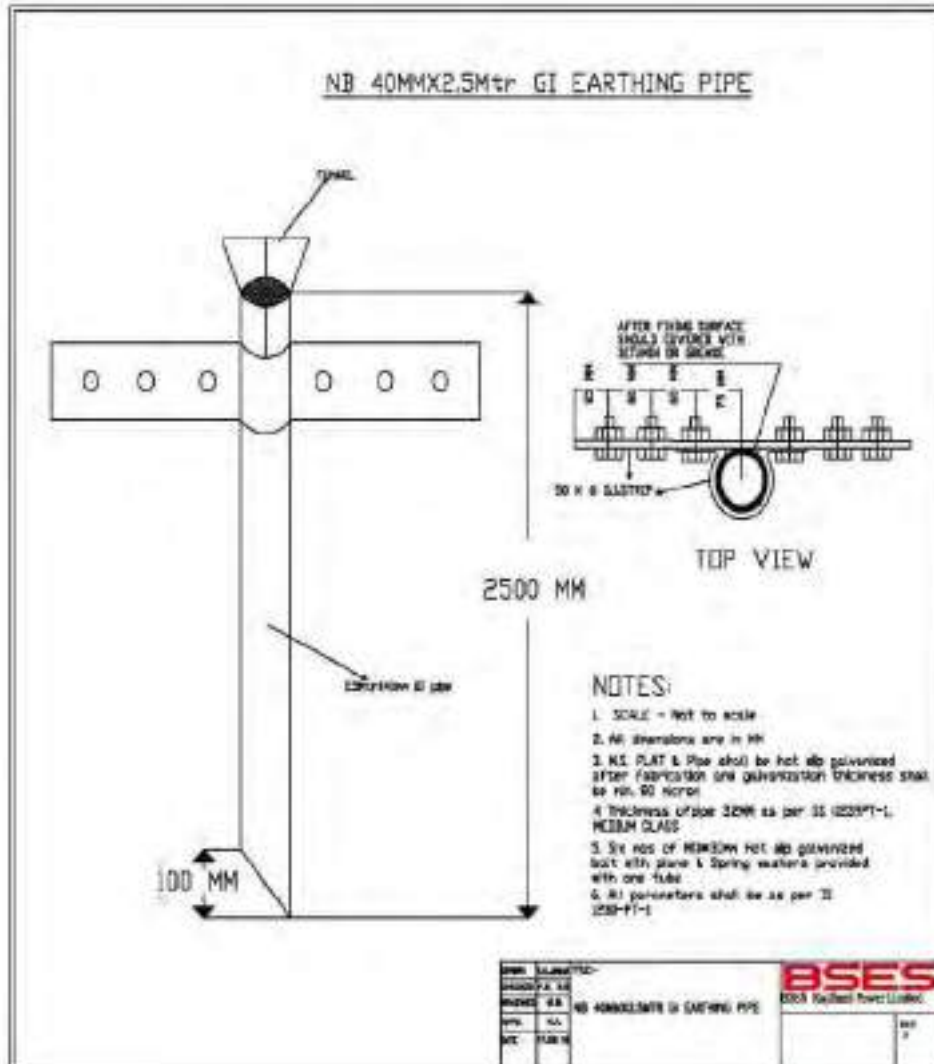


Fig. 1 G.I. EARTHING PIPE DIA 40 MM X 2.50 MTR CLASS B

TECHNICAL SPECIFICATION OF G.I. CONDUIT PIPES & EARTHING PIPE

13. INSPECTION TESTING CRITERIA:

QUALITY ASSURANCE PLAN FOR ERW PIPES

ITEM		: Conduit Pipe Galvanized as per IS:1239 (P-4)										
S. NO.	COMPONENT / OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE CRITERIA	FORMAT OF RECORDS	INSPECTION AGENCY	REMARKS		
									M	TPI		
01.	RAW MATERIAL H.R. COIL	1) CHEMICAL COMPOSITION 2) Physical Properties (Mechanical tests) 3) Thickness & Width	MAJOR	Chemical Analysis	Each Coil/Heat	IS:1239 & IS:10748	IS:1239 (Part-I)-04 & IS:10748 M/F: Test Certificate	Raw Material Test Certificate/ M/F: Test Certificate	W	R		
				Visual								
				Dimensional		IS:1239	IS:1239 (Part-I)-04	In-process inspection report	W	-		
				Mechanical Testing	Two sample per shift	-- do --	-- do --	Test report	W	-		
				Galvanizing Testing	Two sample per shift	IS:4730	IS:4730	Test report	W	-		
				Hydrostatic Pressure	100% in process	-- do --	IS:1239	Test report	W	-		
02	IN PROCESS INSPECTION	i) Physical Properties Tensile Strength Bend Test ii) Galvanizing Tests Mass of zinc & uniformity iii) Leak test iv) Identification & marking	MAJOR	Visual	Each Pipe	IS:1239	IS:1239 & P.O.	-----	W	-		
				Visual and Measurement	As per IS:4711	IS:1239 & Approved data sheet	IS:1239 & Approved data sheet	Test report	P	W		
				Tensile Strength Bend/Flattening test	One sample per Heat	IS:1239 & Approved data sheet	IS:1239 & Approved data sheet	Test report	P	W		
				Mass of zinc coating	One sample per Lot	IS:4730	IS:4730	Test report	P	W		
				Colour identification	IS:4711	IS:1239	IS:1239	-----	P	R/W		
				Visual	Random	IS:1239 & P.O.	IS:1239 & P.O.	-----	P	R/W		
03	FINAL INSPECTION (ERW - BES)	i) Identification marking & Workmanship ii) Inspection Release Note & Documents	MAJOR	All documents	100%	IS:1239 & P.O.	IS:1239 & P.O.	All documents	P	Issued		

Note: One sample to be identified by TPI for Chemical Testing at NABL approved Lab.

R= Review W= Witness H= Hold M= Manufacturer R/W= Random Witness TPI= Third Party Inspection

TECHNICAL SPECIFICATION OF G.I. CONDUIT PIPES & EARTHING PIPE

Note: -

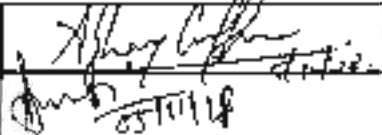
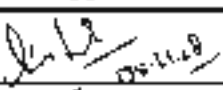
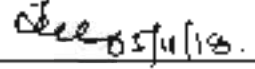
- GI Earthing pipe : Hot marking on every meter Name/logo of manufacturer, ISI monogram, Color of band (Blue Color)
- GI conduit pipe : Hot marking on every meter Name/logo of manufacturer, ISI monogram, Color of band (Yellow Color)

BSES

TECHNICAL SPECIFICATION OF GI STRIP

Specification No- GN101-03-SP-150-00

BSES RAJDHANI POWER, LTD

Prepared by	Abhay Gupta		Rev : 00
	Pronab Bairagi		
Reviewed by	Amit Tomar		Date : 5-Nov-18
Approved by	K. Sheshadri		Page : 1 of 13
Registered Office: BSES Bhawan, Nehru Place, Delhi - 110019			

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TECHNICAL SPECIFICATION OF GI STRIP**1.0 SCOPE**

This specification covers design, manufacture, testing, inspection and supply of GI strip for earthing (50X6mm and 25X6mm) (Heavy duty) for satisfactory operations in Sub-station / Project site at different locations under BSES Rajdhani Power Ltd, New Delhi.

2.0 STANDARDS

Material shall conform to the latest applicable Indian standards (IS) 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:2629 (1966)	Recommended practice for hot dip galvanized iron Earthing strips
2	IS:2633 (1986)	Methods of testing uniformity of coating on Zinc coated articles
3	IS:5358 (1969)	Specification for hot dip galvanized coating on fasteners
4	IS:3203	Specification for electroplating
5	IS:4759 (1968)	Specification for hot dip Zinc coating on structural & other allied products
6	IS:2062 Grade 'A' quality	Specification for MS channel and MS flat
7	IS:2062	Chemical and physical composition material
8	IS:1852	Rolling and cutting tolerances for Hot rolled steel products
9	IS:6745	Specification for methods for the determination of the mass of Zn coated Iron and steel articles

TECHNICAL SPECIFICATION OF GI STRIP**3.0 CLIMATIC CONDITIONS**

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

4.0 GENERAL TECHNICAL REQUIREMENT**4.1 GENERAL REQUIREMENTS**

- The specification is for the sizes 50X6 mm and 25X6 mm GI Strip
- Fully galvanized iron strips shall be used in switchyard. Galvanized Iron strips shall confirm to IS: 2629 (1966). The Zinc deposition should not be more than 610 g / m² of the galvanized surface area of the MS strip.
- All galvanized materials shall withstand test as per IS: 2633 (1972). The weight of zinc coating shall be determined as per the method stipulated in IS: 2633(1964).
- The standard length of Galvanized Iron Earthing Strip shall be minimum 7 Meters and not exceeding 10 Meters.

TECHNICAL SPECIFICATION OF GI STRIP

- Uniform Zinc coating is required.

4.2 PHYSICAL AND CHEMICAL PROPERTIES**Physical-**

The GI flat shall be supplied in 7m to 10m lengths.

The weight of GI flat shall be witnessed by BRPL at the time of taking delivery. The weight recorded in the material receipt certificate issued by BRPL shall be final.

Mechanical Properties (minimum requirement)		
1	Tensile strength (kgf/mm ²)	≥10 kgf/mm ²
2	Yield stress (min.) for thickness <20mm	26 kgf/mm ² or 250 N/mm ²
3	Elongation (%)	23%
4	Bend test	Minimum 3 times the thickness of material
5	Zinc coat thickness	70 microns

Chemical-

Chemical Properties		
S.No	Element	%
1	Iron	98.32
2	Carbon	0.204
3	Silicon	0.158
4	Manganese	0.510
5	Sulphur	0.028

TECHNICAL SPECIFICATION OF GI STRIP**Chemical Properties**

S.No	Element	%
6	Phosphorous	0.0320
7	Nickel	0.040
8	Chromium	0.086
9	Molybdenum	<0.01
10	Aluminium	<0.01
11	Copper	<0.104
12	Titanium	<0.005
13	Niobium	<0.01
14	Cobalt	<0.01
15	Boron	<0.0005
16	Lead	<0.01
17	Vanadium	<0.01
18	Zirconium	<0.006

4.3 METHODS OF GALVANIZING

S.No	Tests	For GI Flat
1	Dip test	4 dips of 1 min each
2	Mass of Zinc coating	610 g/m ² (minimum)

TECHNICAL SPECIFICATION OF GI STRIP

- Pre dispatch inspection shall be performed to witness following tests:
 - Freedom from defects
 - Verification of dimensions
 - Galvanization tests
 - Mechanical tests
 - Chemical composition tests
- These tests are to be performed and certified at NABL accredited third party laboratory
- MS Flat shall conform to IS 2062 and its latest amendments for steel and galvanization as per IS 4759 and its latest amendments.
- The flat shall be coated with Zn 98- Zinc grade
- The minimum Zn coating shall be 610 g/m² for thickness more than 5mm

4.4 MARKING

The bidder shall put his identification marks on the finished materials along with ISI mark, Manufacturer's name, PO No. and BRPL name. This mark shall be in "legible English letters".

4.5 DIMENSIONS TOLERANCE

Width = $\pm 2.5\%$

Thickness = $\pm 0.5\%$

5.0 TESTING**Type Test**

Product shall be type tested from NABL accredited lab and same shall be submitted to BRPL. Type test report should not be older than 5 years old. Vendor shall conduct the type test (as per the relevant IS (Refer Clause 2.0 of this technical specification)) from BRPL sample from NABL accredited lab if type test report is older than 5 years without any cost implications to BRPL. Following type tests shall be conducted mandatorily-

- i. Uniformity in thickness
- ii. Mass of Zn coating
- iii. Adhesion test
- iv. Knife test for Zn coated hardware and assembled Steel products
- v. Bend and wrapping test

TECHNICAL SPECIFICATION OF GI STRIP

- vi. Tensile test
- vii. Chemical composition test
- viii. Freedom from defects

BRPL reserve the right to seal the sample once per PO for type testing from NABL accredited lab if required. Bidder has to conduct the type test on BRPL requirement. Expenses for type testing shall be borne by bidder.

Acceptance test**i. Freedom from defects**

The Zinc coating shall be adherent, smooth, reasonably bright, continuous and free from imperfections as flux, ash and dross inclusions, bare and black spots, lumpiness and runs, rust stains, bulky white deposits and blisters.

ii. Uniformity in thickness

Galvanized articles shall be tested for uniformity in thickness of coating in accordance with Preece test given in IS 2633- 1986.

iii. Mass of Zn Coating

Mass of Zinc coating shall be determined in accordance with IS 6745- 1972.

iv. Adhesion test

The adherence of the Zinc coat on steel shall be determined by the pivoted hammer test. The hammer shall be made of normalized 0.3 – 0.4 percent carbon steel (Shall be in accordance with IS: 2629 – 1985).

v. Knife test for Zn coated hardware and assembled Steel products

When the coating is cut or pried into, such as with a stout knife applied with considerable pressure in a manner tending to remove a portion of the coating, it shall only be possible to remove small particles of the coating and it shall not be possible to peel any portion of the coating so as to expose the underlying iron or steel (Shall be in accordance with IS. 2629 – 1985).

- vi. Bend and wrapping test
- vii. Tensile test
- viii. Chemical composition test

TECHNICAL SPECIFICATION OF GI STRIP**6.0 INSPECTION**

- The representative of Purchaser shall pick up samples at random from the GI strips offered for carrying out routine tests as per specified IS.
- The materials to be supplied will be subject to inspection and approval by BRPL's representative before dispatch and / or on arrival at the destination.
- Inspection before dispatch shall not relieve the bidder of their responsibility to supply the steel section strictly in accordance with the specification
- The bidders shall abide by all the statutory provisions, acts such as the Indian Electricity Act, Indian factory Act, Indian Boiler Act etc. and corresponding rules and regulations as may be applicable and as amended from time to time
- BRPL's representative shall be entitled at all reasonable time during manufacturing to inspect, examine and test at the bidders premises the materials and workmanship of the steel section to be supplied
- As soon as the steel section is ready for testing, the bidder shall intimate BRPL well in advance.
- The material shall not be dispatched unless waiver of inspection is obtained or inspected by BRPL's authorized representative.
- The test certificate shall be in accordance with the latest version of the relevant Indian Standard or any equivalent International standards
- The acceptance of any batch /lot shall in no way relieve the bidder of any of his responsibilities for meeting all the requirements of the specification and shall not prevent subsequent rejection of any item if the same later found defective
- The purchaser reserves the right to reject on inspection after the same is received at destination.

7.0 STORING, PACKING AND HANDLING

Sufficient care shall be exercised while storing, packing and handling of galvanized products. While storing and transporting them, adequate ventilation shall be provided as otherwise 'rust' or 'wet storage stain' may result when galvanized coatings reacts with humidity and atmospheric gases. Galvanized articles can also be stored with spacers in between them, they shall also be kept at an inclination to facilitate drainage of water if collected on the articles. Post treatment like chromating shall be provided to minimize the chances of formation of white rust.

TECHNICAL SPECIFICATION OF GI STRIP

8.0 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 text to be printed over the GI Strip, font sizes to be used, additional text if any etc.

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

Document Submission

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

Legend.

GTP : Guaranteed Technical Particulars

TTR : Type Test Report

RTR : Routine Test Report

TECHNICAL SPECIFICATION OF GI STRIP

	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 GI Strip 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 GI Strip 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 GI Strip 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

8.3 WARRANTY

Warranty shall be 5 years minimum. All the relevant documents shall be submitted by the bidder in support to warranty terms and conditions.

TECHNICAL SPECIFICATION OF GI STRIP**9.0 DEVIATIONS**

- 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. 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.
- a) 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.
- b) 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.

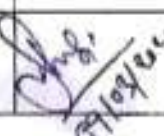

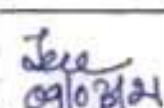
Deviation Sheet Format-

S.No	Document Name	Clause No.	Deviation	Reason	Merits to BRPL



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

Specification no – SP-HCSTJ-03-R4

Prepared by		Reviewed by		Approved by		Rev	Date
Name	Sign	Name	Sign	Name	Sign		
Pronab Bairagi		Amit Tomar		K Sheshadri		R4	09/03/2021

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

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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)

	<ul style="list-style-type: none">Single core repairing long barrel repairing joint for 66kV, 1CX1000 sqmm cable		
4.1.4	<ul style="list-style-type: none">Bind the copper wire mesh on copper screen with copper binding wire/CFS (Constant Force Spring)	KS	04
4.1.6	<ul style="list-style-type: none">--By means of four nos. Of tinned copper braided conductor of 70 sq mm for single core 66kV cable--By means of three nos. Of tinned copper braided conductor of 70 sq mm for three core 66kV cable	KS	04
4.5.1	<ul style="list-style-type: none">Type test validity extended to 10 years from 5 years -- AddedAll the cost of inspector shall be borne by seller as mentioned in inspection expenses clause— DeletedNote added	KS	04
8.0.0	<ul style="list-style-type: none">Inspection Expenses- Deleted	KS	04
Annexure – H	<ul style="list-style-type: none">Job card Details- GPS Co-ordination and uploading in GIS added	KS	04
Annexure – I	<ul style="list-style-type: none">Backfilling, compaction of excavated soil and removing of excess earth from the site	KS	04
Annexure – I (Special Note-5)	<ul style="list-style-type: none">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	KS	04
Annexure – J	<ul style="list-style-type: none">Updated Joint Marker Drawing	KS	04


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

Record of Revision

Item/Clause No.	Change in Specification	Approved By	Rev
4.1.12	GPS Coordination	VP	01
4.5.1b	Type Test	VP	01
Annexure-H	Job Card	VP	01
Annexure-I	SOP	VP	01
3.1.12	HTAB Cable Jointing and Termination Kit	VP	01
4.1.13	Hydraulic Crimping	VP	01
4.1.14	Coffin for completed joint and Joint Marker	VP	02
3.0.0	66kV , 3CX300 Cable Joint (Including OFC Joint)	VP	02
4.1.15	Electronic Ball Marker for 33kV and 66kV Cable Joint	VP	02
8.0.0	Inspection Expenses	VP	02
9.0.0	Failure Analysis and Penalty	VP	02
Annexure-K	BOM-11kV 3CX300/400 sqmm Single Core Repairing Joint	KS	03
3.0.0	11kV, 3-core x 300/400 sq mm AL (Single Core Repairing Joint)	KS	03
3.0.0, 3.1.6, 4.1.18, 19.0	11kV , 3CX400 Cable and 33kV 3CX400 sqmm cable Jointing kit- OFC embedded added	KS	03
4.1.2 (e)	For single core and Three core repairing joint-long barrel mechanical connector/ferrule shall be provided (middle part of ferrule shall be solid for better connectivity)	KS	03
4.2.1(d)	For single phase repairing joint-stress control tube shall be suitable for long barrel mechanical connector/ferrule	KS	03
4.2.1.1 (d)	For single phase repairing joint-insulation build up shall be suitable for long barrel mechanical connector/ferrule	KS	03
3.0	<ul style="list-style-type: none"> Single and three core repairing long barrel repairing joint for 33kV, 3CX400 sqmm 	KS	04

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 fails at site, the vendor shall depute a technical team to site for a root-cause analysis of the failure of the joint, in the presence of BSES officials. An Analysis Report shall then be submitted for BSES’s review and approval. If this report concludes the cause of failure as due to a design/manufacturing defect in a component, then vendor shall replace all such components in the entire stock available with BSES.

2.0.0 Codes & standards**2.1.0 National Standards:**

S No.	Standard Number	Title
2.1.1	IS- 13573: 2011	Joints & Terminations of Polymeric Cables for working voltages from 6.6 kV up to and including 33 kV Performance Requirements and Type Tests
2.1.2	IS- 7098: Part 2:1985	Cross-linked Polyethylene (XLPE) Insulated PVC sheathed cables: Part 2 - For working voltages from 3.3 kV up to and including 33 kV
	IS- 7098: Part 3:1993	Cross-linked polyethylene insulated thermoplastic sheathed Cables specification: Part 3 - For working voltages from 66 kV up to and including 220 KV
2.1.3	IS- 10810: 1984	Methods of test for cables

2.1.1 International Standards:

S No.	Standard Number	Title
2.2.1	EA TS - 09-13	Electricity Association - Technical Specification – 09 – 13 Material component for use in Electric Power Cable Termination & Joints for System voltage above 1kV up to 36 kV
2.2.2	IEC - 60183	Guide to the selection of high voltage cables
2.2.3	IEC - 885 Part 1 to 3	Electric test methods for electric cables
2.2.4	IEC - 60502 - 4	Power Cable Accessories for XLPE Cables above 3kV & up to 30 kV Test methods
2.2.5	IEC - 60840	Power cable with extruded insulation and their accessories for rated voltage above 30 kV (Um=36 kV) up to 150 kV (Um=170 kV) - test methods and requirements.

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

3.0.0 Cable Construction

Normal sizes of XLPE cables used in BSES system and the construction features of these cables are indicated below:

- 11kV, 3-core x 150 sq mm AL
- 11kV, 3-core x 300 sq mm AL
- 11kV, 3-core x 300/400 sq mm AL (For Single and three core long barrel Repairing Joint) **{R4}**
- 11kV, 3-core x 400 sq mm AL (OFC embedded) **{R3}**
- 11kV, 1-core x 1000 sq mm AL
- 11kV, 1-core x 150 sq mm AL HTAB
- 11kV, 1-core x 95 sq mm AL HTAB
- 33kV, 3-core x 400 sq mm AL
- 33kV, 3-core x 400 sq mm AL (OFC embedded) **{R3}**
- 33kV, 3-core x 400 sq mm AL (For Single and three core long barrel Repairing Joint) **{R4}**
- 66kV, 1-core x 630 sq mm AL
- 66kV, 1 core x 1000 sq mm AL
- 66kV, 1 core x 1000 sq mm AL (For Single and three core long barrel Repairing Joint) **{R4}**
- 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.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 only. {R3}
3.1.7	Over all three cores	Binder tape
3.1.8	Inner Sheath	Extruded Inner Sheath of Black PVC type ST-2.
3.1.9	Armour	a) For 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 6) For 66 kV 3-core cable- Round wire AL.



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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)

3.1.10	Binder Tape	Rubberized cotton tape
3.1.11	Outer Sheath	Extruded outer sheath of PVC (ST-2) for 11 kV and 33 kV and HDPE ST 7 for 66kV with termite- repellent and anti-rodent properties. For 66kV, 3Cx300 extra 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 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. {R3}

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		

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

4.1.2	Conductor Screen	<p>For 11kV</p> <p>a) Conductors to be jointed by crimping connectors</p> <p>b) Annular CSA (cross-sectional area) of the ferrule shall not be less than CSA of the conductor of the cable. Length of the ferrule shall be sufficient to allow adequate number of crimps, to limit temperature rise at the joint. (Vendor to furnish dimensional drawing for ferrule, indicating crimp marks.)</p> <p>c) For aluminium cable, the crimped ferrule shall be of aluminium</p> <p>d) Refer annexure F for GA drawing of crimping ferrule</p> <p>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) {R3}</p> <p>For 33kV and 66kV</p> <p>a) Shear bolt type mechanical connector</p> <p>b) Approved make:</p> <ul style="list-style-type: none"> • Tyco Electronics (BSM-185/400-U) • Pfisterer (332617010) • Or equivalent 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. {R4}</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	<p>By means of Tinned copper wire mesh, wrap individual core from cu screen with 50 % overlap and continue on other side cu screen.</p> <p>Bind the copper wire mesh on copper screen with copper binding wire/CFS {R4}</p>
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>

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

4.1.6	Armour continuity	By means of two nos. Of tinned copper braided conductor of 25 sq. mm. for 11 kV cable 35 sq. mm. for 33kV cable By means of four nos. Of tinned copper braided conductor of 70 sq mm for single core 66kV cable {R4} By means of three nos. Of tinned copper braided conductor of 70 sq mm for three core 66kV cable {R4}
4.1.6	OFC	For 11kV 3CX400, 33kV 3CX400 and 66kV, 3CX300 sqmm cables are OFC embedded. - Single Mode-36 Nos. Multi Mode- 12 OFC Cable shall be jointed separately. OFC joint shall not place inside main cable joint. {R3}
Accessories		
4.1.7	Suppression of electrical discharges over XLPE insulation	Cleaning solvent /equivalent, for manual application.
4.1.8	Installation Instruction	Shall be provided in English and Hindi and shall be inside every kit.
4.1.9	Sheet paper Tap	Paper tape, required for measurements during jointing, shall be provided inside every kit.
4.1.10	Identification Tag (for traceability)	a) An aluminum pouch with paper tag & sealing arrangement at one end shall be provided. b) This tag is required to be tied over the cable at one side of the joint. c) The paper tag shall give following information 1) Vendor kit designation 2) Cable section/Division 3) Type of joint 4) Size of Joint 5) Make of joint 6) Voltage class 7) Serial no. of kit 8) Vendor lot & batch no 9) Month & year of manufacturing 10) Date of installation 11) Name of jointer 12) Name of vendor supervisor 13) Name of BSES supervisor 14) Remarks
4.1.11	Printing on each Heat/cold shrinkable or Moulded component	Month and year of manufacturing, batch no. /lot no., size, make, type etc.
4.1.12	GPS Coordination	Vendor to capture GPS coordinates and shall include in job card of each joint at their own cost.
4.1.13	Hydraulic Crimping	Using of Hydraulic crimping tool is mandatory for crimping purpose

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

4.1.14	Coffin for completed joint and Joint Marker	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. After back filling a joint marker shall be fixed by bidder above ground to mark the joint location. Drawing is enclosed with this 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. {R3}

4.2.0 Only for Heat Shrinkable STJ joints

4.2.1	Stress Control System	<ul style="list-style-type: none"> a) The earthed insulation screen of an XLPE cable is terminated at a suitable distance from the connector (Ferrule). b) The stress control tube is in electrical contact with insulation screen. 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. d) The physical and electrical properties shall conform to EA TS 09-13. d) For single phase repairing joint-stress control tube shall be suitable for long barrel mechanical connector/ferrule {R3}
4.2.1.1	Insulation build-up	<ul style="list-style-type: none"> a) Maximum three layers of insulation tubes shall be used. Total thickness of the insulation being provided in the joint shall not be less than 1.2 times the insulation of the cable being jointed. b) Outer-most tube shall be screened insulating tube (dual wall tube). This tube shall be manufactured by extrusion process. c) Physical and Electrical properties shall conform to EA TS 09-13. d) For single phase repairing joint-insulation build up shall be suitable for long barrel mechanical connector/ferrule {R3}
4.2.2	Sealing end of tube	By means of Core end sealing sleeve with red mastic coating
4.2.3	Mechanical Protection	<ul style="list-style-type: none"> a) For 3-core cable: By means of a rollable steel mat (with required protective coating against corrosion) b) For 1-core cable: <ul style="list-style-type: none"> i) Copper wire mesh ii) Adhesive coated medium wall tube iii) One more layer of copper wire mesh iv) Medium wall tube



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

4.2.4	Corrosion Protection	By means of semi-rigid tubes, internally coated with water blocking sealant. Thick wall Insulating tube
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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 BRPL. Also special test shall be done as per IS 13573.2.2011, Table-7 without any cost implication to BRPL. 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) {R4}, same shall be carried out by seller, sample shall be selected randomly by BRPL, test cost to be borne by seller. For new vendor, type test is mandatory from CPRI/ERDA of BRPL sample at their own cost.</p>
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Technical Specification For Heat Shrinkable And Cold Shrinkable Straight Through Jointing Kit (11 kV, 33 kV, 66 kV XLPE Insulated Cables)

4.5.2	Routine & acceptance Tests	I) All the routine and acceptance tests shall be carried out as per EA TS 09-13 guidelines, refer Annexure C. II) H.V. Test shall be carried out on a randomly selected and installed Straight-Through Joint, in the presence of Purchaser's representative, at manufacturer's works. III) The joint shall withstand a test of 4Uo voltage for 4 hours.
4.5.6	Inspection	I) Purchaser reserves the right to inspect /witness all tests on the STJ Kits at Seller's works at any time, prior to dispatch, to verify compliance with the specification. II) In-process and / or final inspection call intimation shall be given in advance to purchaser.
4.5.7	Test Certificates	i) Three sets of complete Test Certificates (Routine & Acceptance tests) shall be submitted along with the delivery of STJ Kits. ii) Bought-out Items: Vendor shall submit Test Certificates, lot/batch number-wise, from their sub-suppliers / principal. TC's should clearly indicate the measured technical parameters, in accordance with sub-supplier's specification. (Also refer Annexure - C)
4.6.0	Documents	"Documents" refer to Documents, Data, Manuals, etc. (Scanned copy of signed documents also shall be part of entire soft file (e-file) 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.

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

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> <p>1) Identification number/type designation (as per manufacturer's standard)</p> <p>2) Voltage grade, size, description of the Kit (including the voltage grade, size, type of the cables, for which it is to be used)</p> <p>3) Batch no., lot no., etc.</p> <p>4) Quantity</p> <p>5) a) Purchase Order no. & date b) Purchaser's name c) BSES's SAP code number</p> <p>6) Weights (kg) of each Cable Termination Kit and of each box containing kits.</p> <p>7) Manufacturer's name</p> <p>8) Month & Year of Manufacturing</p> <p>9) Date of packing, shelf life (if applicable)</p>
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.



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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)**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.

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		

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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		
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 I years)		
10	Kit Content Table (KCT) enclosed? (Refer Annexure — B)	Yes / No	

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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 -09-13 (for heat-shrinkable joints)	Yes / No (If yes, details of test report no. /Date /name of test laboratory to be mentioned.)	
17	Type Test Reports (TTR) (Relevant test report no. & date, With type, size, other details of each type of Kit.) a) Prepared Joint: CPRI TTR as per BIS / IEC enclosed? b) Loose Components: CPRI TTR as per EA TS 09-13 enclosed?	Yes/No Yes/No	
18	Printing details on each of the Heat- shrinkable and Moulded components	(Mention the text, presently printed on each of the component)	
19	OFC kit (11kV 3CX400, 33kV 3CX400 and 66kV, 3CX300 sqmm cable){R3}	Yes/no	

Technical Specification For Heat Shrinkable And Cold Shrinkable Straight Through Jointing Kit (11 kV, 33 kV, 66 kV XLPE Insulated Cables)**Annexure - B: Kit Content Table (KCT)**

Vendor shall submit KCT as a consolidated table, consisting of all data, such as:

A. Heading

1. Voltage grade, size, description of the Kit
(Including the voltage grade, size, type of the cables, for which it is to be used)
2. Type designation (as per manufacturer's standard)

B. Details / Parameters (For each component/item of the KCT)

1. Lot no. /Batch no., etc.
2. Item number (manufacturer's standard)
3. Description
 - a) Material, type, make and grade
 - b) Dimensions cross sectional area
 - c) Colour,
 - d) Other description, if any
4. Function of the item
5. Quantity
6. Make/Name/Location of manufacturer/sub-vendor
 - a) Minimum supplied (or in expanded form) diameter
 - b) Maximum freely recovered diameter
7.
 - a) Minimum supplied (or in expanded form) thickness
 - b) Maximum freely recovered thickness

C. Notes on the KCT

Markings, printings and other details for individual/group of components is to be mentioned on KCT. For example:

- a) Printing of item code, size, batch no., etc.
- b) Printing on components
- c) Other embossing or engraving, if any.

(Note: Vendor may attach an Annexure, for any additional information, if required.)

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.)



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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. 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

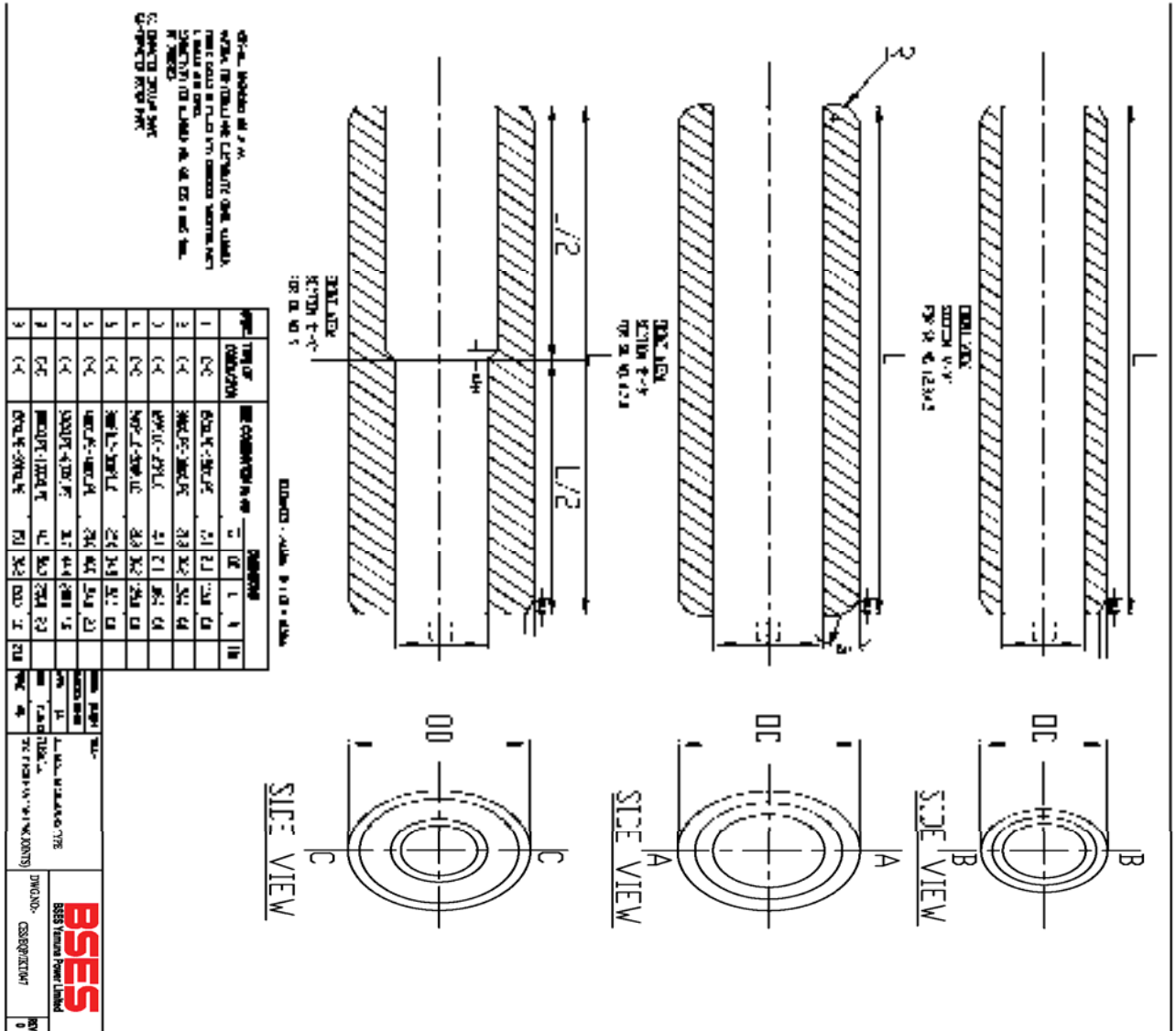
Annexure - E: Service Conditions

(Atmospheric conditions in Delhi)

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

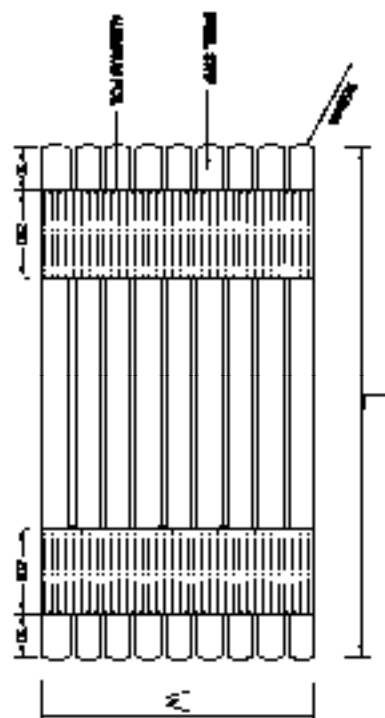
Technical Specification For Heat Shrinkable And Cold Shrinkable Straight Through Jointing Kit (11 kV, 33 kV, 66 kV XLPE Insulated Cables)

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

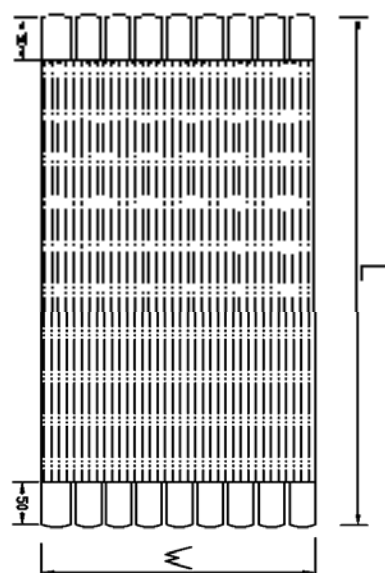


Technical Specification For Heat Shrinkable And Cold Shrinkable Straight Through Jointing Kit (11 kV, 33 kV, 66 kV XLPE Insulated Cables)

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



8DEC-8




SDC-B

THESE RESULTS WERE OBTAINED FROM A STUDY OF THE EFFECTS OF THE VARIOUS TYPES OF CEMENTS ON THE SETTING OF THE CEMENTS. THE RESULTS WERE OBTAINED FROM A STUDY OF THE EFFECTS OF THE VARIOUS TYPES OF CEMENTS ON THE SETTING OF THE CEMENTS.

NOTES: ALL BROOKING ARE IN 40
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B. HYDRAULIC STILL, STORM
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C. HYDRAULIC STILL, STORM
TANKS, 100' x 100'
D. HYDRAULIC STILL, STORM
TANKS, 100' x 100'
E. HYDRAULIC STILL, STORM
TANKS, 100' x 100'
F. HYDRAULIC STILL, STORM
TANKS, 100' x 100'
G. HYDRAULIC STILL, STORM
TANKS, 100' x 100'
H. HYDRAULIC STILL, STORM
TANKS, 100' x 100'
I. HYDRAULIC STILL, STORM
TANKS, 100' x 100'
J. HYDRAULIC STILL, STORM
TANKS, 100' x 100'
K. HYDRAULIC STILL, STORM
TANKS, 100' x 100'
L. HYDRAULIC STILL, STORM
TANKS, 100' x 100'
M. HYDRAULIC STILL, STORM
TANKS, 100' x 100'
N. HYDRAULIC STILL, STORM
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O. HYDRAULIC STILL, STORM
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P. HYDRAULIC STILL, STORM
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Q. HYDRAULIC STILL, STORM
TANKS, 100' x 100'
R. HYDRAULIC STILL, STORM
TANKS, 100' x 100'
S. HYDRAULIC STILL, STORM
TANKS, 100' x 100'
T. HYDRAULIC STILL, STORM
TANKS, 100' x 100'
U. HYDRAULIC STILL, STORM
TANKS, 100' x 100'
V. HYDRAULIC STILL, STORM
TANKS, 100' x 100'
W. HYDRAULIC STILL, STORM
TANKS, 100' x 100'
X. HYDRAULIC STILL, STORM
TANKS, 100' x 100'
Y. HYDRAULIC STILL, STORM
TANKS, 100' x 100'
Z. HYDRAULIC STILL, STORM
TANKS, 100' x 100'

DIAGNOSIS FOR BIT TYPE 2 CANCER

Index	Location	Access time	no. of events	Latency	duration
1	180°	2000 L.C. - 2000 L.C.	40	1424	408
2	180°	2000 L.C. - 2000 L.C.	46	1334	460
3	180°	2000 L.C. - 2000 L.C.	40	1474	408
4	180°	2000 L.C. - 2000 L.C.	46	1334	460
5	180°	2000 L.C. - 2000 L.C.	46	1734	460
6	180°	2000 L.C. - 2000 L.C.	46	1734	460
7	180°	2000 L.C. - 2000 L.C.	34	1364	340
8	180°	2000 L.C. - 2000 L.C.	36	1364	360
9	180°	2000 L.C. - 2000 L.C.	36	1364	360
10	200°	2000 L.C. - 2000 L.C.	50	1474	504
11	200°	2000 L.C. - 2000 L.C.	50	1474	504

FORM NO.	7.1	 BSES BSES Yamuna Power Limited	DWG. NO.- CSES/PROP/048
REVISED	0		
DATE	11.04.23		
BY	(Sd/-) (Signature)		
FOR	(Sd/-) (Signature)		



Annexure – H : Job card Details {R4}

BSES		Amount: #		BSES Rajdhani Power Ltd.	
Job Card For Cable Jointing Work					
Job Card No.	<input style="width: 150px;" type="text"/>		Date	<input style="width: 150px;" type="text"/>	
Division	<input style="width: 150px;" type="text"/>		Project	<input style="width: 100px;" type="text"/>	CRN# <input style="width: 100px;" type="text"/>
Contractor	<input style="width: 350px;" type="text"/>				
Voltage Grade	<input style="width: 100px;" type="text"/>		<input style="width: 100px;" type="text"/>	<input style="width: 100px;" type="text"/>	LT / HT / HT
No. of cores	<input style="width: 50px;" type="text"/>	<input style="width: 50px;" type="text"/>	<input style="width: 50px;" type="text"/>	<input style="width: 50px;" type="text"/>	
Cable Size:	2000 / 180 / 160 / 100 / 400 / 150 / 240 / 300 / 185 / 150 / 95 / 70 / 35 / 25 square				
Jointing Details	Type of Joint		No. of Joints		Notes No.
			Single	Double	
	RHT/HT/HT PTH/PTH Through Joints				
	RHT/HT/HT Transition Joint				
	PTH/PTH Through Joints				
	PTH/PTH Transition				
		PTH/PTH Termination			
		PTH/PTH Termination			
		PTH/PTH Termination			
		PTH/PTH Termination			
		PTH/PTH Termination			
		PTH/PTH Termination			
Feeder Details		From <input style="width: 150px;" type="text"/>		To <input style="width: 150px;" type="text"/>	
Location		From <input style="width: 150px;" type="text"/>		To <input style="width: 150px;" type="text"/>	
GPS Co-ordinate		<input style="width: 150px;" type="text"/>		GC Spotting <input style="width: 50px;" type="text"/> Yes <input style="width: 50px;" type="text"/> No	
Location <input style="width: 350px;" type="text"/>					
Fault Occurrence Date <input style="width: 350px;" type="text"/>					
MS Allocated By <input style="width: 150px;" type="text"/>			PWT Ref. <input style="width: 150px;" type="text"/>		
Date and Time of Splicing		Work Completed On			
<input style="width: 100px;" type="text"/> <input style="width: 100px;" type="text"/>		<input style="width: 100px;" type="text"/> <input style="width: 100px;" type="text"/>			
Digging Details (in Meter)		Length <input style="width: 100px;" type="text"/>		Depth <input style="width: 100px;" type="text"/>	
Details of cable laid		Size <input style="width: 100px;" type="text"/>		Length (in Meter) <input style="width: 100px;" type="text"/>	Weight (kg) <input style="width: 100px;" type="text"/>
Contractor Supervisor <input style="width: 150px;" type="text"/>		Signature <input style="width: 150px;" type="text"/>		Date <input style="width: 100px;" type="text"/>	
Job Card Details					
Stage Verification		Stage/Work order Number		Name & Signature	
In Digging / Laying etc.					
Scrap Details including Qty:					
New MS Details <input style="width: 350px;" type="text"/>					
Old MS Details <input style="width: 350px;" type="text"/>					
Type of Fault <input style="width: 350px;" type="text"/>					
Remarks <input style="width: 350px;" type="text"/>					
MS Certified By: <input style="width: 150px;" type="text"/>		<input style="width: 150px;" type="text"/>		<input style="width: 50px;" type="text"/>	<input style="width: 50px;" type="text"/>
MS Checked By: <input style="width: 150px;" type="text"/>		<input style="width: 150px;" type="text"/>		<input style="width: 50px;" type="text"/>	<input style="width: 50px;" type="text"/>
Name		Signature		Date	



SP-HCSTJ-03-R4

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



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

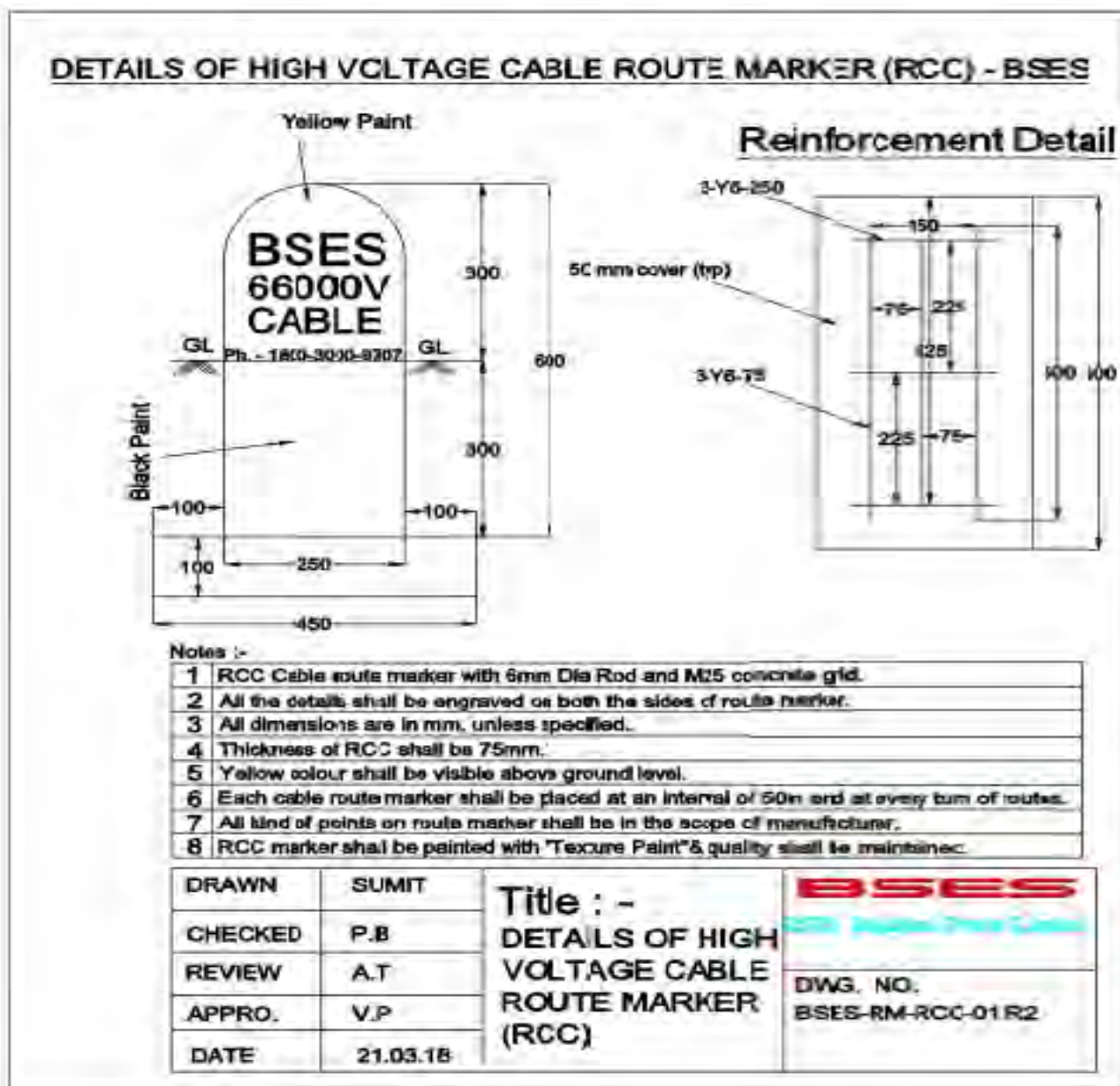
4	Backfilling, compaction of excavated soil and removing of excess earth from the site {R4}	Cable jointing contractor
5	Completion information in Job Card (Details of work done, material consumption, location, feeder name and joint tag no., date, supervisor name, jointer name) sent to SDO	Cable jointing 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.{R4}

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



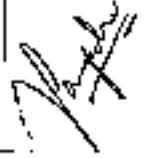
Annexure – J Joint Marker {R4}





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

Specification no – SP-HSGTK-04-R3

Prepared by		Reviewed by		Approved by		Rev	Date
Name	Sign	Name	Sign	Name	Sign		
Gautam Deka/Pronab Bairagi	 03/09/21	Amil Tomar	 03/09/21	Vijay Panpatia		R3	02/09/2021

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

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2.0.0# Codes & standards	4#
3.0.0# Cable Construction	5#
4.0.0# Cable Termination Kits	6#
5.0.0# Quality Assurance (QA)	10#
6.0.0# Deviations	11#
7.0.0# Delivery	11 2
8.0.0# Inspection Expenses	11 2
9.0.0# Failure Analysis and Penalty	11 2
 Annexure – A: Guaranteed Technical Particulars (GTP)	 11#
Annexure – B: Kit Content Table (KCT)	14#
Annexure – C: Routine and Acceptance Test	14#
Annexure – D: Technical Deviation Sheet	15#
Annexure – E: Service Conditions	15#
Annexure – F: Bimetallic Aluminium / Copper Lug	17#
Annexure – G: Aluminum Lug For XLPE Cable	18#
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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
3.14	HTAB Cable Jointing and Termination Kit	VP	02
4.2.1e	GIS Termination kit-Plug in Type	VP	02
4.2.1a	Hydraulic Crimping	VP	02
4.5d	Type Test	VP	02
Annexure-H	Job Card	VP	02
Annexure-I	SOP	VP	02
3.0.0	66kV, 3CX300 Cable, 33kV, 3CX400 sqmm and 11kV, 3CX400 sqmm Termination (Including OFC kit)	VP	03
4.2.1(e)	Tinned copper with long barrel	VP	03
4.2.1(f)	Top corners of all lugs shall be circular shape not rectangular	VP	03
4.2.3	Insulation Tube length for termination kit shall be 650 mm for both indoor and outdoor kit (only for all type of 11kV Termination kits)	VP	03
4.4.0	Type test clause modified	VP	03
8.0.0	Inspection Expenses-Deleted	VP	03
9.0.0	Penalty	VP	03

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 : 1985	Cross-linked Polyethylene (XLPE) Insulated PVC sheathed cables : Part 2 : For working voltages from 3.3 kV up to and including 33 kV
2.1.3	IS – 692: 1994	Paper insulated lead-sheathed cables (PILC) for rated voltages up to and including 33 kV specification
2.1.3	IS – 10810: 1984	Methods of test for cables

2.1.1 International Standards:

S No.	Standard Number	Title
2.2.1	EA TS – 09 – 13	Electricity Association – Technical Specification -09-13 Material component for use in Electric Power Cable Termination & Joints for System voltage above 1000 V up to 36 kV
2.2.2	IEEE – 48	Standards Test Procedures and requirements for high voltage alternating current cable termination
2.2.3	IEC – 60183	Guide to the selection of high voltage cables
2.2.4	IEC – 885 Part 1-3	Electric test methods for electric cables
2.2.5	IEC – 60840	Power cable with extruded insulation and their accessories for rated voltage above 30 Kv (Um=36 kV) up to 150 KV (Um=170 kV) – test methods and requirements.

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 BRPL system and the construction features of these cables are indicated below:

11Kv, 3-core x 150 sq mm AL
11Kv, 3-core x 300 sq mm AL
11Kv, 3-core x 400 sq mm AL
11Kv, 1-core x 1000 sq mm AL
11Kv, 1-core x 150 sq mm AL HTAB
11Kv, 1-core x 95 sq mm AL HTAB
33Kv, 3-core x 400 sq mm AL
66Kv, 1-core x 630 sq mm AL
66Kv, 1 core x 1000 sq mm AL
66Kv, 3-core x 300 sq mm AL

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 XLPE up for 11 kV and TR XLPE for 33 kV, 66 kV and HTAB cable Insulation For PILC: Layers of impregnated papers
3.4.0	Insulation Screen	For XLPE : a) Freely strippable Semi Conducting (without application of heat) for 66kV firmly bonded b) Copper Tape (Not applicable for HTAB) 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

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

3.6.0	Filler	For XLPE: All interstices, including centre interstices filled by PP filler. Special Note- for 66kV 3CX300 sqmm, 33kV, 3CX400 and 11kV 3CX400 cable -36 nos. Single mode and 12 nos. Multi modes OFC are also inbuilt as filler. For PILC : a) 11 kV : Crushed paper filler b) 33kV: Jute twine
3.7.0	Over all three cores	XLPE : Binder tape PILCA : 11 kV : belt paper 33kV: Copper Woven Fabric tape
3.8.0	Inner Sheath	For XLPE: Extruded Inner Sheath of Black PVC type ST-2. For PILC : Lead alloy sheath
3.9.0	Bedding Tape	For XLPE: not applicable For PILC: two layers of paper, followed by compounded (bituminized) cotton tape.
3.10.0	Copper Woven Fabric Tape (CWF tape)	For XLPE : not applicable For PILC : a) 11 kV : absent (Belted cable) b) 33 kV : applicable for screened cable
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
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, 3CX300 Cable- HDPE extruded semicon layer or HDPE with graphite layer. For PILC : compounded (bituminised) Jute/PVC
3.14.0	HTAB Cable (1CX150 and 1CX95)	AB cable- conductor-conductor semicon screen- TR XPLE-insulation Water Swallowable tape –Round wire armour (in the place of copper t Water Swallowable tape-outer sheath+ messenger wire

4.0.0 Cable Termination Kits

General Technical Requirements for Cable Termination Kits are as follows:

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

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	<p>a) Lug connection by crimping using hydraulic crimping tools, plug in type shall be for GIS. Using Hydraulic crimping tools is mandatory.</p> <p>b) Sizes of lugs are standardised as follows:</p> <ol style="list-style-type: none">1. For 120 sq. Mm. PILC cable and 150 sq. Mm. XLPE cable, the lug suitable for 150 sq. Mm. XLPE cable shall be used.2. For 240 sq. Mm. PILC cable and 300 sq. Mm. XLPE cable, the lug suitable for 300 sq. Mm. XLPE cable shall be used.3. For 11kV, 3CX400 lug shall be 400 sqmm. <p>c) 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>d) For 66kV 1Cx1000 or 630sqmm, 66kV, 3CX300 sqmm and 33kV 3CX400 sqmm aluminium lugs shall be used with appropriate size.</p> <p>e) All the lugs for all type and size of 11kV termination kits shall be tinned copper with long barrel . Refer Annexure F for details</p> <p>f) 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</p>

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

		termination shall be according to 650mm insulation tube length.			
4.2.3.1	Outer Anti-tracking Tube	Outer length of the tube shall be controlled by providing creepage Extension Shed having the same material composition as the tube. These lengths are given in the table below: Creepage distance shall be 31mm/kV minimum.			
4.2.3.1	OFC (66kV, 3CX300 sqmm , 33kV, 3Cx400 sqmm and 11kV, 3Cx400 sqmm cable)	Termination kit for OFC (36 single mode and 12 nos. Multi mode) shall be supplied along with termination kit.			
Cable System		Length of tube (mm)		Creepage Extension Shed (No.)	
Voltage	Cores	Indoor	Outdoor	Indoor	Outdoor
11 kV	3 – core	650	650	Nil	2
	1 – core	340	340	NIL	2
33 kV	3 – core	800	1200	2	5
	1 – core	600	600	2	5

4.2.3.3	Oil Barrier Tube (applicable for PILC cable termination)	<p>a) Transparent tube is used for restoring the insulation provided by belt paper, which is terminated at the crotch.</p> <p>b) 33 kV PILC Termination: The oil barrier tube provides an oil-resistant layer to contain impregnating compound within, thus preventing anti-tracking tube coming in contact with the impregnating compound.</p>
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>a) Earth Bond Assembly shall comprise of copper braided conductors as earthing conductors, GI armour support ring (non-split type) and two stainless steel hose clips.</p> <p>b) For GIS termination kit The earthing arrangement for 3-core cables shall be the same as stated under 'a' above.</p> <p>c) Two nos. Copper braided conductors shall be of size: 25 sq. Mm. For 11 kV cables, 35 sq. Mm. For 33 kV cables and 50 sq. Mm.</p> <p>d) Length of the copper braided conductor shall be 750 mm.</p> <p>e) Each copper braided conductor shall be supplied with copper lug, crimped at one end. Size of lug : 70 sq. Mm. For 11 kV and 120 sq. Mm. For 33 kV.</p>
4.2.6	Suppression of electrical discharges	<p>Following materials are required for use during cable termination :</p> <p>a) Silicone-based compound Required for filling-in minute services/ surface cracks over XLPE insulation.</p> <p>b) Polymeric mastic Required for application over 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.
4.3.0	Technical Particulars	Vendor shall submit Guaranteed Technical Particulars (GTP) as per Annexure A.
4.4.0	Type Tests	<p>i. Termination Kit shall be of type-tested quality from CPRI/ERDA/KEMA/CESI as per the BIS/IEC/IEEE within last 5 years.</p> <p>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.</p> <p>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 BRPL</p>
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	<p>1) Buyer reserves the right to witness all tests specified on individual H. S. components, Moulded components or completed Cable Termination Kit.</p> <p>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.</p> <p>3) In-process and final inspection call intimation shall be given in 10 days advance to purchaser.</p>




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

5.2.0	Sampling Method	Sampling Method for quality checks shall be as per manufacturer's standard practice / ESI guidelines and Purchaser's prior approval shall be taken for the same.
5.3.0	Inspection Hold-Points	To be mutually identified, agreed and approved in Quality Plan.

6.0.0 Deviations

6.1.0.	Deviations	<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. 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..</p> <p>b) In the absence of any list of deviations from the Seller 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.</p> <p>c) 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.</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.

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


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		
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	



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

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	
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 (66Kv, 3CX300 sqmm , 33Kv, 3cx400 sqmm and 11kv, 3cx400 sqmm)	Yes/no	

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

Annexure – B: Kit Content Table (KCT)

Vendor shall submit KCT as a consolidated table, consisting of all data, such as:

A. Heading

1. Voltage grade, size, description of the Kit
(Including the voltage grade, size, type of the cables, for which it is to be used)
2. Type designation (as per manufacturer's standard)

B. Details / Parameters

(For each component/item of the KCT)

1. Lot no. /Batch no., etc.
2. Item number (manufacturer's standard)
3. Description
 - a) Material, type, make and grade
 - b) Dimensions cross sectional area
 - c) Colour,
 - d) Other description, if any
4. Function of the item
5. Quantity
6. Make/Name/Location of manufacturer/sub-vendor
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.



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

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 BRPL's SAP code no. RTR shall record the serial numbers of the kits selected, as per vendor's sampling method. Following details, besides vendor's/manufacturers standard check-points, shall appear in every RTR.

Annexure – D: Technical Deviation Sheet

Sr No.	Clause No.	Deviation

Annexure – E: Service Conditions

(Atmospheric conditions at Site)

1	Delhi	
a)	Average grade Atmospheric Condition:	Heavily Polluted, Dry
b)	Maximum altitude above sea level	1000 M
c)	Ambient Air temperature	Highest 50 deg C, Average 40 deg C



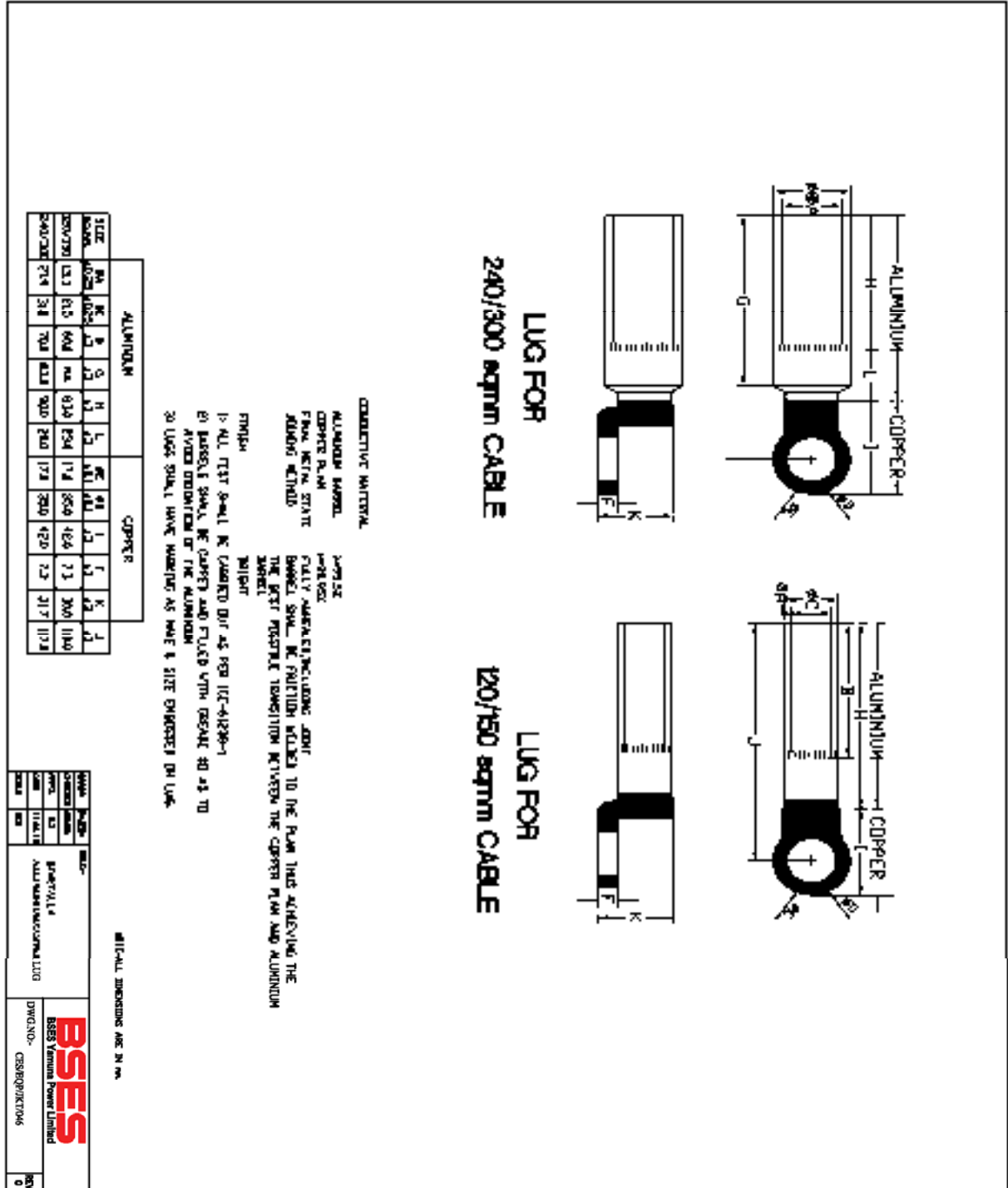
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Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 kV, 33 kV, 66 kV Cables)

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

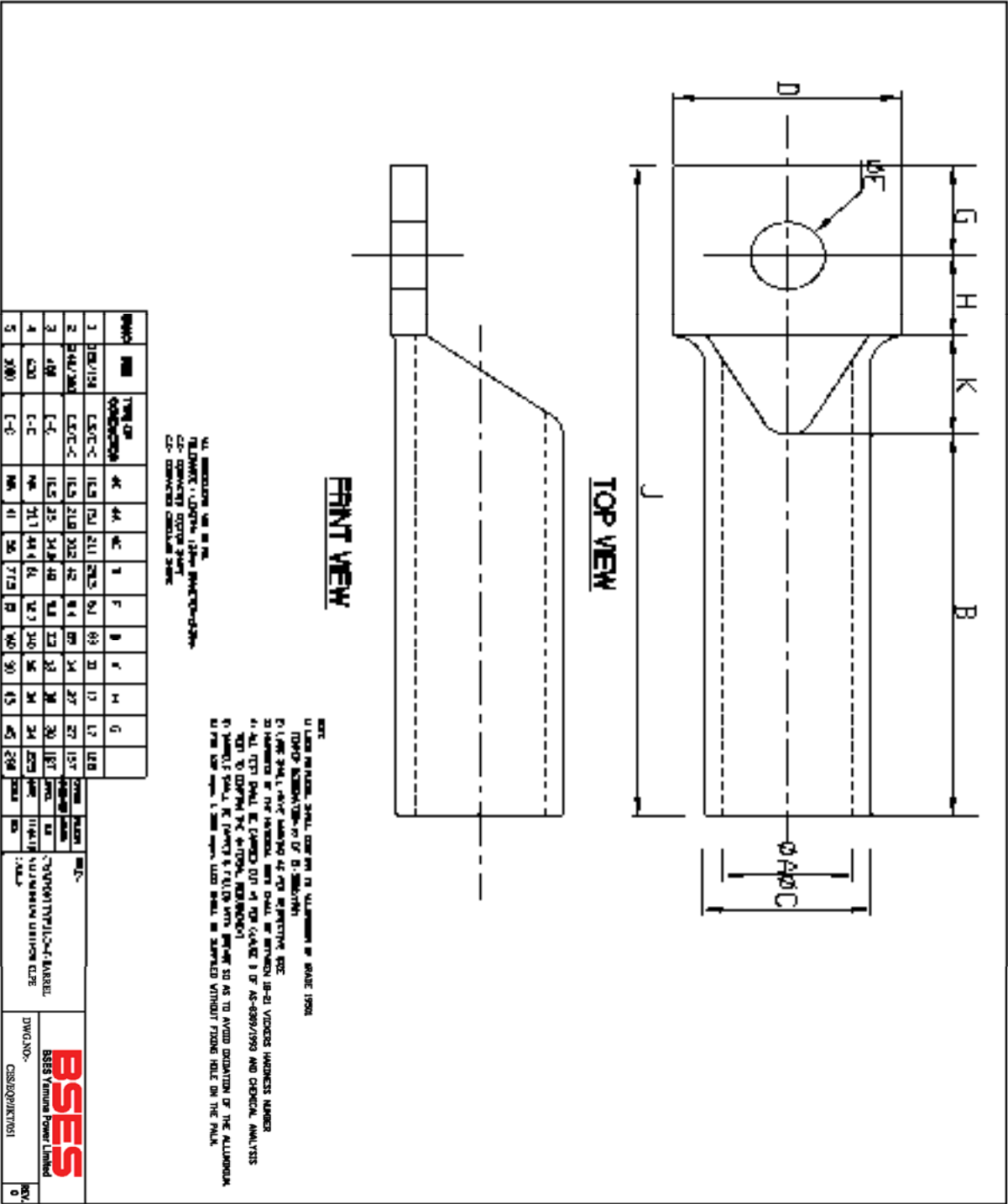
Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 kV, 33 kV, 66 kV Cables)

Annexure – F: Bimetallic Aluminium / Copper Lug



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

Annexure – G: Aluminum/Copper Lug For XLPE Cable





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

Annexure-I

SOP FOR REPAIRING OF CABLE FAULT (Shall be part of PO)		
SI. 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	Cable jointing contractor



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

	removing of excess earth from the site	
5	Completion information in Job Card (Details of work done, material consumption, location, feeder name and joint tag no., date, supervisor name, joiner 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, joiner name, feeder name	GNIIT
10	Information to include GPS location of cable fault.	GNIIT

Special Note-

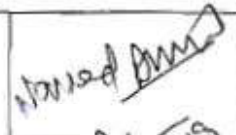
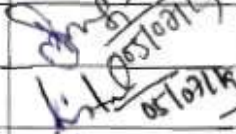
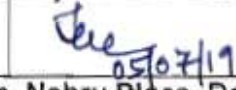
- 1) Joints to be done preferably during day. In case of constraints, DGM (O&M) to authorize for night time jointing with supervisor
- 2) Daily joint report to be shared with CES
- 3) Bi-monthly analysis of faulty joint for ensuring warranty compliance to be organized at circle level by contractor in 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.

BSES

TECHNICAL SPECIFICATION FOR 11 kV INDOOR METERING CUBICAL

Specification No: GN101-03-SP-171-00

BSES RAJDHANI POWER LTD

Prepared by	Naved Ahmed		Rev : 0
	Pronab Bairagi		
Reviewed by	Amit Tomar	 05/07/19	Date : 05.07.2019
Approved by	K. Sheshadri	 05/07/19	Page : 1 of 15
Registered Office: BSES Bhavan, Nehru Place, Delhi - 110019			

Technical Specification for 11 kV Indoor Metering Cubical**Table of Contents**

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Technical Specification for 11 kV Indoor Metering Cubical**Revision Details:**

Clause no	Descriptions	R1	R0

Technical Specification for 11 kV Indoor Metering Cubical**General Specifications****1.0 Scope of supply**

This specification covers design, engineering and manufacture, assembly, testing at manufacture's works, packing, transportation and delivery to BRPL Store / site.

2.0 Codes and Standards

All Material against this specification shall conform to the relevant Indian standards /International Standards with latest amendments from time to time, in all respects. Some relevant standards are listed below:

Sl.no	Standard	Title
1	IS 3427 -1997	AC metal enclosed switchgear and control gear
2	IS:2705-1992	Current transformers
3	IS:3156-1992	Voltage transformers
4	IS:2099-1986	Bushings for alternating voltages above 1 000 Volts
5	IS:5561	Specification for electric power connectors
6	IS: 2062	Structural Steel (Std. quality)
7	IS: 5	Colors for ready mix paints
8	IEC: 62271 -200	AC metal enclosed switchgear and controlgear
9	IEC: 60044-1	Current transformers
10	IEC: 60044-2	Potential Transformer
11	Indian Electricity rules	

Material conforming to other internationally accepted standards, which ensures equal or better quality than the standards mentioned above would be acceptable, subject to prior approval of BRPL. In case the Bidders who wish to offer material conforming to the other standards, salient points of difference between the Standards adopted and the specific standards shall be clearly brought out in relevant schedule and approval must be taken from BRPL during tendering stage. Four copies of such standards with authentic English Translation shall be furnished along with the offer.

In the case of conflict the order of precedence shall be as follows:

- Indian Standards
- IEC Standards
- BRPL Requirement

Technical Specification for 11 kV Indoor Metering Cubical**3.0 Service Conditions:**

The Metering Cubical to be supplied against this specification shall be suitable for satisfactory continuous operation under the following service conditions:

a) Maximum ambient temperature (Degree C)	50
b) Relative Humidity (%)	100
c) Maximum annual rainfall (mm).	1450
d) Maximum wind pressure (Kg/Sq.m)	150
e) Maximum Altitude above mean sea level (Meters)	1000
f) Seismic level (Horizontal Acceleration)	0.30
g) Climatic Conditions : Moderately Hot and humid tropical climate conducive to rust and fungus growth	
h) Ref Ambient Max Temperature (Degree C)	50
i) Ref Ambient Min Temperature (Degree C)	0

4.0 Design Feature:

The design and manufacturing of the required 11 kV Indoor CT/PT Metering Cubicle shall be in accordance with the best engineering practices, to ensure satisfactory performance throughout its service life.

4.1 The CT/PT Metering cubicle shall be complete with all components and accessories, which are necessary for their efficient performance and trouble free operation under various operating and atmospheric conditions, specified in clause no 3.

4.2 Some parts that may not be specifically included, but otherwise form part of the CT/PT Metering cubicle as per standard trade and/or professional practice and/or are necessary for proper operation of CT/PT Metering cubicle, must be considered subject to BRPL acceptance. The successful bidder shall not be eligible for any extra charges for such accessories

4.3 All kind of accessories make shall be as per list given in the Annexure-I.

5.0 Construction

5.1 11 kV Indoor metering cubicle shall house Three (03) no's 11kV Current Transformer, 3 phase Potential Transformer, Meter chamber and provision for termination of 11kV, 3CX150mm² to 3Cx400mm² XLPE Cable.

Technical Specification for 11 kV Indoor Metering Cubical

5.2 The metering cubicle shall be fabricated with 3.0mm CRCA sheet. The panel shall be vermin proof and totally enclosed. The panel shall have four separate compartments. All the compartments shall be completely segregated from each other. The Upper compartment i.e. the "meter compartment" shall be suitable for housing 3 phase 4 wire Energy Meter (energy meter not in bidder's scope of supply) and associated wiring. The Lower compartment i.e. the CT/PT compartment shall house 11 kV current transformers (3 nos.) and 3 phase potential transformer. Two cable compartments suitable for termination of 11kV, 3CX150sqmm to 3CX400sqmm XLPE cable shall be provided for incoming and outgoing cables.

5.3 A separate and independent vermin proof door shall be provided for meter compartment with provision of locking and sealing arrangement. The locking arrangement shall be identical to the lockers provided in banks that are operable with two keys. Two sets of keys shall be provided with each cubicle. The meter compartment shall be completely lockable and sealable with at least one locking and two sealing arrangements on the door. The hinges of the doors shall be concealed type. Two earthing connections shall also be provided in the meter compartment for earthing. Door shall also be provided with flexible earthing braid. The meter compartment shall contain hanger arrangement of slotted angle for mounting meter so that meter can be adjusted vertically and horizontally (details of mounting arrangement will be provided by BSES). Clearances between all parts and components of panel should comply with relevant IS standard. The meter chamber shall be of IP-5X protection class, CT PT Compartment-IP 7X, Cable Compartment-IP 3X . All joints of metering cubicle shall be welded to provide ample mechanical strength. No metal part or joint shall have bolted arrangement except the front door.

5.4 04 No's lifting lugs shall be provided at the top of the metering cubicle for transportation. All nuts, bolts, flat and spring washers shall be SS only except termination nuts and bolts Termination. Nuts and bolt shall be brass along with reducer. Reducer to be used for termination of different type of cable lugs of cable size 11kV, 3CX150 sqmm to 3CX400 sqmm cable. Bimetallic washers must be provided for each and every termination.

The meter compartment shall be provided with a window of size 350 (W) X 300 (H) mm approximately with colourless transparent acrylic sheets and wire mesh shall be suitably fixed on the front door of the meter compartment to enable the meter reader to note down the reading. Provision for mounting serial port for meter reading should also be provided on the door of meter compartment.

CT/PT compartment shall be fabricated after bending the CRCA sheets on three sides and fourth side shall be welded to make the complete assembly tamper proof. Pressure release device/ explosion vent should be provided on the CT PT compartment at the top side. Complete Metering cubical including cable termination compartment must be AFLR internal arc type tested with top release vent to release the arcing gas

Technical Specification for 11 kV Indoor Metering Cubical

5.5 Cable termination compartments (for incoming and outgoing) should have bottom cable entry provision along with gland plate (3.0mm thick) suitable for 11kV, 3CX150 sqmm to 3CX400sqmm XLPE aluminum cable and knockout punch must be provided accordingly Height adjustable HDPE clamp and support arrangement should be provided for both incoming and outgoing cables. Each cable termination compartments should have atleast two sealing arrangements. Clearance of cable box gland plate from ground shall be sufficient (900mm minimum) for bending of 11KV Cable. Height of cable termination point from gland plate inside the cable box shall be 550mm (minimum). 3M/Raychem/K.D.Joshimake boots should be provided for incoming and outgoing cable terminations (6 nos. for each metering cubicle).

5.6 The Panel shall be sand blasted and subjected to seven-tank process for surface treatment. The paint shall be powder coated with pure polyester grade 'A' structured finish. The colour shade shall be RAL 7032. Minimum paint thickness of 80 microns shall be maintained.

5.7 The total height including base channel shall not be more than 2000mm. Width and depth should be minimum possible and may be increased suitably to accommodate CT's/PT's.

5.8 All the moving edges shall be provided with Polyethylene Foam Gasket firmly glued to the surface, to make the metering panel dust & vermin proof.

5.9 All the doors must be sealed with Polyethylene Foam Gasket for corner sealing to prevent dust and moisture entry to the compartment.

6.0 Current transformer

The metering current transformers shall be suitable for 12kV, 50Hz (height system voltage) effectively earthed neutral system. The CT shall be single core, epoxy resin cast, copper wound primary type with rated burden 2.5VA and accuracy class 0.5s or better conforming to IS:2705 (Part-I&II). Instrument security factor shall be less than or equal to 10. CTs should have solid copper bus bar type primary terminals for connection with main busbar/bushing terminal. Secondary terminals of CTs should be made of copper or brass. The short time current rating of current transformer shall be as follows.

S. No	CT Ratio	Short time rating	Size of main busbar
1	15 / 5 A	21KA for 3 seconds	30 x 5 sqmm
2	30 / 5 A		
3	60 / 5 A		
4	100 / 5 A		
5	150 / 5 A		
6	300 / 5 A		40 x 6 sqmm
7	400 / 5 A		

Technical Specification for 11 kV Indoor Metering Cubical**7.0 Potential transformer**

The Potential Transformer shall be indoor dry type Epoxy resin cast, Copper wound suitable for 3 phase 12kV (maximum system voltage), 50Hz effectively earthed neutral system. The PT shall be connected in star to have ratio $11\text{kV}/\sqrt{3}$ / $110/\sqrt{3}$ V with rated burden of 10VA per phase and accuracy class 0.5 or better conforming to IS:3156 (Part I & II). Primary terminal of PT should be of copper. Secondary terminals of PT should be made of copper or brass.

Major design parameters for CT and PT are as follows:-

S No.	Description	Requirement for CT	Requirement for PT
1	Nominal System Voltage (KV rms)	11kV	11kV
2	Highest System Voltage (KV rms)	12kV	12kV
3	Type	Single phase Indoor CT's	Three single phase Star/Star PT.
4	Accuracy Class	0.5s	0.5
5	Rated frequency	50Hz	50Hz
6	Rated Secondary Current Amp.	5 Amp	N / A
7	Rated continuous thermal current	1.2 times of rated primary current	NA
8	Max Ratio error	As per IS 2705	As per IS 3156
9	Max Phase angle error	As per IS 2705	As per IS 3156
10	Rated burden	5VA at 0.8 pf (Lag)	10VA/ phase at 0.8 pf (Lag)
11	Rated voltage factor	N / A	1.2 times continuous and 1.5 times for 30seconds
12	Short time current rating		
12.1	Thermal rating	As provided in section 3.2	N / A
12.2	Dynamic rating	2.55 times of shorttime thermal current rating	N / A
13	One minute high voltage power frequency withstand voltage		

Technical Specification for 11 kV Indoor Metering Cubical

S No.	Description	Requirement for CT	Requirement for PT
13.1	On primary winding kV rms	• 28KV (rms) for 1 minute for 11 kV class	28KV (rms) for 1 minute for 11 kV class
	On secondary winding kV rms	• 3KV (rms) for 1 minute	3KV (rms) for 1 minute
13.2	1.2 / 50 impulse withstand voltage	75 kV (peak) for 11 kV class	75 kV (peak) for 11 kV class
14	Winding materials	Copper	Copper
15	Insulation security factor	< 10	N / A

8.0 Wiring

Secondary wiring of CTs and PTs shall be done with 2.5 sq. mm PVC insulated cables with stranded copper conductor. CT and PT wiring should run in independent rigid steel conduit pipes of appropriate size from CT/PT compartment to meter compartment. Conduit pipes shall be clamped with the inner wall of the panel and shall be so laid that none of the wires can be tampered from outside.

Current transformer and Potential transformer secondary wiring shall be colour coded as per IS and shall be suitably ferruled for identification. No link or test terminals shall be provided in wire from CT/PT to meter terminals. All kind of wires must be terminated with pin/ring type lugs with proper ferrule marking.

9.0 Bushing

Bushing should be made of homogeneous epoxy / polymeric material free from laminations, cavities and other flaws or imperfections that might affect the mechanical or dielectric quality. Bushings shall be designed to have ample insulation level, mechanical strength and rigidity for the conditions under which they will be used.

The hollow Cast resin epoxy bushings shall conform to IS-5621.

Bushing clamping accessories, bolts, studs etc. shall be hot dip galvanized. All the nuts and washer shall be SS-304. All iron parts shall be hot tin galvanized and all points shall be airtight. All current carrying contact surfaces shall be bimetallic type. The creepage distance of the bushing shall not be less than 31mm/kV.

Bushing shall be tested in accordance with IS-2099. Routine as well as type tests reports in conformity with IS-2099 shall be furnished to the purchaser.

Technical Specification for 11 kV Indoor Metering Cubical**10.0 Earthing**

The assembly comprising of the chassis, framework and the fixed parts of the metal casing shall be provided with two separate earthing terminals of 50X6 GI Strip. These terminals shall be provided over and above all other means provided for securing and earthing metallic enclosures (armour or other metallic coverage) or current- carrying cables.

The earthing terminals shall be readily accessible and so placed that the earth connection of the CT/ PT chamber is maintained when the cover or any other movable part is removed.

The earthing terminals shall be protected against corrosion and shall be metallically clean. Under no circumstances shall a movable metal part of the enclosure be insulated from the part carrying the earthing terminals when the movable part is in place.

2 nos. for each terminal GI M10 Nuts and Bolts shall be provided along with 50X6 GI Strip terminals to facilitate the strip connection to ground by BRPL.

The earthing terminals shall be identified by means of the symbol marked in a legible and indelible manner on or adjacent to the terminals.

11.0 Connections

No joint in the primary winding of CT shall be acceptable. Connection between CT terminal and bushing terminals shall be done with solid copper bus bar of adequate size as per the table given in the specification (refer clause no. 3). Flexible copper strip / rope are not acceptable for primary connection. PT should be connected to primary bus bar through bus bar of appropriate size (connections using flexible conductor are not acceptable). All bus bars/connections in the CT/PT compartment shall be encapsulated in epoxy.

12.0 Provision for sealing

Holes must be provided for the purpose of sealing using the sealing wire of 3 ply on the following compartments

- a. Metercompartment
- b. Incoming cablecompartment
- c. Outgoing cablecompartment

13.0 Name Plate and Marking

The metering cubicles shall be provided with a non-detachable type nameplate with legible and indelible marking of the following details:

Technical Specification for 11 kV Indoor Metering Cubical

- a. BRPL Property
- b. Supplier's name
- c. P.O. No. & Year of manufacturing
- d. Sr. No. of panel
- e. Particulars of CT's such as ratio, VA burden, accuracy class, SC rating, BIL.
- f. Particulars of PT's such as ratio, accuracy class, VA burden, BIL.
- g. Standard connection diagram
- h. Consumer account no
- i. Sanctioned load.
- j. Date of release of connection.
- k. Circuit diagram along with CT PT rating details.
- l. IP details
- m. Voltage rating

Name plate having complete data shall be provided outside as well as inside the metering cubicle at a suitable place where it can be easily read. Name plate shall be anodized Aluminium fixed on the enclosure sheet with welded arrangement so that in case name plate is removed no passage holes are left.

In addition to nameplate, CT ratio of the cubicle should be indelibly marked in bold on the CT/PT compartment. Labels and color coding should be provided for phase identification.

Quality Assurance

14.0 Quality Assurance:

Vendor Quality Plan	To be submitted for purchaser approval
Inspection Points	To be mutually identified & agreed in quality plan

15.0 Testing, Inspection and Physical Inspection:

The Metering cubicle shall be subjected to the following tests

Technical Specification for 11 kV Indoor Metering Cubical

a.	Type test	<p>a. Metering cubicle shall be type tested as per IS 3427</p> <p>b. CT and PTs shall be type tested as per IS2099, IS5621, IS2705, and IS3156& IEC 60947 respectively.</p> <p>c. Bushings shall be type tested in accordance with IS 2099& IS 5621,IEC 60947</p> <p>d. Type tests should not pertain to period earlier than five years.</p> <p>e. In case type test report is more than five years old, bidder has to conduct the type test from CPRI/ERDA from BRPL sample in accordance to IS, IEC as well as BRPL requirement without any cost implication to BRPL.</p> <p>In addition, below mentioned tests must be the part of type test report on complete metering cubical</p> <p>f. Internal Arc test (21KA/1 sec) must be AFLR type. Arc release vent must be on top of the cubical only. Bottom release vent will not be accepted.</p> <p>g. IP test</p> <p>h. Short Circuit test (21KA/3 sec)</p> <p>i. Contact Resistance Measurement (CRM)</p> <p>j. Temperature rise test</p>
b.	Inspections	<p>a. Metering cubicle shall be tested as per IS 3427, IS 2099& IS 5621,IEC 60947</p> <p>b. CT and PTs will be tested in accordance with IS2705 and IS3156 respectively.</p> <p>c. Temperature rise test will have to be carried out during inspection on sample basis</p> <p>d. During inspection, all routine and acceptance tests shall be carried out in presence of representative of purchaser.</p> <p>e. Complete verifications of Raw materials purchase and test certificate</p>
c.	Physical Inspection	<p>a. Checks of all mounting plates / fasteners.</p> <p>b. Checking of components as per drawing.</p> <p>c. Electrical circuits fasteners tightness / surface area contacts.</p> <p>d. Labels / identification / nameplates.</p> <p>e. All doors checks – safety and accessibility.</p> <p>f. Panel surface finish / smoothness.</p>

16.0 Packing

16.1	Packing Protection	Against corrosion , Dampness, heavy rains, breakage and vibration
16.2	Packing for	Robust wooden non-returnable package case with all the

Technical Specification for 11 kV Indoor Metering Cubical

	accessories and spares	protection mentioned above and identification Label mentioned in the sl. No 8.3
16.3	Packing Identification Label	<p>In each packing case, following details are required</p> <ul style="list-style-type: none">a. Individual serial nob. Purchaser's namec. PO no along with date and SAP coded. Equipment Tag no if anye. Destinationf. Manufacturer name/Supplier nameg. Address of manufacturer/Supplier/Its agenth. Country of Origini. Month of year of manufacturerj. Gross and Net weight in kilogramk. All necessary slinging and stacking instructionl. All necessary storage instructionsm. Case measurement

17.0 Shipping

17.1	Shipping	The bidders shall ascertain at an early date and definitely before the commencement of manufacture, any transport limitations such as weight, dimensions, road culverts, overhead lines, free access etc. from the manufacturing plant to the project site. Bidder shall furnish the confirmation that the proposed packages can be safely transported, as normal or oversize packages, up to the site. Any modifications required in the infrastructure and cost thereof in this connection shall be brought to the notice of the Purchaser.
17.2	Packing	The seller shall be responsible for all kind of transit damage and shall be replaced by seller at free of cost if any.

18.0 Handle and Storage

18.1	Handling and storage	Manufacturer instruction shall be followed. Detail handling and storage instruction sheet /manual needs to be furnished before commencement of supply.
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Technical Specification for 11 kV Indoor Metering Cubical**19.0 Deviations**

19.1	<p>a) Deviations from this specification shall be listed separately by bidder clause wise (format given below clause no- 20.2) 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.</p> <p>b) 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.</p> <p>c) 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.</p>
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Deviation sheet format.

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

Annexure: I

Make List of Accessories		
Sl.No.	Descriptions	Make
1	CT	Pragati
		NPT
		Gilbert and Maxwell
2	PT	Pragati
		NPT
		Gilbert and Maxwell
3	Wire (Copper)	havells

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Make List of Accessories		
Sl.No.	Descriptions	Make
4	Boot	Finolex
		Polycab
		Raychem
		3M
		K.D Joshi
5	Copper	Vedanta
		Hindalco
		Hindustan Copper
6	Terminal Block	Connectwell/Wago
7	Insulator	Aditya Birla
8	Paint make	Asian Paints
		Berger Paints
9	CRCA Sheet	SAIL
		Tata
		Jindal
10	Lock	Godrej
		Harrison
		Abloy
		Suzu

Special Note

1. Proper instruction for use of Toque wrench & Torque pressure on I/D design to be displayed on the CT PT Unit.
2. Bimetallic & spring washer shall be supplied with Meter cubical & CT/PT unit.
Each Termination Set shall have
 - Spring washer-1 no
 - Bimetallic washer-1 no
 - Plain Washer- 2 nos
3. Separate Connector shall be provided for cable lugs tightening for CT/PT unit instead of direct tightening on bushing rod.
4. Termination boots on O/D design CT/PT unit to be provided.