

Tender Notification 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,GITRONI**

NIT NO CMC/BR/20-21/SV/RS/KG/880 DT 23.10.2020

Due Date for Submission: 13.11.2020 1530HRS

BSES RAJDHANI POWER LTD (BRPL)

Corporate Identification Number: **U74899DL2001PLC111527**

Telephone Number: +91 11 3009 9999

Fax Number: +91 11 2641 9833

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 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,GITRONI	5.2 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 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,GITRONI NIT NO CMC/BR/20-21/SV/RS/KG/880"

- 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 13/11/2020 1530 HRS at the address given at 3.01 below. Part A of the Bid shall be opened on 13/11/2020 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

- (i) **Earnest Money Deposit (EMD)** of value **Rs 5,20,000/-** 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.
- (ii) The offer does not contain prices indicating break-up towards all taxes & duties in prescribed format
- (iii) Complete Technical details are not enclosed.
- (iv) Tender is received after due date and time.
- (iv) Technical offer contains any prices
- (v) 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 supply, laying, testing & commissioning of similar Cross section (i.e 300mm²) or higher (Voltage level 11KV and Above) cable on turnkey basis. 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 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	28.10.2020
2	Pre-Bid meeting	06.11.2020 1430 HRS
3	Last date of Queries, if any	09.11.2020
4	Last date of receipt of bid documents	13.11.2020 1530HRS
5	Date & time of opening of tender – Part A	13.11.2020 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.

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. Robin Sebastian (Head Procurement)
Address	BSES Rajdhani Power Ltd , 2 nd Floor, B Block, BSES Bhawan, Nehru Place, New Delhi 110019	BSES Rajdhani Power Ltd , 1 st Floor, D Block, BSES Bhawan, Nehru Place, New Delhi 110019
Email	<u>sheshadri.krishnapura@relianceada.com</u> amit.as.tomar@relianceada.com	<u>robin.sebastian@relianceada.com</u> pankaj.goyal@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 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, GITRONI".

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 II
Technical Specifications - Annexure III

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

6.00 **AMENDMENT OF BIDDING DOCUMENTS**

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

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

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

Purchaser shall reserve the rights to following

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

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

7.00 **LANGUAGE OF BID**

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

8.00 **DOCUMENTS COMPRISING THE BID**

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

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

9.00 **BID FORM**

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

9.02 **EMD**

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

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

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

The EMD may be forfeited in case of:

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

OR

- (b) The case of a successful Bidder, if the Bidder does not

- (i) Accept the Purchase Order, or
- (ii) Furnish the required performance security BG.

10.00 **BID PRICES**

10.01 Bidders shall quote for the entire Scope of Supply/Work with a break-up of prices for individual items and Taxes & Duties. The total Bid Price shall also cover all the Supplier's obligations mentioned in or reasonably to be inferred from the Bidding Documents in respect of Design, Supply, Transportation to site, Erection, testing & commissioning all in accordance with the requirement of Bidding Documents The Bidder shall complete the appropriate Price Schedules included herein, stating the Unit Price for each item & total Price with taxes, duties & freight upto destination.

10.02 The prices offered shall be inclusive of all costs as well as Duties, Taxes and Levies paid or payable during execution of the supply work, breakup of price constituents, should be there. The Bidder is required, at his expense, to obtain all the information he may require to enable him to submit his tender including necessary visits to the site to ascertain the local conditions, procurement of necessary materials, labour, etc., requirements of the local/government/public authorities in such matters.

10.03 Prices quoted by the Bidder shall be "**Firm**" and not subject to any price adjustment during the performance of the Contract. **A Bid submitted with an adjustable price/ Price Variation Clause will be treated as non-responsive and rejected.**

11.00 **BID CURRENCIES**

Prices shall be quoted in Indian Rupees Only.

12.00 PERIOD OF VALIDITY OF BIDS

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

12.02 Notwithstanding Clause 12.01 above, the Purchaser may solicit the Bidder's consent to an extension of the Period of Bid Validity. The request and the responses thereto shall be made in writing and sent by post/courier.

13.00 ALTERNATIVE BIDS

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

14.00 FORMAT AND SIGNING OF BID

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

14.02 The original and copies of the Bid shall be typed or written in indelible ink and shall be signed by the Bidder or a person or persons duly authorized to sign on behalf of the Bidder. **Such authorization shall be indicated by written Power-of-Authority 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.



BSES RAJDHANI POWER LIMITED

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

SECTION IV

GENERAL TERMS AND CONDITIONS - SUPPLY

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

2.0 Definition of Terms

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

- 2.11** "Contract Period" shall mean the period during which the "Contract" shall be executed as agreed between the Supplier and the Purchaser in the Contract inclusive of extended contract period for reason beyond the control of the Supplier and/or Purchaser due to force majeure.
- 2.12** "Acceptance" shall mean and deemed to include one or more of the following as will be stipulated in the specification:
- a) The written acceptance of material by the inspector at suppliers works to ship the materials.
 - b) Acceptance of material at Purchaser site stores after its receipt and due inspection/ testing and release of material acceptance voucher.
 - c) Where the scope of the contract includes supplying, acceptance shall mean issue of necessary equipment / material takeover receipt after installation & commissioning and final acceptance.

3.0 Contract Documents & Priority

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

1. Any amendments to Contract
2. Commercial Terms & Conditions of the Contract
3. Clarifications/addendum/corrigendum to Tender
4. Terms & Conditions of the Tender

4.0 Scope of Supply -General

- 4.01 The "Scope of Supply" shall be on the basis of Bidder's responsibility, completely covering the obligations, responsibility and supplies provided in this Bid enquiry whether implicit or explicit.
- 4.02 Bidder shall have to quote for the Bill of quantities as listed elsewhere.
- 4.03 All relevant drawings, data and instruction manuals.

5.0 Quality Assurance and Inspection

- 5.01 Immediately on award of contract, the bidder shall prepare detailed quality assurance plan/test procedure identifying the various stages of manufacture, quality checks performed at each stage, raw material inspection and the Customer hold points. The document shall also furnish details of method of checking, inspection and acceptance standards / values and get the approval of Purchaser before proceeding with manufacturing. However, Purchaser shall have right to review the inspection reports, quality checks and results of suppliers in house inspection department which are not Customer hold points and the supplier shall comply with the remarks made by purchaser or his representative on such reviews with regards to further testing, rectification or rejection, etc. In case of standard items, BRPL shall forward the standard QAP which is to be followed by vendor during manufacturing.
- 5.02 Witness and Hold points are critical steps in manufacturing, inspection and testing where the supplier is obliged to notify the Purchaser in advance so that it may be witnessed by the Purchaser. Final inspection is a mandatory hold point. The supplier can proceed with the work past a hold point only after clearance by purchaser or a witness waiver letter from BRPL.
- 5.03 The performance of waiver of QA activity by Purchaser at any stage of manufacturing does not relieve the supplier of any obligation to perform in accordance with and meet all the requirements of the procurement documents and also all the codes & reference documents mentioned in the procurement document nor shall it preclude subsequent rejection by the purchaser.

- 5.04 On completion of manufacturing the items can only be dispatched after receipt of dispatch instructions issued by the Purchaser.
- 5.05 All in-house testing and inspection shall be done without any extra cost. The in-house inspection shall be carried out in presence of BRPL/BRPL authorized third party inspection agency. Cost of Futile/abortive visit(s) shall be debited from the invoices
- 5.06 Purchaser reserves the right to send any material being supplied to any recognized laboratory for testing, wherever necessary and the cost of testing shall be borne by the Bidder. In case the material is found not in order with the technical requirement / specification, the charges along with any other penalty which may be levied is to be borne by the bidder. To avoid any complaint the supplier is advised to send his representative to the stores to see that the material sent for testing is being sealed in the presence of bidder's representative.

6.0 Packing, Packing List & Marking

- 6.01 **Packing:** Supplier shall pack or shall cause to be packed all Commodities in crates/boxes/drums/containers/cartons and otherwise in such a manner as shall be reasonably suitable for shipment by road or rail to BRPL, Delhi/New Delhi stores/site without undue risk of damage in transit.
- 6.02 **Packing List:** The contents of each package shall be itemized on a detailed list showing the exact weight, extreme outside dimensions (length, width & weight) of each container/box/drum/carton, Item SAP Code, PO No & date. One copy of the packing list shall be enclosed in each package delivered.

7.01 Price basis for supply of materials

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

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

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

Transit insurance will be arranged by bidder.

8.0 Terms of payment and billing – SUPPLY

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

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

9.0 Price Validity

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

10.0 Performance Guarantee

- 10.01 Bank guarantee shall be drawn in favour of "BSES Rajdhani Power Ltd" as applicable. The performance Bank guarantee shall be in the format as specified by BRPL.
- 10.02 Contract performance bank guarantee of total 10% of the contract price shall be submitted within 15 days of award of contract with the validity till completion of the contract period.
- 10.03 Contractor shall submit the performance bank guarantee equivalent to the 10% of the contract value at the time of claiming the last payment as per clause no. 8.0(C) (Terms of payment and billing – SUPPLY), with the validity of the bank guarantee till Defect Liability Period plus 3 months towards Claim period.

11.0 Forfeiture

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

12.0 Release

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

13.0 Guarantee of Performance

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

14.0 Guarantee Period/Defects Liability Period

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

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

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

If during the defects liability period any materials / items are found to be defective, these shall be replaced or rectified by the bidder at his own cost within 30 days from the date of receipt of intimation.

Cost of repairs on failure in Guarantee Period:

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

15.0 Latent Defect:

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

16.0 Support beyond the Guarantee Period

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

17.0 Return, Replacement or Substitution

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

18.0 Effective Date of Commencement of Contract:

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

19.0 Time – The Essence of Contract

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

20.0 The Laws and Jurisdiction of Contract:

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

21.0 Events of Default

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

- (a) Supplier fails or refuses to pay any amounts due under the Contract;
- (b) Supplier fails or refuses to deliver Commodities conforming to this RFQ/ specifications, or fails to deliver Commodities within the period specified in P.O. or any extension thereof
- (c) Supplier becomes insolvent or unable to pay its debts when due, or commits any act of bankruptcy, such as filing any petition in any bankruptcy, winding-up or reorganization proceeding, or acknowledges in writing its insolvency or inability to pay its debts; or the Supplier's creditors file any petition relating to bankruptcy of Supplier;
- (d) Supplier otherwise fails or refuses to perform or observe any term or condition of the Contract and such failure is not remediable or, if remediable, continues for a period of 30 days after receipt by the Supplier of notice of such failure from BRPL.

22.0 Consequences of Default

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

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

23.0 Liquidated Damages

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

24.0 Statutory variation in Taxes and Duties

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

25.0 Force Majeure

25.01 General

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

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

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

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

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

25.03 Notice of Events of Force Majeure If a force majeure event prevents a party from performing any obligations under the Contract in part or in full that party shall:

- i) Immediately notify the other party in writing of the force majeure events within 7(seven) working days of the occurrence of the force majeure event
- ii) Be entitled to suspend performance of the obligation under the Contract which is affected by force majeure event for the duration of the force majeure event.
- iii) Use all reasonable efforts to resume full performance of the obligation as soon as practicable
- iv) Keep the other party informed of all such efforts to resume full performance of the obligation on a regular basis.
- v) Provide prompt notice of the resumption of full performance or obligation to the other party.

25.04 Mitigation of Events of Force Majeure Each Party shall:

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

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

25.06 Termination for Certain Events of Force Majeure. If any obligation of any Party under the Contract is or is reasonably expected to be delayed or prevented by a Force Majeure event for a continuous period of more than 3 months, the Parties shall promptly discuss in good faith how to proceed with a view to reaching a solution on mutually agreed basis. If a solution on mutually agreed basis cannot be arrived at within a period of 30 days after the expiry of the period of three months, the Contract shall be terminated after the said period of 30 days and neither Party shall be liable to the other for any consequences arising on account of such termination.

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

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

25.08 Limitation of Force Majeure event. The Supplier shall not be relieved of any obligation under the Contract solely because cost of performance is increased, whether as a consequence of adverse economic consequences or otherwise.

25.09 Extension of Contract Period due to Force Majeure event The Contract period may be extended by mutual agreement of Parties by way of an adjustment on account of any period during which an obligation of either Party is suspended due to a Force Majeure event.

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

26.0 Transfer and Sub-Letting

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

27.0 Recoveries

When ever under this contract any money is recoverable from and payable by the bidder, the purchaser shall be entitled to recover such sum by appropriating in part or in whole by detecting 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

	Laying of one HT feed from Fatepurberi Grid via Aya nagar with installation of one O/D at C-2 Ayanagar area upto NICF ESS. Second source from Fatepurberi Grid to Gadhaipur village ss/tn with installation of one O/D RMU. Further extension from Empire Apartment SS/stn to NICF Ghitorni ESS on turnkey basis							
MATERIAL SUPPLY								
Sl no	Description	UOM	Qty	Basic (Rs)	Freight (Rs)	GST (Rs)	Unit Landed (Rs)	Total Landed Cost (Rs)
1	CBL,PWR,300MM2;3C;11KV;AL;XLPE	M	22600					
2	KIT CBL TERN IND 11KV 3CX300MM2 HS XLPE	EA	8					
3	KIT STRT JNT -- 11KV 3CX300MM2 HS XLPE	EA	70					
4	RNG MAIN UNT,INDR,3WAYS,11KV	EA	1					
5	RNG MAIN UNT,O/D,3WAYS,11KV	EA	2					
6	PIPE,CONDUIT,GI,100MM	M	100					
7	EXTINGUISHER,FIRE,ABC TYPE,5KG	EA	2					
8	MAT,INSLTNG:5M:1M:3MM:Elastomer	EA	2					
9	PNL,ELEC PWR,INDR OG FDR;11KV;800A	NOS	2					
10	CBL ELEC ARM 1.1KV, FRLS PVC CU 10C 2.5MM2(2100004724)	M	50					
11	CABLE ARM PVC 1.1KV , FRLS 6C 2.5MM2 CU	M	50					
12	HT XLPE cable of size 3x150 sq. mm	M	10					
13	KIT CBL TERN IND 11KV 3CX150MM2 HS XLPE	EA	2					
14	Supply of MS Steel (Angle, Channel, Flat)	KG	40					
15	Supply of HDPE 160 mm Pipe	M	11000					
16	Supply and fixing of wire mesh fencing 2.65 mtr height with gate frame of 3 mtr x 2.5 mtr with complete material eg angle,chain link,wire mesh and civil material etc complete as per specification,drawing no.Angle iron size 50x50x6 mm & MS strip 50 x 3 mm wire mesh 1"x3", 8 SWG wire to be used for wire-mesh with providing support at 1.25 distance.	SQM	38					

Appendix- I

COMMERCIAL TERMS AND CONDITIONS - SUPPLY

Sl No	Item Description	AS PER BRPL	BIDDER'S CONFIRMATION
1	Validity	120 days from the due date of submission or amended due date of submission	
2	Price basis	a) Firm , FOR Delhi store basis. Prices shall be inclusive of all taxes & duties, freight up to Delhi stores. b) Unloading at stores - in vendor's scope c) Transit insurance in Bidder scope	
3	Payment terms	a. 70 % against R/A bills within 30 days against receipt of material at site b. 15% prorata after installation/erection of equipment c. 15% prorata after completion of successful acceptance testing, commissioning and Handing Over of the entire Installation and duly certified by BRPL Project-in-charge and submission of BG of 10% of contract value valid up to Defect Liability period i.e. 24 months from the date of Handing over of entire Installation Plus 3 months towards Claim period	
4	Completion time	4 months from date of LOI/Order	
5	Defect Liability period	24 months from the date of Handing over of entire Installation. For Cable, 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.	

APPENDIX II**BID FORM**

To

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

Sir,

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

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

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

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

5 We agree to abide by this Bid for a period of 120 days from the due date of bid submission & subsequent corrigendum/amendment/extension of due date of submission. It shall remain binding upon us and may be accepted at any time before the expiration of that period.

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

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

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

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

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

Signature..... In the capacity of

.....duly authorized to sign for

and on behalf of

(IN BLOCK CAPITALS).....

Appendix III

ACCEPTANCE FORM FOR PARTICIPATION IN REVERSE AUCTION EVENT

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

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

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

1. In case of bidding through Internet medium, bidders are advised to ensure availability of all associated infrastructure as required to participate in the reverse auction event. Inability to bid due to telephone glitch, internet response issues, software & hardware hangs/failures, power failures or any other reason shall not be the responsibility of BRPL.
2. In case bidder fails to participate in the reverse auction event due to any reason whatsoever, it shall be presumed that the bidder has no further discounts to offer and the initial bid submitted by them as a part of tender shall be considered as bidder's Final No Regret offer. Any off-line price bids received from a bidder in lieu of non-participation in the reverse auction event shall be rejected by BRPL.
3. The bidder is advised to understand the auto bid process to 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 contractor is deemed to have visited the site of the work and ascertained therefore all site conditions and information pertaining to his work. The company shall not accept any claim whatsoever arising out of the difficult site/terrain/local conditions, if any.

3. LANGUAGE AND MEASUREMENT:

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

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

4. SCOPE OF WORK:

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

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

All the labour, cranes, tool and tackles, and technical supervision etc. are including in your scope of work. Adequate number of engineers, supervisors and laborers shall be posted at site and the list of the same along with certificate of Qualification of technical staff should be submitted by the Contractor to the Engineer In Charge for checking the adequacy immediately (within seven days) after award of contract.

The Contractor shall also make his own arrangement for the accommodation/conveyance requirements for its staff at site. Company will be provided at site the adequate open space for contractor's site store for storing the materials, tools, tackles etc. The entire Contractor's storage will be within the site premises. All the incoming and outgoing materials, equipment, tools, tackles and any other items related to said work shall be entered into the register kept for this purpose and shall be in the custody of Contractor, however company does not hold any responsibility for any loss or damage of Contractor's material etc.

All loading/unloading, of materials at work-site shall be Bidder's responsibility. Involvement of Crane/Hydra/Tractor/Trailer for this type of work shall be in your scope. Adequate weather protection shall be provided by the contractor to keep the materials safe from sun & rain by providing covered storage space as well as using tarpaulins.

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

Special Instruction:-

- a. 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 the employees or agents of COMPANY or contractor for bodily injury, damage to property or other loss which may arise out of or in consequence of the execution or completion of Works and against all costs charges and expenses that may be occasioned to COMPANY by the claims of such person.

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 parties 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.

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

	Laying of one HT feed from Fatehpur beri Grid via Aya nagar with installation of one O/D at C-2 Ayanagar area upto NICF ESS. Second source from Fatehpurberi Grid to Gadhaipur village ss/tn with installation of one O/D RMU. Further extension from Empire Apartment SS/stn to NICF Ghitorni ESS on turnkey basis						
SERVICE							
Sl no	Description	UOM	Qty	Basic (Rs)	GST (Rs)	Unit Landed (Rs)	Total Landed Cost (Rs)
1	Installation of Chemical earthing as per technical specification	EA	12				
2	Supply and fixing of GI strip(50 X 6 mm) for more than 20 meter.	M	300				
3	Making Cable End termination 11KV 3CX300MM2 HS XLPE	EA	8				
4	Laying of Cable 3X300 sq mm in S/Stn trench/pipe	M	11000				
5	Laying of Cable 3X300 sq mm in S/Stn trench/pipe	M	800				
6	Charges for digging of the trench - double ckt	M	5400				
7	Laying of under- ground HT. cable in trench ,cable of size 3X150/300 sq.mm.11KV. double Circuit	M	5400				
8	Testing and commissioning comprising of Hi-pot test, primary injection, IR & mV Drop test for 3-Way RMU .	EA	3				
9	RMU Installation 3- Way RMU	EA	3				
10	Supply, fabrication & Erection of MS Frame for 3-Way RMUs .	EA	3				
11	Providing and Fixing of Danger plate with clamps.	EA	2				
12	High Pot Testing	EA	20				
13	Cleaning and clearing of malba after completion of work at site or removal of malba to carry out the work at site.	CUM	500				
14	Route survey charges	M	8000				
15	Making Straight Through joint 11KV 3CX300MM2 HS XLPE.	EA	70				

16	Charges for providing continous steel barricade 1.2 mtr high including cost of all material plant consumables transport and labour for shifting placing painting and regular maintenance.	M	1500				
17	C113-Plaster with cement mort 1:4	SQM	15				
18	C1040210-Dig.Jt/Pit Bric & Sand By Cont.	EA	50				
19	C11605-Paint Nomenclature, HT/LT Equip	EA	300				
20	ETC of 11kV, 800A grid panel	EA	2				
21	Fabrication work using MS steel	KG	40				
22	Laying of HT/LT cables through S/Stn Trench. above 50 sqmm upto 150 sqmm.	M	10				
23	Making Cable End termination for 11kV 3C x150 sqmm	EA	2				
24	Laying of HDPE 160 mm Pipe through Trenchless method.	M	11000				

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-XI
FORMAT FOR PERFORMANCE BANK GUARANTEE

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

Bank Guarantee No.

Place:

Date:

To
BSES Rajdhani Power Limited

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

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

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

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

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

Now it is agreed as follows:

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



BSES RAJDHANI POWER LIMITED

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 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,GITRONI			
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, Ghitroni " 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.

For and on behalf of the members of Consortium

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



BSES RAJDHANI POWER LIMITED

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-II

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 12
Approved By	K. Sheshadri		28Oct 2020

**TECHNICAL SPECIFICATION FOR SUPPLY, ERECTION, TESTING & COMMISSIONING OF 11KV CABLE
SUPPLY AND LAYING WORK ON TURNKEY BASIS****Registered office: BSES Bhawan , Nehru Place , New Delhi- 19****Index**

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1.	Laying of 66kV / 33kV / 11kV / 1.1 kV grade PVC / XLPE cables	
2.	11kV HT cable (3CX300 sqmm cable)	
3.	66kV / 33kV /11kV Jointing Kit	
4.	66kV / 33kV /11kV Termination Kit	
5.	1.1 kV LT power and control cable	
6.	1.1kV LT termination	
7.	11kV Ring Main Unit	
8.	11kV VCB Panel	
9.	Chemical Earthing	
10.	GI and Earthing pipe	
11.	Nut bolt, Washer etc & PVC insulation tape	
12.	GI Strip	
13.	PPE Items	
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16.	11kV Metering cubicle	
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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	Fibre 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	Aluminium 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	√	
3	Supply, Laying, testing and commissioning of 11kV VCB panel (Indoor)	X	√	
4	Supply, Laying, testing and commissioning of 11kV Ring Main Unit (Indoor and Outdoor)	X	√	
5	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
6	GPR/Scanning of the whole route shall be done and the same shall be submitted to BRPL. The report shall be submitted within 15 days after the issue of LOI	X	√	This work shall be done by vendor before execution of job.
7	Drawing Submissions	X	√	
8	Engineering Approvals	√	X	
9	Testing Equipments	X	√	

**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	Lighting Arrangement	X	√	
11	Construction Power and Construction Water	X	√	
12	Safety , Security and insurance of Manpower(Labour, Engineers, Supervisors etc)	X	√	Labour should be provided with every safety gear like safety jacket, helmet etc.
13	Various Tools and Tackles related to Job	X	√	
14	Transportation of Material and any other tender related work	X	√	
15	Cleanliness around project site	X	√	
16	Security and Safety of material until handing over the project to BRPL	X	√	
17	Providing of Various Machines e.g Crane, Hydra, JCB, Hammer , Cutting Machine etc. to complete the project	X	√	
18	Providing of Trenchless Machine	X	√	
19	Loading and Unloading of material at site including scrap returning to BRPL site	X	√	
20	Electrical Inspector Clearance	X	√	Statutory fees will be borne by BRPL
21	Providing of Continuous Steel Barricading with Mobile no of project supervisor, sufficient traffic marshal, beacon light, Fluorescent tape, PPE etc. (Mobile no shall be clearly visible on the barricading)	X	√	As per drawing enclosed with specification.
22	Permit to work requesting Agency in BRPL premises	X	√	Permit Should be applied to Engineer Incharge prior to work through proper procedure
23	Permit to work issuing agency inside BRPL Premises	√	X	
24	Temporary office and Material Store near work premises	X	√	
25	Storage of all kind of Material required for project	X	√	BRPL premises will not provide for any kind of material storage and issuance
26	Dismantling of material at project site, , Dismantled material loading, Unloading and transportation and deposit to BRPL store	X	√	Store location will be within BRPL premises

**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
27	Preparation, updation and submission of PERT chart fortnightly to track activities	X	√	
28	Submission of final drawing showing layout of cable in Google map along with of cable joint location with GPS Coordinates	X	√	Approval will be done by BRPL Representative
29	Removal and renaming of existing signboard of other utilities (if any) including painting as per their actual route	X	√	Painting colour and material should be in line with the existing ones for aesthetic look
30	Surface levelling, removal and disposal of excess earth (malwa) after back filling of trench. During execution excavated earth shall be covered with green mat to prevent dust pollution. Also regular Water Sprinkling is to be required at site.	X	√	
32	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	√	

Special requirement

1. Delivery of cable at site and all other associate equipment /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 an interval of 1 meter on the outer sheath of the cable.

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

5. HDPE pipe make shall be from Flow well, Tirupati and Narendra Polyplast.
6. Type test required after award of PO for cable
 - i) Type test-1 (To be borne by the bidder): Sample for Type test shall be taken from one randomly selected drum from any lot of each type/rating of PO. Sample shall be sent to CPRI/ERDA by respective OEM to conduct type test as per relevant IS/IEC. Cost of this type test shall be borne by 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.

Note: Bidder to note that Type test result will not withhold any final MDCC. Bidder shall get the final MDCC as per actual delivery of cable. Type test process shall continue side by side as per schedule at CPRI/ERDA.

3.00.00 PACKAGE

3.01.00 Laying of one HT feed from Fatepurberi Grid via Ayanagar with installation of one O/D at C-2 Ayanagar area upto NICF ESS. Second source from Fatepurberi Grid to Gadhaipur village ss/tn with installation of one O/D RMU. Further extension from Empire Apartment SS/stn to NICF Ghitorni ESS on turnkey basis (KR20NC2005)

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



BSES Rajdhani Power Ltd

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

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

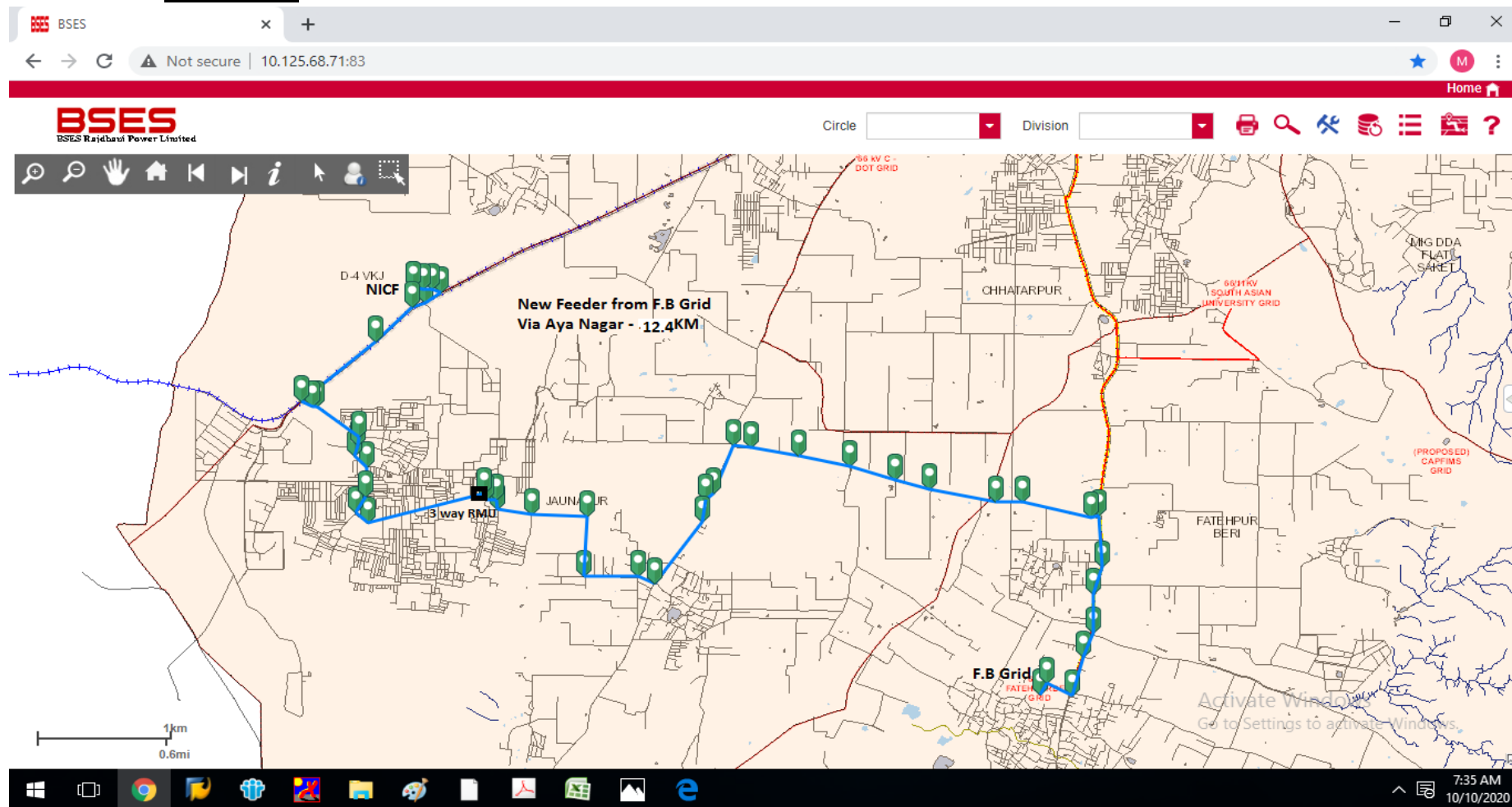
Sl no	Specification cl no	Deviation	Remark

**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	
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	11kV VCB Panel	1. Schneider Electric	
4	11 kV Jointing and Termination KIT	1. Raychem 2. 3M 3. Compaq 4. Yamuna Denson	
5	11kV Metering Cubicle	1. Adhunik 2. Perfect sales 3. Concord	
6	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

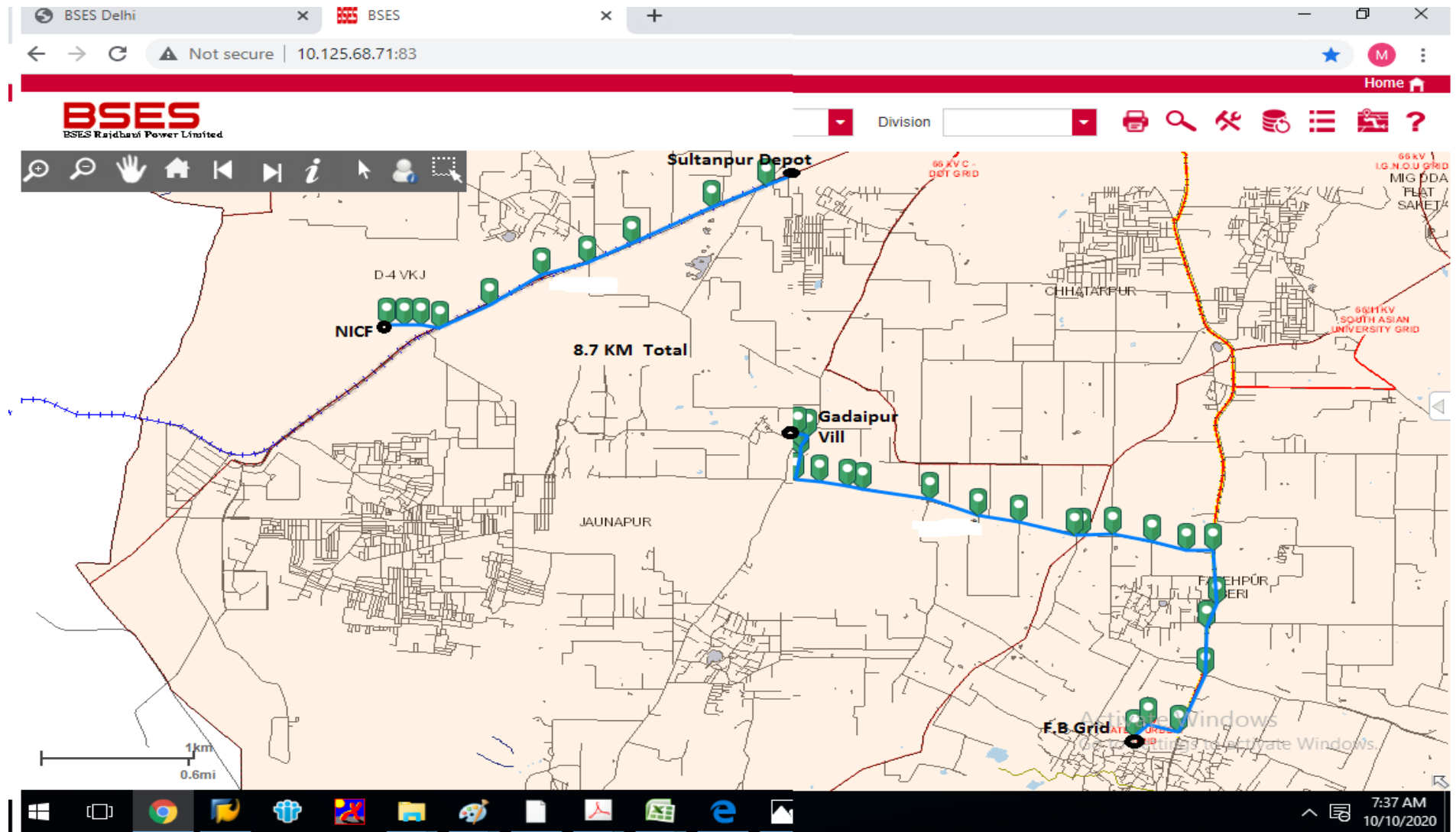
3.02.00 Route Map



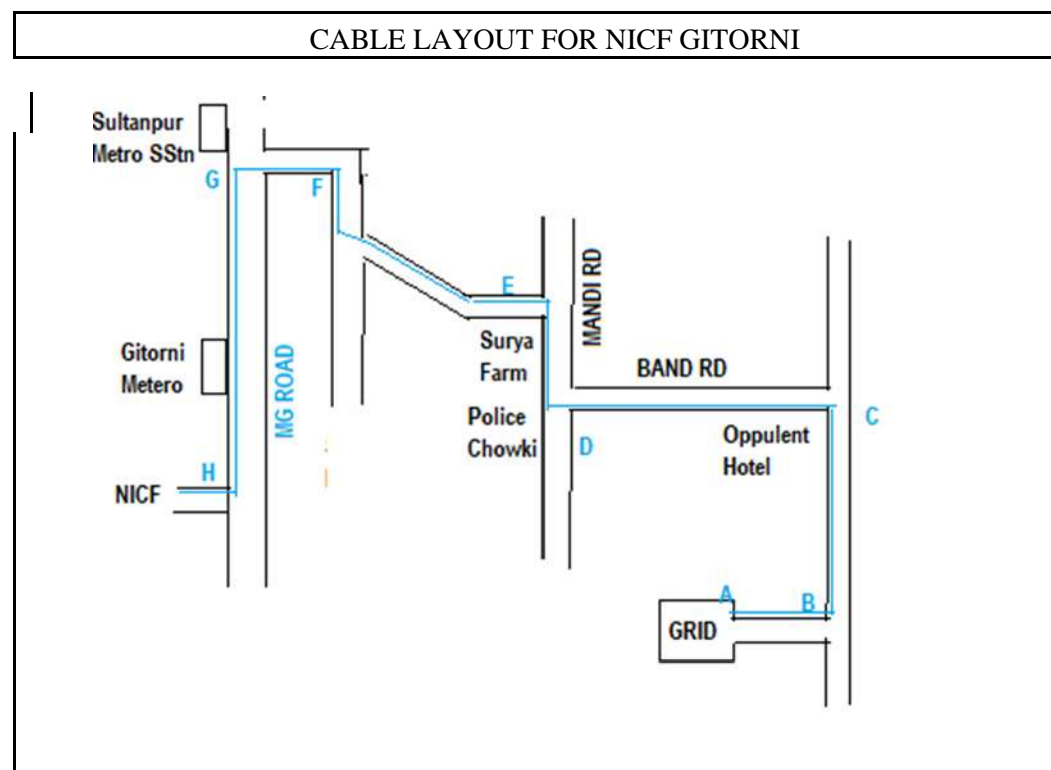


BSES Rajdhani Power Ltd

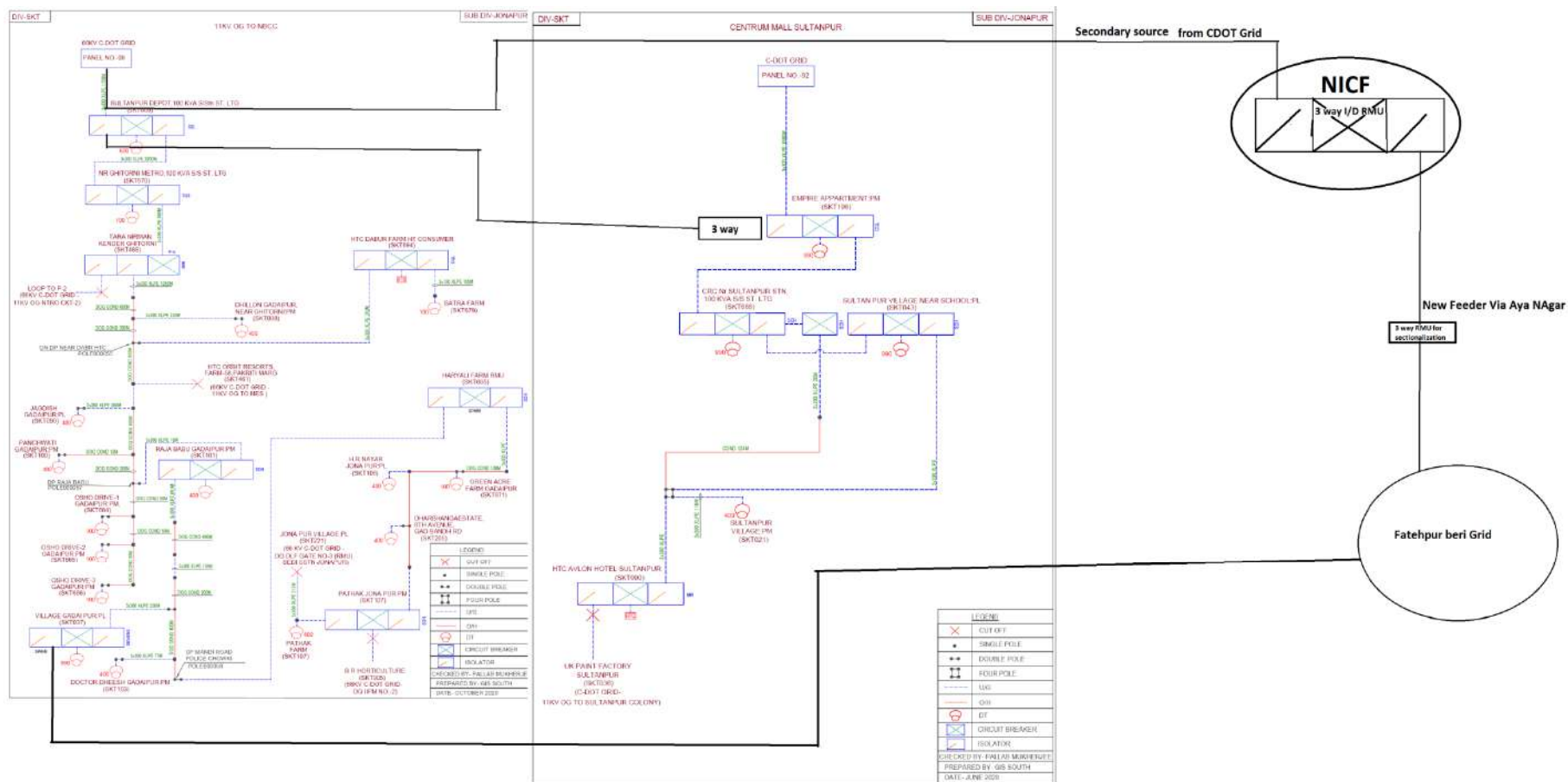
TECHNICAL SPECIFICATION FOR SUPPLY, ERECTION, TESTING & COMMISSIONING OF 11KV CABLE SUPPLY AND LAYING WORK ON TURNKEY BASIS



CABLE LAYOUT FOR NICF GITORNI



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



ANNEXURE-III



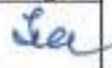
TECHNICAL SPECIFICATIONS



**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 Bairagi		Amit 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-EWHP-01-R3)	As per Revised Technical Specification(GN101-03-SP-172-00)	Date of approval	Approved by
1	2.0.0	Cable Construction Features	XLPE	TR-XLPE	23/07/19	KS
2	2.1.12-C-12	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> 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.	23/07/19	KS
4	4.0.0-c	Routine 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 -OEM shall intimate 10 days advance to BRPL along with complete manufacturing scheduled	23/07/19	KS
6	4.0.0-e	Acceptance Tests	a. Wafer Boil test- once per PO b. Void-and-contamination Test- once per PO c. Strippability 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. Wafer Boil test- in each lot b. Void-and-contamination Test- in each lot c. Strippability 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) 300 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-e	Type of Drum	Steel/Wooden	only Steel non returnable	23/07/19	KS

Proposed by
Pronab Bairagi

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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	<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-swellaable tapes / yarn / powder, etc.) shall also be stated in the List of Sub-Vendors for pre-order approval. f) All detailed constructional features shall be shown in the cross-sectional drawing.
2.1.2	Conductor Screen	<p>Extruded semi-conducting material. (Also refer Cl. 2.1.3.) (Tapes are not acceptable)</p>
2.1.3	Insulation	<ul style="list-style-type: none"> a) Extruded XLPE (Cross-Linked Poly-Ethylene) Insulation, with water-tree retardant (WTR) property 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	<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-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>
2.1.8	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.	

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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			

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

	(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)

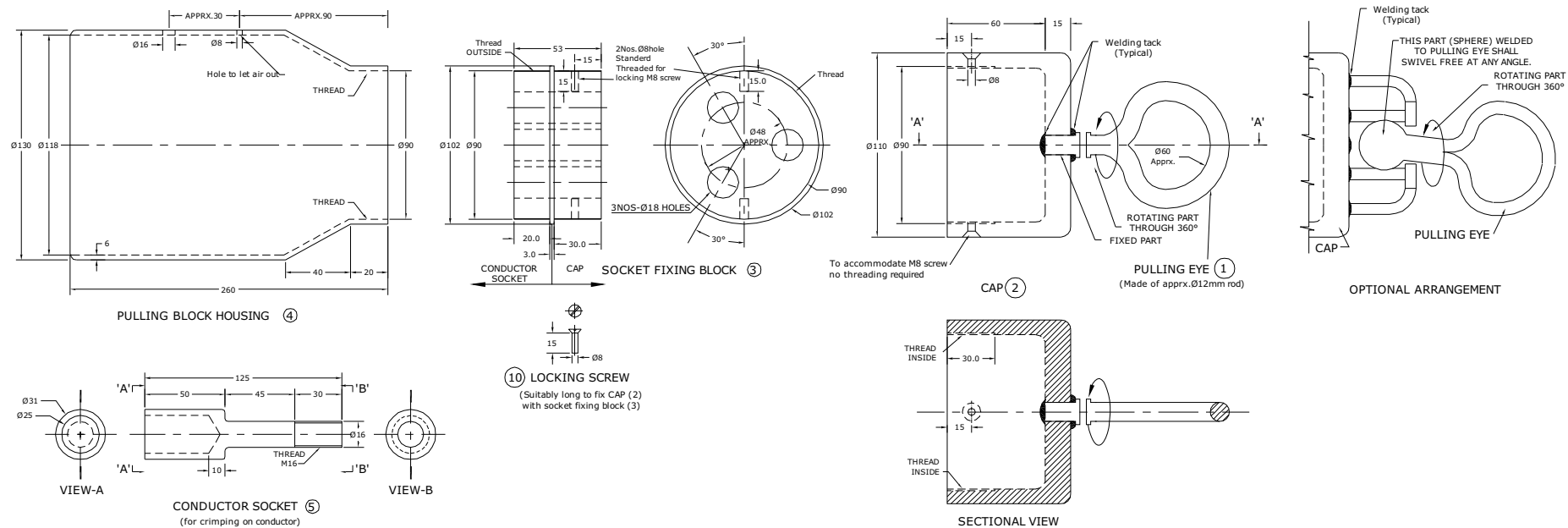
B. Delhi		
a)	Average grade atmospheric condition	Heavily polluted, dry
b)	Maximum altitude above sea level	1000 M
c)	Air temperature Ambient	i) Highest : 50 deg C ii) Average : 40 deg C iii) Minimum : 0 deg C
d)	Relative Humidity	100 % max
e)	Thermal Resistivity of Soil	150 deg. C. cm / W max.
f)	Seismic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

Annexure E

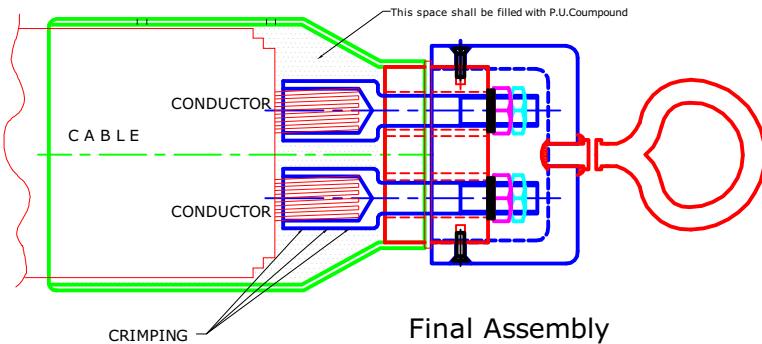
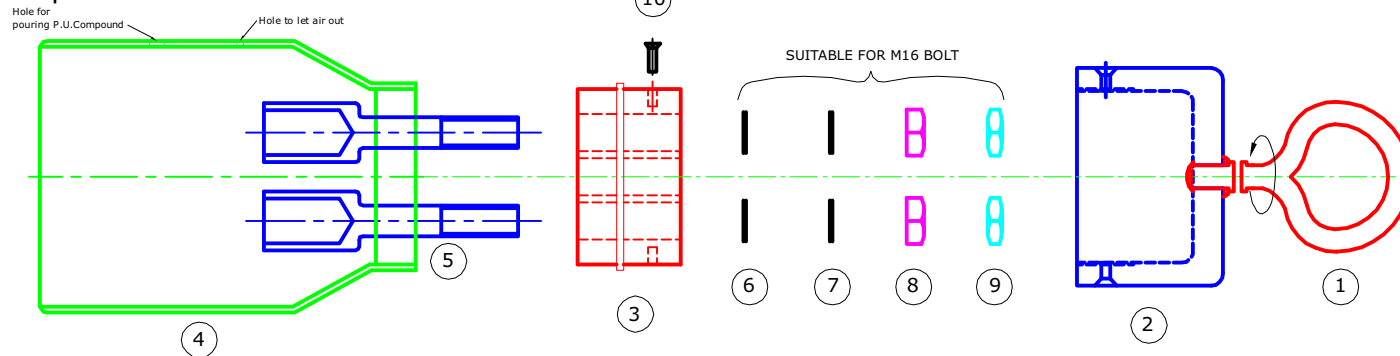
1. General Arrangement Drawing for Cable Pulling Eye

2. General Arrangement Drawing for End-sealing Cap

Both the above drawings are given on next pages.



Exploded View



EXAMPLE:

- 1) For cable size 33kV, 3/C X 400sq mm Al XLPE.
- 2) 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:

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

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:

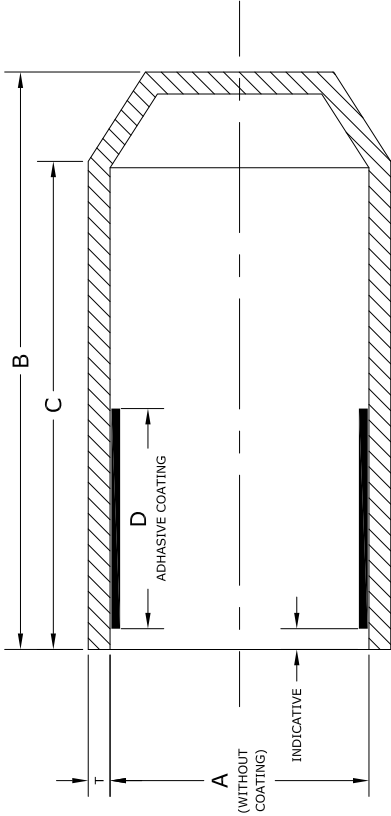
REVISIONS

Addl V.P.

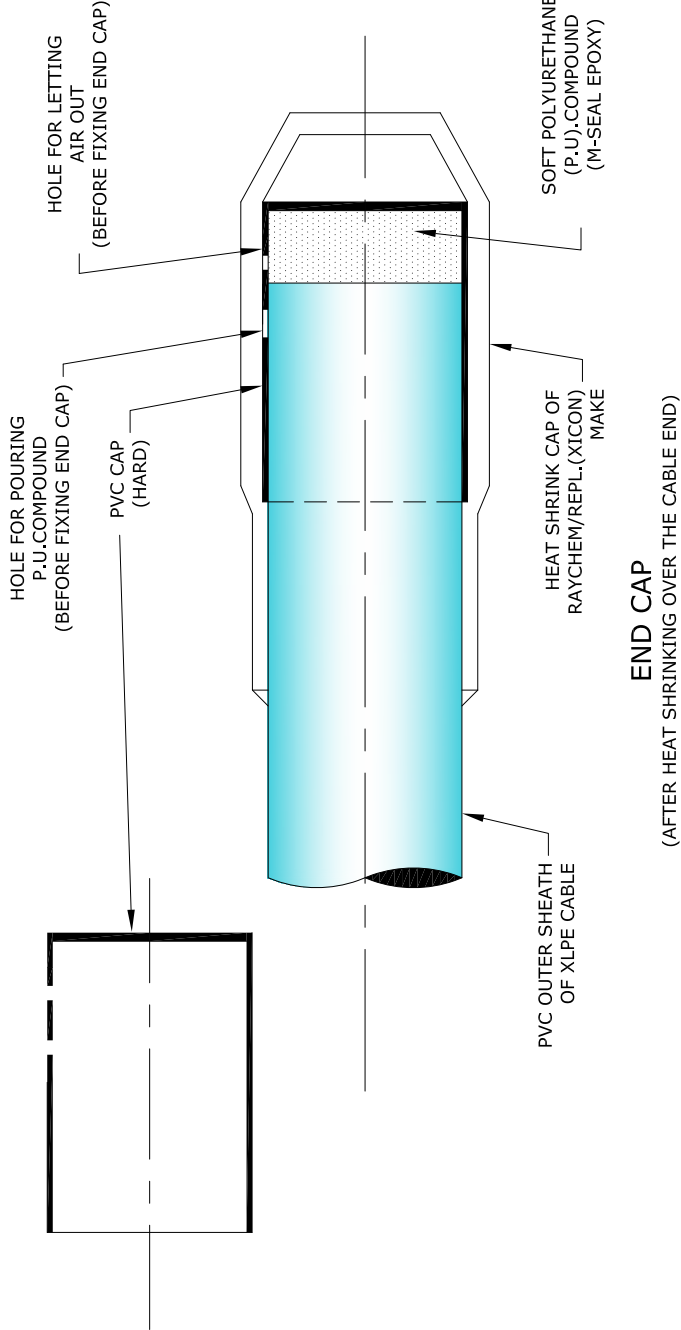
DIMENSIONS

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



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

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

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

Addl V.P.

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	
4	Taping - water Swellable semi-conducting	k) Wafer boil test for extruded semi-conducting layers	Major	Physical	1 sample/lot	BIS draft Specn	BIS draft Specn	Reg./Sheet	-	P	V	
		a) Dimensions	Minor	Physical	Sample	Tech. Data Sheet	Tech. Data Sheet	-	-	P	-	
5	Taping - Copper tape	b) Tape Application (Overlap)	Minor	Visual	During m/c setting	Suitable overlap	Suitable overlap	-	-	P	-	
		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		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	
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	



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

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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	



**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											
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

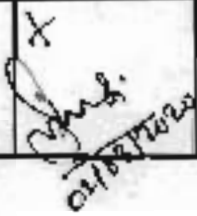

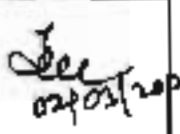
Annexure-H: Deviation Format

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

BSES

Technical Specification for LT POWER CABLE WITH FRLS OUTER SHEATH (Single & Multi-Core)

Specification no – SP-EWLP-01-R5

Prepared By		Reviewed By		Approved By		Rev /Pa ges	Date
Name	Sign	Name	Sign	Name	Sign		
Rohit Patil		Amit Tomar		K. Sheshadri		R5/ 22	02.03.2020

TECHNICAL SPECIFICATION OF LT POWER CABLE**INDEX****Contents**

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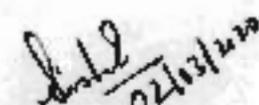
RECORD OF REVISION

Sr. No.	Revision No.	Item/Cl. No.	Nature of Change	Approved By
1	R2	2.0	National & International Standards added	VP
2	R2	3.6 (c)	UV resistance test shall be carried out on all size of cable	VP
3	R2	6.4	Type tests Cl. Changed.	VP
4	R2	4.1 & 4.2	Cable Drum as per IS 10418	VP
5	R2	4.3	For 2C X 10 mm ² cable drum length – 1000 +/- 5% Mtr	VP
6	R3	ANNEXTUE- C	New size cable added 1.1 kV 1CX1000 mm ²	KS
7	R4	3.6	Drum number laser printing on every meter of cable outer sheath	KS
8	R5	2.0	National & International Standards added	KS
9	R5	3.6	FRLS outer sheath	KS
10	R5	3.9	FRLS outer sheath properties	KS
11	R5	6.5	Acceptance Test	KS
12	R5	Annexure-E	Sub vendor list	KS

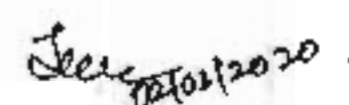
Prepared By


Rohit Patil

Reviewed By


Amit Tomar

Approved By


K. Sheshardri

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

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

2.0 CODES & STANDARDS

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

2.1	IS- 7098 (Part-1)	Cross linked polyethylene insulated PVC sheathed cables for working voltages upto and including 1100V.
2.2	IS- 6474	Polyethylene insulation & sheath of electric cables.
2.3	IS- 5831	PVC insulation and sheath of electrical cables.
2.4	IS : 10810	Methods of tests for cables.
2.5	IS : 8130	Conductors for insulated electrical cables and flexible cords.
2.6	IS : 3975	Low carbon galvanized steel wires, formed wires and tapes for armouring of cables.
2.7	IS- 4026	Aluminum Ingots, billets and wire bars (EC grade)
2.8	IS-5484	EC Grade aluminium rod produced by continuous casting and rolling
2.9	IS : 10418	Specification for drums for electric cables.
2.10	IS : 3961	Recommended current ratings for cables.
2.11	IS:1255	Installation and Maintenance of power cables upto and including 33 kV rating.
2.12	IS:4826	Specification for hot-dipped galvanized coatings on round steel wires
2.13	IS:1717	Metallic Materials – Wire – Simple torsion test
2.14	IEC 60228	Conductors of insulated cables. Guide to the dimensional limits of circular conductors.
2.15	IEC 60331	Fire resisting characteristics of electric cables.
2.16	IEC 60332 – 3	Tests on electric cables under fire conditions. Part 3: Tests on bunched

TECHNICAL SPECIFICATION OF LT POWER CABLE

		wires or cables.
2.17	IEC 60502	Extruded solid dielectric insulated power cables for rated voltages from 1kV to 30 kV.
2.18	IEC 60754 - 1	Test on gases evolved during combustion of materials from cables. Part 1: Determination of the amount of halogen acid gas evolved during combustion of polymeric material taken from cables.
2.19	IEC 60811	Common test methods for insulating and sheathing materials of electric cables
2.20	IEC 60885	Electric test methods for electric cables
2.21	IEC 60304	Standard colours for insulation for low frequency cables and wires.
2.22	IEC 60227	PVC insulated cables of rated voltages up to and including 450/750 V.
2.23	IEC 1034	Measurement of smoke density of electric cables burning under defined conditions
2.24	ASTMD 2843 (R5)	Standard Test Method for density of Smoke from the burning or decomposition of cables
2.25	ASTM 2863 (R5)	Standard Test Method for measuring of minimum oxygen concentration
2.26	IEC 60754-1 (R5)	Test on gases evolved during combustion of materials for cables. Part 1 – Determination of the Halogen Acid gas Content
2.27	IS 1554 part 1	Specification for PVC Insulated (Heavy duty) Electric cable

TECHNICAL SPECIFICATION OF LT POWER CABLE**3.0 CABLE DESIGN**

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

3.1	Conductor	a) Electrolytic Grade Stranded Aluminium Conductor b) Grade : H2 as per IS: 8130/1984 c) Class 2 d) Chemical Composition as per IS 4026 e) Shape & Size: <table><tr><th>S.no.</th><th>Shape</th><th>Single core</th><th>Multi core</th></tr><tr><td>1</td><td>Compacted Circular</td><td><ul style="list-style-type: none">1x3001x6301x1000</td><td>2x10</td></tr><tr><td>2</td><td>Sector</td><td>---</td><td><ul style="list-style-type: none">2x254x254x504x150</td></tr></table>	S.no.	Shape	Single core	Multi core	1	Compacted Circular	<ul style="list-style-type: none">1x3001x6301x1000	2x10	2	Sector	---	<ul style="list-style-type: none">2x254x254x504x150
S.no.	Shape	Single core	Multi core											
1	Compacted Circular	<ul style="list-style-type: none">1x3001x6301x1000	2x10											
2	Sector	---	<ul style="list-style-type: none">2x254x254x504x150											
3.2	Insulation	Extruded XLPE as per IS : 7098 part-1												
3.3	Core Identification	As per Cl.10 of IS 7098 part-1												
3.4	Inner Sheath	For 1.1 kV 2CX10, 2CX25 Pressurized Extruded For other cable Extruded Inner Sheath of black PVC type ST-2 (IS 5831-1984)												
3.5	Armour	a) For 2C X 10 mm ² – Galvanized Steel round wire. b) For all sizes above 10 mm ² -Galvanized Steel Strip c) Not applicable for single core cables of size 300 , 500 , 630 & 1000 mm ² d) Minimum area of coverage of armouring shall be 90% e) The breaking load of armour joint shall not be less than 95% of that armour wire / strip f) Zero negative tolerance for thickness of armour strip shall be as per IS:3975 g) Zinc rich paint shall be applied on strip/wire and its joint surface.												
3.6	Outer Sheath	a) Extruded FRLS (RS) outer sheath of PVC (ST-2) shall be as per IS:5831 b) Colour : Yellow (For multi core cables)												

TECHNICAL SPECIFICATION OF LT POWER CABLE

		<p>Black (For single core 300,500, 630 & 1000 mm²)</p> <p>c) FRLS(R5) Outer sheath of all the LT cables shall be UV resistant; as these cables are laid in air exposed to sun. Bidder to ensure the same for these requirements supported by required test.</p> <p>d) Shape of the cable over the outer sheath shall be circular, when manufactured/completed.</p> <p>e) The FRLS (R5) outer Sheath shall be embossed with following minimum text:</p> <ul style="list-style-type: none"> i) The voltage designation ii) Type of construction /cable code (For e.g. A2XWY/A2XFY) iii) Manufacture name/Trade mark iv) Number of Cores and nominal cross section area of conductor v) Name of buyer i.e BRPL (BSES Rajdhani Power Ltd.) vi) Month & year of manufacturing vii) IS reference , i.e IS-7098 viii) P.O No. and Date ix) Font size shall be 5/5mm x) ISI mark <p>The embossing shall be progressive, automatic, in line and marking shall be legible and indelible.</p> <p>Following points shall be laser printed on every meter of cable</p> <ul style="list-style-type: none"> i. Progressive (Sequential) length of cable at every meter, starting from zero for every drum. Colour filled in for the progressive marking, shall be with proper contrast in colouring. ii. Drum number marking on every meter of the cable length
3.7	Bending Radius	Bending Radius of cable shall comply to IS:1255
3.8	Sealing of cable end	Both ends of the cable shall be sealed by means of non-hygroscopic heat shrinkable HDPE caps
3.9	FRLS Properties (R5)	<p>Oxygen Index : Not less than 29% as per ASTM 2863</p> <p>Temperature Index : 250 Deg C at Oxygen Index 21 (when tested as per ASTM D 2863)</p> <p>Max Acid Gas Generation – Not more than 20% as per IEC -60754-1</p> <p>Light Transmission - Minimum 40% when tested as per ASTM D 2843 (Smoke Density rating shall be max 60%)</p> <p>Flammability Test – As per IEC 60332-III, Cat – B, IEC 60332- I, IS- 10810 – Part 53, IS:10810 – Part 61 & 62 (Category A)</p>

4.0 CABLE DRUM

4.1	Reference Standard	Cable drum shall comply with IS: 10418.
4.2	Type of Drum	Wooden drums with anti termite treatment. (The drums shall be provided with M.S spindle plate and nut-bolts arrangement as per IS: 10418)

TECHNICAL SPECIFICATION OF LT POWER CABLE

4.3	Drum Length & Tolerance	For 1.1 KV 2C X 10 mm ² Cable - 1000+/-5% Mtr For all size above 10 mm ² Cables - 500 +/-5% Mtr
4.4	Overall Tolerance	-2 % for the total cable length for the entire order.
4.5	Short Length of Cable	a) Minimum Acceptance short length shall be 1% of the total ordered quantity and no length shall be less than 500 mtrs for 2C X 10 mm ² cable & 250 mtr for all sizes above 10 mm ² . Manufactures shall be taken prior approval from BRPL Engineering for any short length supply. Short length will be accepted in last lot. b) Manufacture shall not be allowed to put two cable pieces of different short length in same cable drum
4.6	Preventive Measure for cable Drum	a) The surface of the drum and outer most cable layer shall be covered with water proof layer b) Ferrous part of wooden drum shall be treated with suitable rust preventive paint/coating to minimize rusting during storage.
4.7	Drum Identification Labels	a) Drum identification number b) Cable voltage grade c) Cable code (eg. A2XFY/A2XWY) d) Number of cores and cross sectional area e) Cable quantity i.e cable length (Meters) f) Purchase order number, date & SAP item code g) Total weight of cable and drum (kg) h) Manufacturer's and Buyer's name i) Month & year of manufacturing j) Direction of rotation of drum; an arrow and suitable accompanying wording shall be marked on one end of the reel indicating the direction in which it should be rolled. k) Cable length final end-marking (i.e reading at the inner end and reading at the outer end, just before packing shall be marked on the drum.

5.0 PACKING , SHIPPING , HANDLING & STORAGE

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

TECHNICAL SPECIFICATION OF LT POWER CABLE**6.0 QUALITY ASSURANCE , TESTING & INSPECTION**

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

6.1	Quality Assurance Plan	As per Annexure – E. In event of order Manufacturer has to Submit the signed copy of QAP.
6.2	Inspection hold points	As per QAP
6.3	Routine Test	a) Measurement of Electrical Resistance b) HV test with power frequency AC voltage
6.4	Type Test	(a) Cables must be of type tested quality. Type test reports shall be submitted for the type, size and rating of cable offered along with bid. Type test shall not be more than 5 years old. In the event of type test being older than 5 years, bidder has to conduct the same at CPRI/ERDA, approved Lab without commercial implication to BRPL. (b) Bidder supplying cable to BRPL for the first time shall have to conduct type test, Chemical Composition & UV resistance test on sample randomly selected from lot in event of order from CPRI/ERDA. (c) UV resistance test to be carried out on one sample from CPRI/ERDA/NABL Accredited Lab as per ASTM standard (sample shall meet minimum 80% retention after exposure of 21 days as per ASTM standard).
6.5	Acceptance Test (Shall be conducted as per Cl.15.2 of IS 7098 Part-1 & IS 1554 part 1 for each lot of cable)(R5)	a) For cable sizes up to 50 mm ² – one sample for chemical composition and purity test of aluminium shall be conducted upto r 100km of ordered quantity and multiple thereof. b) For cable sizes above 50 mm ² – one sample for chemical composition and purity test of aluminium shall be conducted upto 50km of ordered quantity and multiple thereof. c) Chemical composition and purity test of aluminium shall be conducted from the lot offered to BRPL on each size involved in the purchase order. Test shall carried out at NABL accredited third party lab without any price implication to BRPL. d) The sample will be selected either during acceptance test or after receipt of cable in BRPL Stores.
6.6	Inspection	a) The buyer reserves the right to witness all tests specified on

TECHNICAL SPECIFICATION OF LT POWER CABLE

		<p>completed cables</p> <p>b) The buyer reserves the right to inspect cables at the seller's works at any time prior to dispatch either in finished form or during manufacturing, to prove compliance with the specifications.</p> <p>c) In-process and final inspection call intimation shall be given in 10 days advance to purchaser/CES.</p>
6.7	Test Certificates	Complete test certificates (routine & acceptance tests) need to be submitted along with the delivery of cables.

7.0 DRAWING, DATA & MANUALS

7.1	To be submitted along with bid	<p>The vendor has to submit:</p> <p>a) Cross section drawing of cable</p> <p>b) Completely filled GTP</p> <p>c) Type test certificates</p> <p>d) Complete cable catalogue and manual along with the bid</p> <p>e) Copy of BIS licence</p>
7.2	After award of contract	Within 7 days, the seller has to submit four sets of above mentioned drawings for buyer's approval along with the signed copy of QAP (Annexure – E)
7.3	Final As Built	6 sets hardcopy + One Soft copy of all documents including type test certificates

8.0 PROGRESS REPORTING

8.1	Outline Document	To be submitted for purchaser approval for outline of Production-Inspection, testing-Inspection, packing, dispatch, documentation programme.
8.2	Detailed Progress Report	<p>To be submitted to purchaser once a month containing</p> <p>(i) Progress on material procurement</p> <p>(ii) Progress on fabrication (As applicable)</p> <p>(iii) Progress on assembly (As applicable)</p> <p>(iv) Progress on internal stage inspection</p> <p>(v) Reason for any delay in total programme</p>

TECHNICAL SPECIFICATION OF LT POWER CABLE

		(vi) Details of test failures if any in manufacturing stages. (vii) Progress on final box up constraints/forward path.
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9.0 DEVIATION

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

Deviation sheet format.

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

TECHNICAL SPECIFICATION OF LT POWER CABLE**10.0 TECHNICAL PARTICULARS**

- a. GTP - As per Annexure-B for Multi-core cables.
- b. GTP - As per Annexure-C for Single-core cables (300, 500, 630 & 1000 mm² cables).
- c. Armour Coverage Percentage - As per Annexure-D.
- d. Quality Assurance Plan - As per Annexure-E.
- e. List of sub-vendors for Raw Material - As per Annexure-F.

TECHNICAL SPECIFICATION OF LT POWER CABLE**11.0 ANNEXURE – A****SCOPE & PROJECT SPECIFICATION DETAILS****1.0.0 Scope**

1.0.0	Scope	Design, manufacture, testing & supply of L.T Power Cables
2.0.0	Delivery Schedule	To be filled up as per purchase requisition.

2.0.0 Document Submission

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

	Along with offer	For Approval after award of contract	Final after approval	Remarks
Drawings	2 copies (Typical Drawings)	2 Copies	2 Copies + 1 soft copy in CD	See Clause 7.0 for details of required drawings
Calculations	2 Copies (Typical)	2 Copies		
Catalogues	1 Copy			
Type Test Report	2 Copies			Type test and sample routine test reports

TECHNICAL SPECIFICATION OF LT POWER CABLE**12.0 ANNEXURE - B****GUARANTEED TECHNICAL PARTICULARS (Multi-core)**

(Standard Cable sizes are 2c x10, 2c x25, 4c x25, 4c x50, 4C X 95, 4c x150, 4cx300)

For each size /rating separate GTP need to be furnished

Sr. No.	Description	Buyer's Requirement	Seller's data
	Manufacture Contact Person & Number		
	Purchase Req. No.	
	Guarantee Period: (Min)	60 Months (from date of commissioning) / 66 months (from date of receipt at purchaser's store) whichever is earlier	
	Applicable IS / IEC Standard followed by vendor	As mentioned in the clause no - 2.0	
1	Make	..	
2	Type (as required by purchaser)		
A	For 2Cx10Sqmm	A2XWY	
B	For Sizes above 10 mm ²	A2XFY	
3	Voltage Grade (kV)	1.1	
4	Maximum Conductor temperature		
A	Continuous	90°C	
B	Short time	250°C	
5	Conductor		
A	Material and Grade	As per CI.3.1	
B	Make of Al	Ref Annexure E	
C	Size (mm ²) mm ²	
D	Min no. of wires in each conductor (Nos.)	As per Manufacturer Standard	
E	Min Dia. of wires in each conductor before compaction (mm)	As per Manufacturer Standard	

TECHNICAL SPECIFICATION OF LT POWER CABLE

F	Shape of Conductor	As per Cl.3.1 (e)	
G	Diameter over conductor (mm)	
H	Maximum Conductor resistance at 20 ° C (Ohm/Km)	As per Table 2 of IS 8130	
G	Insulation		
A	Insulation Material	As per Cl. 3.2	
B	Nominal thickness (mm)	As per Table 3 of IS 7098 Part-1	
C	Diameter over Insulation (mm) Approx.	
D	Make of insulation compound	Ref: Annexure E	
7	Inner Sheath		
A	Material and Type	As per Cl. 3.4	
B	Minimum thickness	As per Table 5 of IS 7098 Part-1	
C	Approx. dia. Over sheath (mm)	
8	Galvanized Steel Armour	as per purchaser's site - specific condition	
A	Material		
a)	For 2CX10 mm ²	G.I.Wire	
(i)	Wire Dia (mm)	1.4+/-0.040	
(ii)	No. of wires	As per Manufacturer Standard	
b)	For sizes above 10 mm ²	G.I.Strip	
(i)	Strip size (Width and Thickness)	4x0.8 (Zero negative tolerance for thickness)	
(ii)	No. of Strips	As per Manufacturer Standard	
B	Area covered by Armour	Min 90% and calculations shall be strictly as per Annexure D	
C	Dia. over Armour – Approx.(mm)	
9	Outer Sheath (FRLS)		
A	Material and Type	As per Cl. 3.6	

TECHNICAL SPECIFICATION OF LT POWER CABLE

B	Minimum Thickness	As per Table 8 of IS 7098 Part-1	
C	Colour	Yellow	
D	Embossing Details	As per Cl.3.6 (f)	
10	Approx. overall dia. (mm)	
11	Overall order tolerance	- 2 % for the total cable length for the entire order	
12	Cable Drum		
A	Type of Drum	Wooden	
B	Drum Length & tolerance	As per Spec. Cl. 4.3 & 4.4	
C	Marking on Drum	As per Spec. Cl 4.7	
D	Drums provide with MS Spindle plate & nut bolts arrangement (as per IS:10418)	Required	
13	End Cap	Required	
14	Weights	
a)	Net Weight of cable (Kg/Km.) – Approx		
b)	Weight of empty drum	Kg	
c)	Weight of cable with drum	Kg	
15	Continuous current rating for standard I.S condition laid direct		
a)	In ground 30° C	Amps	
b)	In duct 30° C	Amps	
c)	In Air 40° C	Amps	
16	Short circuit current for 1 sec of Conductor (kAmp)	
17	Electrical Parameters at Maximum operating temperature:		
A	AC Resistance	Ohm/Km	
B	Reactance at 50 C/s	Ohm/Km	
C	Impedance	Ohm/Km	
D	Capacitance	Micro farad / Km	
18	Recommended minimum bending radius x O/D	

TECHNICAL SPECIFICATION OF LT POWER CABLE

19	Derating factor for following Ambient temperature in	Ground / Air	
a)	At 30° C		
b)	At 35° C		
c)	At 40° C		
d)	At 45° C		
e)	At 50° C		
20	Group factor for following Nos. of cables laid	Touching / Trefoil	
a)	3 Nos		
b)	4 Nos.		
c)	5 Nos.		
d)	6 Nos.		
21	Process of Cross linking of Polyethylene	Dry/ Sioplas Cure	
22	Type test	Is copy of latest valid TTR for respective Sizes enclosed? Yes / No	
23	FRLS Properties (R5)	As per IS 1554, Part-1	
	Oxygen Index	As per IS 1554, Part	
	Temperature Index	As per IS 1554, Part	
	Max Acid Gas Generation	As per IS 1554, Part	
	Light Transmission / Smoke Density	As per IS 1554, Part	

TECHNICAL SPECIFICATION OF LT POWER CABLE**13.0 ANNEXTURE- C****GUARANTEED TECHNICAL PARTICULARS (Single Core)**(Separate GTP needs to be furnished for 300, 500, 630 & 1000 mm² cables)

S.No.	Description	Buyer's Requirement	Seller's data
	Manufacture Contact Person & Number		
	Purchase Req. No.	
	Guarantee Period: (Min)	60 Months (from date of commissioning) / 66 months (from date of receipt at purchaser's store) whichever is earlier	
	Applicable IS / IEC Standard followed by Vendor	As mentioned in the clause no-2.0	
1	Make	
2	Type	A2XV (Un-armoured)	
3	Voltage Grade (kV)	1.1kV	
4	Maximum Conductor temperature		
A	Continuous	90°C	
B	Short time	250°C	
5	Conductor		
A	Material and Grade	As per Cl.2.1.1	
B	Size (mm ²)	300 / 500 / 630 / 1000 mm ²	
C	Min no. of wires in each conductor (Nos.)	As per Manufacturer Standard	
D	Min Dia. of wires in each conductor before compaction (mm)	As per Manufacturer Standard	
E	Shape of conductor	Compacted Circular	
F	Diameter over conductor (mm)	
G	Maximum Conductor resistance at 20 ° C (Ohm/Km)	As per Table 2 of IS 8130	
H	Make of Al	Ref Annexure E	
6	Insulation	As per Table 3 of IS 7098	

TECHNICAL SPECIFICATION OF LT POWER CABLE

		Part-1	
A	Insulation Material	As per Cl. 3.2	
B	Nominal thickness (mm)		
(i)	For 1Cx300 mm ²	1.8 mm	
(ii)	For 1Cx500 mm ²	2.2 mm	
(iii)	For 1Cx630 mm ²	2.4 mm	
iv)	For 1Cx1000 mm ²	2.8 mm	
C	Diameter over Insulation (mm) Approx.	
D	Make of insulation compound	Ref: Annexure E	
7	Inner Sheath	Not applicable	
8	Armour	Not applicable	
9	FRLS Outer Sheath (R5)		
A	Material and Type	As per Cl. 3.6	
B	Minimum Thickness	As per Table 8 of IS 7098 Part-1	
C	Colour	Black	
D	Embossing Details	As per Cl.3.6 (f)	
10	Approx. overall dia. (mm)	
11	Overall order tolerance	-2 % for the total cable length for the entire order	
12	Cable Drum		
A	Type of Drum	Wooden	
B	Drum Length & tolerance	As per Spec. Cl. 4.3 & 4.4	
C	Marking on Drum	As per Spec. Cl. 4.7	
D	Drums provide with MS Spindle plate & nut bolts arrangement (as per IS:10418)	Required	
13	End Cap	Required	
14	Weights	
a)	Net Weight of cable [Kg/Km.] – Approx		
b)	Weight of empty drum	Kg	
c)	Weight of cable with drum	Kg	
15	Continuous current rating for standard I.S condition laid direct		

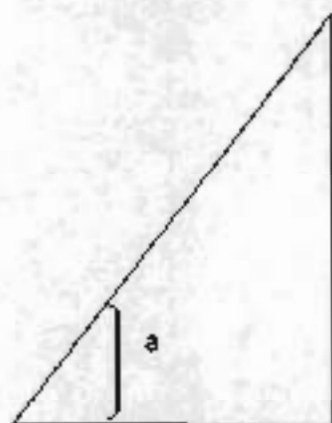
TECHNICAL SPECIFICATION OF LT POWER CABLE

a)	In ground 30° C	Amps	
b)	In duct 30° C	Amps	
c)	In Air 40° C	Amps	
16	Short circuit current for 1 sec of Conductor (kAmp)	
17	Electrical Parameters at Maximum operating temperature:		
A	AC Resistance	Ohm/Km	
B	Reactance at 50 C/s	Ohm/Km	
C	Impedance	Ohm/Km	
D	Capacitance	Micro farad / Km	
18	Recommended minimum bending radius x O/D	
19	Derating factor for following Ambient temperature in	Ground / Air	
a)	At 30° C		
b)	At 35° C		
c)	At 40° C		
d)	At 45° C		
e)	At 50° C		
20	Group factor for following Nos. of cables laid	Touching / Trefoil	
a)	3 Nos.		
b)	4 Nos.		
c)	5 Nos.		
d)	6 Nos.		
21	Process of Cross linking of Polyethylene	Dry/ Sioplas Cure	
22	Type test	Is copy of latest valid TTR for respective Sizes enclosed? Yes / No	
23	FRLS Properties (R5)		
	Oxygen Index	As per IS 1554, Part	
	Temperature Index	As per IS 1554, Part	
	Max Acid Gas Generation	As per IS 1554, Part	

TECHNICAL SPECIFICATION OF LT POWER CABLE

Light Transmission / Smoke Density

As per IS 1554, Part

**14.0 ANNEXTURE – D
ARMOUR COVERAGE PERCENTAGE**

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

Where

N = number of parallel wires / Strips

d = diameter of wire / width of formed wires

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

D = diameter under armour

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

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

C = lay length of armouring wires / formed wires.

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

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

TECHNICAL SPECIFICATION OF LT POWER CABLE

15.0 ANNEXTURE - E

LIST OF SUB-VENDORS


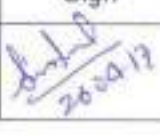
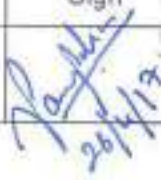
For critical items

Sr. No.	Description of Material	Sub-Vendors
1	E.C Grade Aluminium Rod	Bharat Aluminium Co. Ltd. (BALCO) Hindustan Aluminium Co. Ltd. (HINDALCO) National Aluminium Co. Ltd. (NALCO)
2	XLPE Compound	Kkalpana Industries Ltd. KLI Polymers and Chemicals Ltd. Dow Chemical, U.S.A Borealis, Sweden Hanwha, Seoul, South Korea
3	PVC Compound (R5)	Kkalpana Industries Ltd. KLI Polymers and Chemicals Ltd Universal SCJ Plastic Sriram Polytech Shri Ram Vinyl, Kota
4	GI Strip (RS)	Tata Balaji Systematic Mica Wires Pvt Ltd. Bansal Industries



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-R2

Prepared by		Reviewed by		Approved by		Rev	Date
Name	Sign	Name	Sign	Name	Sign		
Pronab Bairagi		Amit Tomar	 26/04/17	Vijay Panpalia	 26/4/17	R2	26/04/2017

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

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

Item/Clause No.	Change in Specification	Approved By	Rev
4.1.12	GPS Coordination		01
4.5.1b	Type Test		01
Annexure-H	Job Card		01
Annexure-I	SOP		01
3.1.12	HTAB Cable Jointing and Termination Kit		01
4.1.13	Hydraulic Crimping		01
4.1.14	Coffin for completed joint and Joint Marker		02
3.0.0	66kV , 3CX300 Cable Joint (Including OFC Joint)		02
3.0.0	11kV , 3CX400 Cable Jointing kit		02
4.1.15	Electronic Ball Marker for 33kV and 66kV Cable Joint		02
8.0.0	Inspection Expenses		02
9.0.0	Failure Analysis and Penalty		02

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 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 15 sq mm AL HTAB
- 33kV, 3-core x 300 / 400 sq mm AL
- 66kV, 1-core x 630 sq mm AL
- 66kV, 1 core x 1000 sq mm AL
- 66kV, 3-core x 300 sq mm AL

3.1.0	Conductor	a) Electrolytic Grade Stranded Aluminium Conductor b) Grade: H2 / H4 as per IS: 8130 / 1984 (For Al) c) Stranded, compacted and circular in shape d) Class 2 e) Longitudinal "Water-Blocking Arrangement" (or water-tight construction or water barrier protection)
3.1.1	Conductor Screen	Extruded Semi Conducting material
3.1.2	Insulation	Extruded XLPE Insulation 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 66 kV, 3CX300 sqmm cable only.
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.
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/graphait layer over HDPE ST7.

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

3.1.12	HTAB Cable (1CX150 and 1CX95)	AB cable- conductor-conductor semicon screen- TR XPLE-insulation sc Water Swallowable tape -Round wire armour (in the place of copper tap Water Swallowable tape-outer sheath+massenger wire
3.1.13	OFC	For 66kV, 3CX300 Cable- Single Mode-36 Nos. Multi Mode- 12 nos. All the OFC cable is placed as filler inside the cable.

4.0.0 Straight-Through Joints (STJ)

General Technical Requirements for Straight-Through Joints (STJ) for XLPE cables are as follows:

Scope: Design, manufacture, testing and supply of Straight-Through Joint Kits for 11 kV, 33 kV & 66kV Power Cables.

Functional requirements for Heat Shrinkable / Cold Shrinkable STJ joints are given below:

4.1.0 Heat Shrinkable / Cold Shrinkable STJ joints		
4.1.1	Cable preparation	Cable preparation shall be as per installation instruction sheet. Manufacturer shall be provide Installation instruction sheet in every kit
Connector		
4.1.2	Conductor Screen	<p>For 11kV</p> <p>a) Conductors to be jointed by crimping connectors</p> <p>b) Annular CSA (cross-sectional area) of the ferrule shall not be less than CSA of the conductor of the cable. Length of the ferrule shall be sufficient to allow adequate number of crimps, to limit temperature rise at the joint. (Vendor to furnish dimensional drawing for ferrule, indicating crimp marks.)</p> <p>c) For aluminium cable, the crimped ferrule shall be of aluminium</p> <p>d) Refer annexure F for GA drawing of crimping ferrule</p> <p>For 33kV and 66kV</p> <p>a) Shear bolt type mechanical connector</p> <p>b) Approved make:</p> <ul style="list-style-type: none"> • Tyco Electronics (BSM-185/400-U) • Pfisterer (332617010) • Or equivalent make (Manufacturer shall take prior approval from CES) <p>d) Maintain smooth surface over connector after cut the shear head bolt</p> <p>e) Vendor to furnish drawing for the mechanical connector</p>

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

4.1.3	Void filling and stress relief over crimped connector and cut point of the insulation screen.	By means of High permittivity mastic tapes / Lubricant.
4.1.4	Metal screen continuity	By means of Tinned copper wire mesh, wrap individual core from cu screen with 50 % overlap and continue on other side cu screen. Bind the copper wire mesh on copper screen with copper binding wire
Armour / Earthing Continuity		
4.1.5	Armour bond	a) By means of a combination of steel (G.I.) support ring (for 3 - core Cable) or Aluminium support ring (for 1 - core Cable) and two nos. of stainless steel hose clips. b) GI Support Ring shall be 'zinc-sprayed with central bulge / bump'.
4.1.6	Armour continuity	By means of two nos. Of tinned copper braided conductor of 25 sq. mm. for 11 kV 35 sq. mm. for 22 or 33kV and 50 sq mm for 66kV.
4.1.6	OFC	For 66KV, 3CX300 Cable- Single Mode-36 Nos. Multi Mode- 12 nos OFC Cable shall be jointed separately. OFC joint shall not place inside main cable joint.
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.

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

4.1.10	Identification Tag (for traceability)	<p>a) An aluminum pouch with paper tag & sealing arrangement at one end shall be provided.</p> <p>b) This tag is required to be tied over the cable at one side of the joint.</p> <p>c) The paper tag shall give following information</p> <ol style="list-style-type: none">1) Vendor kit designation2) Cable section/Division3) Type of joint4) Size of Joint5) Make of joint6) Voltage class7) Serial no. of kit8) Vendor lot & batch no9) Month & year of manufacturing10) Date of installation11) Name of joiner12) Name of vendor supervisor13) Name of BSES supervisor14) 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
4.1.14	Coffin for completed joint and Joint Marker	<p>After successfully completion of joint, Coffin shall be made by bidder for completed joint. Drawing shall be provided by BSES. Excluding drawing, everything shall be in the scope of bidder.</p> <p>After back filling a joint marker shall be fixed by bidder above ground to mark the joint location. Drawing is enclosed with this tech spec.</p>
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	66KV, 3CX300 sqmm cable Joint for OFC shall be supplied along with main cable joint. (36 single mode and 12 nos multi mode OFC inbuilt inside cable). OFC joint shall be made separately from main cable joint.

4.2.0 Only for Heat Shrinkable STJ joints

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

4.2.1	Stress Control System	<p>a) The earthed insulation screen of an XLPE cable is terminated at a suitable distance from the connector (Ferrule).</p> <p>b) The stress control tube is in electrical contact with insulation screen.</p> <p>c) Impedance of the tube shall be constant up to an operating temperature and shall be within the range 1×10^8 ohm-cm to 8×10^8 ohm-cm.</p> <p>d) The physical and electrical properties shall conform to EA TS 09-13.</p>
4.2.1	Insulation build-up	<p>a) Maximum three layers of insulation tubes shall be used. Total thickness of the insulation being provided in the joint shall not be less than 1.2 times the insulation of the cable being jointed.</p> <p>b) Outer-most tube shall be screened insulating tube (dual wall tube). This tube shall be manufactured by extrusion process.</p> <p>c) Physical and Electrical properties shall conform to EA TS 09-13.</p>
4.2.2	Sealing end of tube	By means of Core end sealing sleeve with red mastic coating
4.2.3	Mechanical Protection	<p>a) For 3-core cable: By means of a rollable steel mat (with required protective coating against corrosion)</p> <p>b) For 1-core cable:</p> <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
4.2.4	Corrosion Protection	By means of semi-rigid tubes, internally coated with water blocking sealant. Thick wall Insulating tube

4.3.0 Only for Cold Shrinkable ST joints

Scope:

The term cold shrink applies to materials, which are capable of shrinking without raising the material above the ambient temperature of its immediate surroundings. The material of the rubber insulator used in the Cold Shrink assembly shall be silicone which is factory expanded and placed on a removable core. The removing of the core causes the cold shrink assembly to shrink. The cold shrink assembly shall maintain a compressive force on the cable continuously throughout the life of the product. This pressure will ensure a complete moisture seal.

4.3.1	Stress Control System	By means of one piece body (splice assembly) providing stress control, insulation and screen continuity.
4.3.2	Mechanical Protection	<p>By application of mastic coated vinyl tape and armor cast structural material.</p> <p>The taped armor cast layer may also be sprayed with water to hasten the curing.</p>

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

4.4.0	Technical Particulars	Vendor shall submit Guaranteed Technical Particulars (GTP) as per Annexure A.
4.5.0 Testing & Inspection		
4.5.1	Type Tests (CPRI/ERDA)	<p>a) Straight-Through Joint shall be of type-tested quality from CPRI/ERDA.</p> <p>b) In addition to this, in case of rate contract, vendor will be required to conduct type-testing on heat/cold -shrinkable and moulded components, stress grading mastic, etc., in line with EA TS 09-13 standard, at third party test laboratory once in 6 months on randomly selected sample of each voltage rating without any commercial implication to BSES. Also special test shall be done as per IS 13573.2.2011, Table-7 without any cost implication to BSES. Cable for type test may be provided by buyer at the cost of bidders.</p> <p>C) If product is not type tested or test report is more than 5 years old from CPRI/ERDA, same shall be carried out by seller, sample shall be selected randomly by BSES, test cost to be borne by seller. For new vendor, type test is mandatory from CPRI/ERDA of BSES sample at their own cost. All the cost of inspector shall be borne by seller as mentioned in inspection expenses clause</p>
4.5.2	Routine & acceptance Tests	<p>I) All the routine and acceptance tests shall be carried out as per EA TS 09-13 guidelines, refer Annexure C.</p> <p>II) H.V. Test shall be carried out on a randomly selected and installed Straight-Through Joint, in the presence of Purchaser's representative, at manufacturer's works.</p> <p>III) The joint shall withstand a test of 4Uo voltage for 4 hours.</p>
4.5.6	Inspection	<p>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.</p> <p>II) In-process and / or final inspection call intimation shall be given in advance to purchaser.</p>
4.5.7	Test Certificates	<p>i) Three sets of complete Test Certificates (Routine & Acceptance tests) shall be submitted along with the delivery of STJ Kits.</p> <p>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)</p>
4.6.0	Documents	"Documents" refer to Documents, Data, Manuals, etc. (Scanned copy of signed documents also shall be part of entire soft file (e-file) or CD.

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

4.7.0	Along with the Bid	Vendor shall submit signed 3 sets (plus 1 set of soft copy) of following documents a) GTP (duly filled-in) (as per Annexure — A) b) Cross-sectional drawings for components Assembly. c) Type Test Certificates d) Complete Catalogue and Installation Instructions. e) Any other document.
4.8.0	After Award Contract	Vendor shall submit signed 2 sets (plus 1 set of soft copy) of above-mentioned documents within 15 days, for Purchaser's approval.
4.8.0	"As-Built" documents	Final signed "As-built" documents for the equipment in 3 sets (hard copy), 1 no. soft copy and 1 no. CD. These documents shall include signed Routine & Acceptance Test Certificates also.
4.9.0	Packing, Marking, Shipping, Handling and Storage	a). Every component / kit / box shall be properly sealed/ packed for protection against damage. Stress grading mastic shall be packed in air-tight / air-sealed packing. b). Every kit box shall be wrapped in polythene covers. c. Separate packing (sub-kits) shall be provided, for components (given below) used in crotch area and connector area. These sub-kits, labeled as "CROTCH KIT" and "CONNECTOR KIT", shall be placed inside every kit box. i) Crotch Kit Components --Conductive cable break-out -- Yellow moulded wedge -- Break-out end sealing tube -- Break-out finger sealing tube -- Stress grading mastic ii) Connector Kit : Components -- Ferrule (connector) -- Void Filling mastic (yellow)

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

4.9.1	Identification Label	Markings / Labels shall be on both sides of every packed box. 1) Identification number/type designation (as per manufacturer's standard) 2) Voltage grade, size, description of the Kit (including the voltage grade, size, type of the cables, for which it is to be used) 3) Batch no., lot no., etc. 4) Quantity 5) a) Purchase Order no. & date b) Purchaser's name c) BSES's SAP code number 6) Weights (kg) of each Cable Termination Kit and of each box containing kits. 7) Manufacturer's name 8) Month & Year of Manufacturing 9) Date of packing, shelf life (if applicable)
4.9.2	Transit damage	The seller shall be responsible for any transit damage due to improper packing.

5.0.0 Quality Assurance Plan (QAP)

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

6.0.0 Deviations

6.1.0	Deviations	a) Deviations from this specification 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.. 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. 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.
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Technical Specification For Heat Shrinkable And Cold Shrinkable Straight Through Jointing Kit (11 kV, 33 kV, 66 kV XLPE Insulated Cables)**7.0.0 Delivery**

7.1.0	Delivery	Dispatch of Material: Vendor shall dispatch the material, only after the Routine Tests /Final Acceptance Tests (FAT) of the material witnessed/waived by the Purchaser, and after receiving written Material Dispatch Clearance Certificate (MDCC) from the Purchaser.
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8.0.0 Inspection Expenses

Inspection (i.e. routing test, acceptance test, type test, factory visit etc.) shall be done any time by BSES on the basis of PO or may involve 3rd party as per BSES requirement.

Inspection expenses like accommodation, fooding, local transport, air fair, train fair, taxi (NCR) etc shall be borne by seller.

Any kind of test (routine/type test/acceptance test if any) at 3rd lab (i.e. CPRI/ERDA/NABL approved lab) shall be carried out by seller at their own cost. BSES may witness the test and the expenses like accommodation, fooding, local transport, air fair, train, taxi etc. shall be borne by seller.

Above expenses shall be applied at each and every inspection and shall stand till closing of PO/WO/Rate contracts etc.

9.0.0 Failure Analysis and Penalty

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


Technical Specification For Heat Shrinkable And Cold Shrinkable Straight Through Jointing Kit (11 kV, 33 kV, 66 kV XLPE Insulated Cables)**Annexure - A: Guaranteed Technical Particulars (GTP)**

The Vendor is deemed to have examined all parts of the Specification documents and to have been fully informed, as to the nature of work and the conditions related to its performance.

S No.	Description	Purchase requirement	Vendor's data
1	Manufacturer's name		
2	Purchase Order no. & date		
3	Guarantee Period (minimum)	60 Months (from date of commissioning) / 66 Months (from date of receipt at Purchaser's store), whichever is earlier	
4	Applicable IS / IEC Standard followed by Vendor (incl. type test standard)		
5	Voltage Grade (kV)		
5.1	Lightning Impulse Voltage Withstand Test		
5.2	4Uo AC voltage withstand test for 4 hours	To be conducted on Installed joint at works	
6	Continuous operating temperature	90 deg. C	
7	Functional Requirements		
7.1	Method of Stress Control and Discharge Suppression		
7.2	Method of Insulation build-up and screening		
7.3	Method of earth bond a) Size and no. of braids b) Size of armour support c) No. of hose clips		
7.4	Method of mechanical protection a) for 3-core Cable b) for 1-core Cable		
7.5	Method of protection against corrosion (type & coating thickness of protective layer on steel mat)		
7.6	Method of conductor continuity a) For crimping connector b) For mechanical connector		

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

8	Description of items in the Kit, which are imported /sourced From Principal /Sub-suppliers		
9	Names of items in the Kit and their respective shelf life (months years)		
10	Kit Content Table (KCT) enclosed? (Refer Annexure — B)	Yes / No	
11	Drawing for connector (ferrule) enclosed	Yes / No (If yes, mention the document reference)	
12	Is Annexure - D (Technical Deviation Sheet) duly filled-in?		
13	Packing (Qty) i) Packing of every Kit h) Group Packing	1 no -- No. of Kits per Box -- No. of Boxes	
14	Installation Procedure enclosed?	Yes / No (If yes, mention the document reference)	
15	Quality Assurance Programme (QAP for raw materials, in-process inspection, factory testing) is enclosed?	Yes / No	
16	Whether all heat-shrinkable and moulded components of the kit meet the requirements of and have been tested in accordance with EA TS -09-1 3.(for heat-shrinkable joints)	Yes / No (If yes, details of test report no. /Date /name of test laboratory to be mentioned.)	
17	Type Test Reports (TTR) (Relevant test report no. & date, With type, size, other details of each type of Kit.) a) Prepared Joint: CPRI TTR as per BIS / IEC enclosed? b) Loose Components: CPRI TTR as per EA TS 09-13 enclosed?	Yes/No Yes/No	
18	Printing details on each of the Heat- shrinkable and Moulded components	(Mention the text, presently printed on each of the component)	

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

19	OFC kit (66kV, 3CX300 sqmm cable)	Yes/no	
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Annexure - B: Kit Content Table (KCT)

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

A. Heading

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

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

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

C. Notes on the KCT

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

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

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

Technical Specification For Heat Shrinkable And Cold Shrinkable Straight Through Jointing Kit (11 kV, 33 kV, 66 kV XLPE Insulated Cables)**Annexure - C: Routine and Acceptance Test****A. Visual Examination**

Condition of selected items / components, as per sampling method, shall be recorded. Some of the normal check-points can be as follows:

1. Every component shall be verified in quantity and description as per KCT.
2. All items shall be free from any defects, pin holes, cracks, etc.
3. Metallic components to be free from sharp edges.

B. Measurements of Dimensions

(Required / observed dimension — length, diameter, etc.)

1. Supplied dimensions
2. Recovered dimensions

C. Destructive Testing

On various heat-shrinkable / moulded components of ready Kits (items 3 and 4 are applicable only for heat-shrinkable components)

1. Tensile Strength
2. Wall Thickness Ratio
3. Heat Shock
4. Longitudinal Change, after full recovery
5. Ultimate Elongation
6. Low Temperature Flexibility
7. Dielectric Strength
8. Volume Resistivity

Routine Test Reports (RTR) (Typical)

Each RTR shall clearly indicate P.O. no. & date and also BSES's SAP code no. RTR shall record the serial numbers of the kits selected, as per vendor's sampling method. Following details, besides vendor's/manufacturers standard check-points, shall appear in every RTR.



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

Annexure - D: Deviation Sheet

Sr No.	Clause No.	Deviation

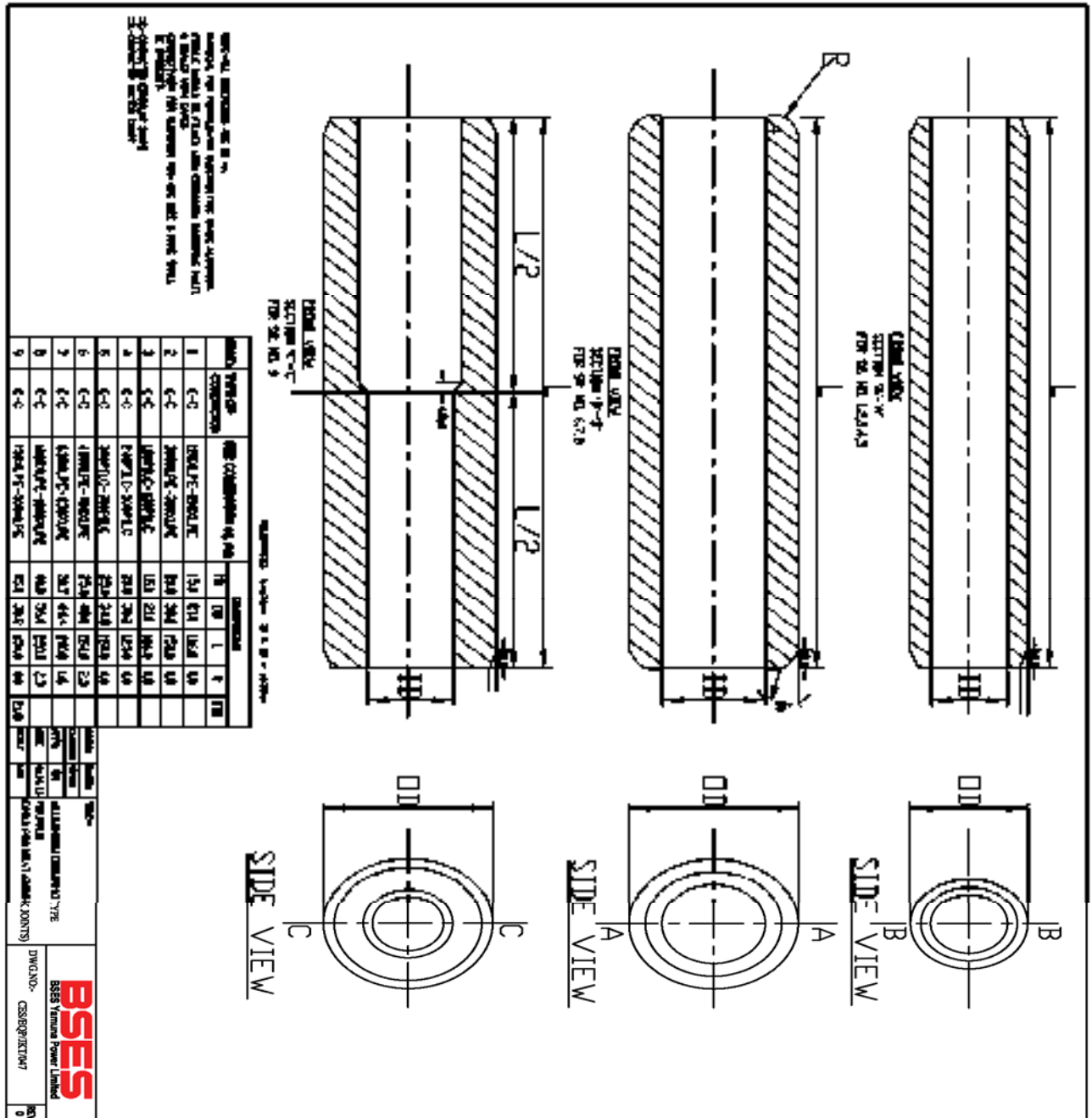
Annexure - E: Service Conditions

(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

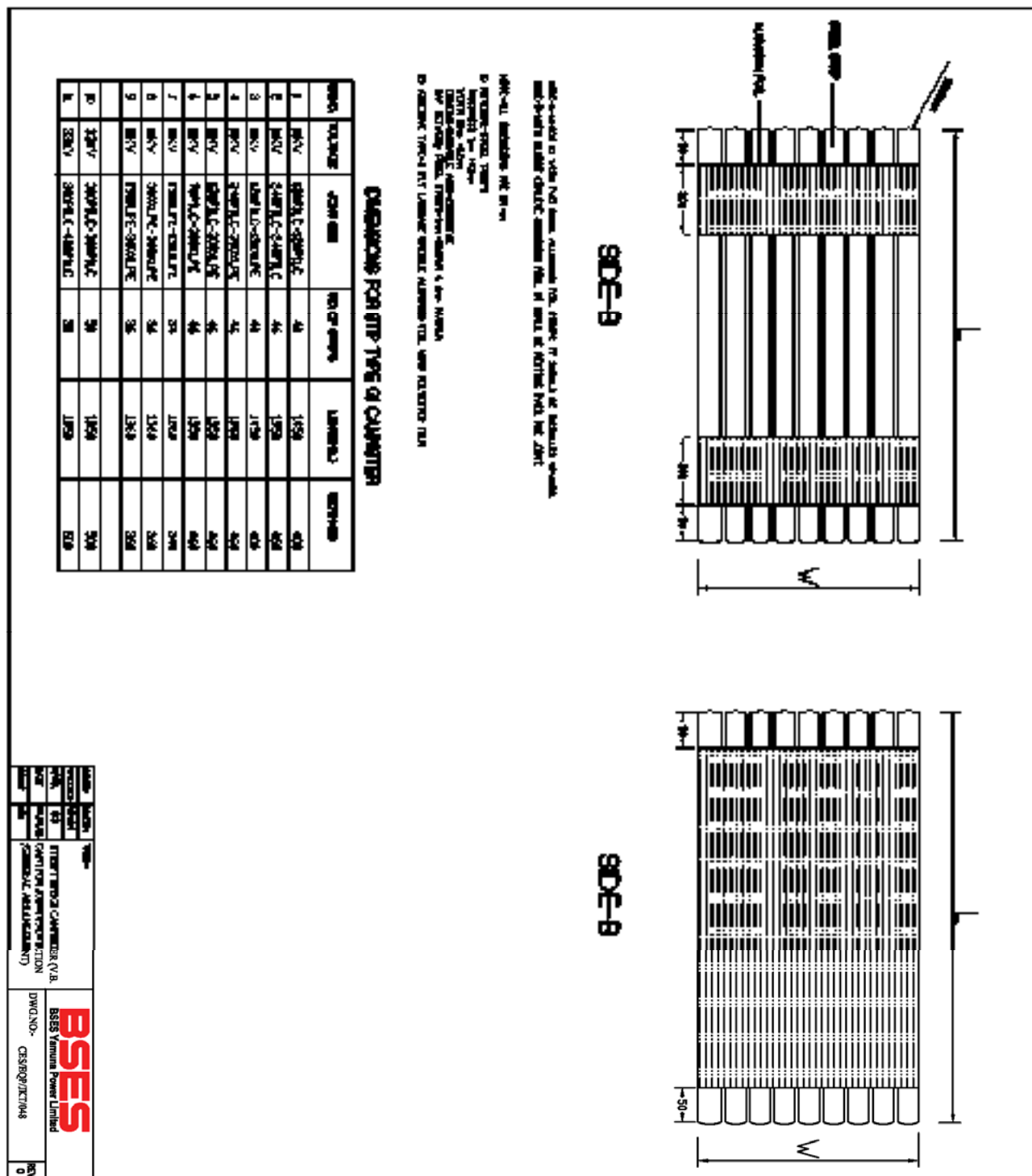
Technical Specification For Heat Shrinkable And Cold Shrinkable Straight Through Jointing Kit (11 kV, 33 kV, 66 kV XLPE Insulated Cables)

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



Job Card For Cable Jointing Work

Job Card No. Date Fault ID

Division Purpose Project / Scheme O&M

Contractor

Voltage Grade 11kv 33kv 66kv 1.1 KV/LT

No. of cores 1 3 3.5/4

Cable Size: 1000 / 800 / 630 / 500 / 400 / 300 / 240 / 225 / 185 / 120 / 95 / 70 / 50 / 25 sqmm

Joining Details	Type of Joints	No. of Joints		Docate No.	IR Ref.
		Single	Double		
	XLPE/XLPE(or PVC/PVC) Straight Through Joints				
	XLPE/PILCA Transition Joint				
	PILCA/PILCA Straight Through Joints				
	XLPE Indoor Termination				
	XLPE Outdoor Termination				
	PILC Indoor Termination				
	PILC Outdoor Termination				

Feeder Details From To

Location From To

Landmark:

Fault Occurance Date:

Job Allocated By: PWT Ref:

Date and Time of Spiking Work Completed On:

Digging Details (In Meter) Length Wedth Depth

Details of cable laid Size Length (In Meter) Docate Ref.:

Contractor Supervisor : Signature : Date :

Joiner Details:

Stage Verification	Stage/Work Verification	Name & Signature	Date & Time
ie : Digging / Jointing etc.			

Scrap Details including Qty:

New Kit Details:

Old Kit Details:

Type of Fault:

Remark If any :

Job Certified By :

Shift Incharge Name Signature Date

1* COPY - BILLING COPY

Registered Office: BSES Rajdhani Power Ltd. BSES Bhawan, Nehru Place, New Delhi-110019

Annexure-I

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

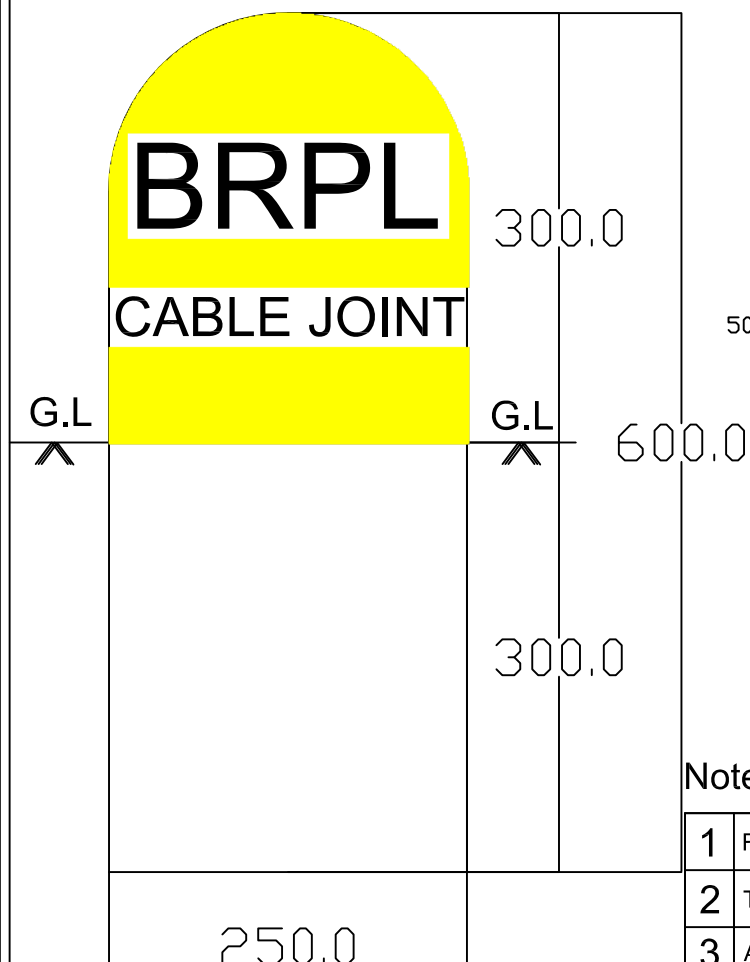
Annexure-I

	of work done, material consumption, location, feeder name and joint tag no., date, supervisor name, jointer name) sent to SDO	
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	Updation of information in OMS including supervisor name, jointer name, feeder name	GNIIT
10	Information to include GPS location of cable fault.	GNIIT

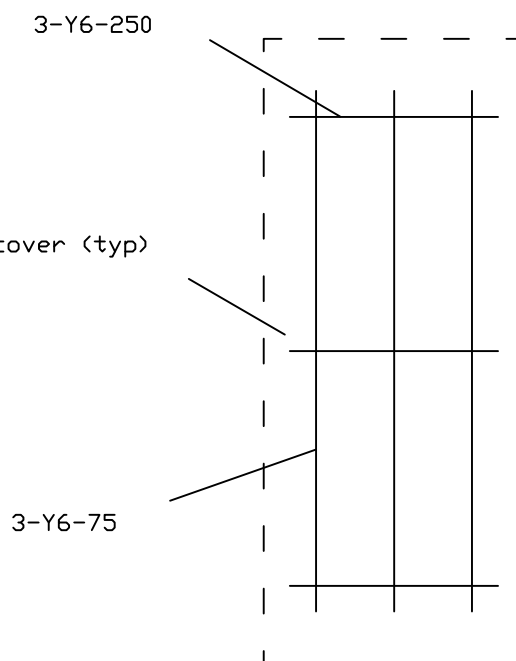
Special Note-

- 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.

ANNEXURE- J-DETAIL OF CABEL JOINT MARKER (RCC) -BSES



Reinforcement Detail



Notes:-



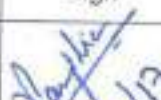
1	RCC Cable Joint marker with 6 mm Dia. Rod and M25 concrete grade.
2	The letter/word shall be engraved on both the side route marker.
3	All dimintions are in mm unless specified.
4	Thickness of RCC shall be 75mm.
5	Yellow colour shall be visible above ground level above ground.
6	Each Cable Joint marker to be placed at each joint location
7	All kind of paint on route marker shall be in the scope of manufacturer.

DRAWN	R.K.JANA	TITLE:- DETAIL OF CABLE JOINT MAKER (RCC).	BSES Rajdhani Power Ltd. DWG. NO. BSES-JM-RCC-01, R0
CHECKED	P.B		
REVIEWED	A.T		
APPO.	V.P.		
DATE	25-04-2017		



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		
Pronab Bairagi		Amit Tomar	 26-04-17	Vijay Panpalia	 21/4/17	R3	26/04/2017

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

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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		02
4.2.1e	GIS Termination kit-Plug in Type		01
4.2.1a	Hydraulic Crimping		02
4.5d	Type Test		02
Annexure-H	Job Card		02
Annexure-I	SOP		02
3.0.0	66kV , 3CX300 Cable Termination (Including OFC kit)		03
3.0.0	11kV , 3CX400 Cable Termination kit		03
4.2.1.(h)	Long barrel lugs		03
8.0.0	Inspection Expenses		03
9.0.0	Failure Analysis and Penalty		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, 66KV XLPE / PILC cables, shall be designed, manufactured, tested, packed and delivered by the Vendor, as per Purchaser's requirements.

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

SL	Standard Number	Title
2.1.1	IS - 13573: 2011	Joints & Terminations of Polymeric Cables for working voltages from 6.6 kV up to and including 33 kV Performance Requirements and Type Tests
2.1.2	IS – 7098 Part 2 : 1985	Cross-linked Polyethylene (XLPE) Insulated PVC sheathed cables : Part 2 : For working voltages from 3.3 kV 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 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 400 sq mm AL
 11kV, 1-core x 1000 sq mm AL
 11kV, 1-core x 1000 sq mm AL
 11kV, 1-core x 150 sq mm AL HTAB
 11kV, 1-core x 15 sq mm AL HTAB
 33kV, 3-core x 300 / 400 sq mm AL
 66kV, 1-core x 630 sq mm AL
 66kV, 1 core x 1000 sq mm AL
 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

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

3.5.0	Water Swellable Tape	For XLPE: Semi-conducting Water Swellable Tape shall be provided under the copper tape on each core. For PILC : not applicable
3.6.0	Filler	For XLPE: All interstices, including centre interstices filled by PP filler. Special Note- for 66kV 3CX300 sqmm cable only-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 tape) Water Swallowable tape-outer sheath+massengre wire

4.0.0 Cable Termination Kits

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

General Technical Requirements for Cable Termination Kits are as follows:

4.1.0	Scope	Design, manufacture, testing and supply of Cable Termination Kits for H. T. Power Cables.
4.2.0	Functional Requirements	
4.2.1.	Conductor Connection	<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 aluminium cable, the lug shall be of aluminium</p> <p>d) Bi-metallic type lug having an aluminium barrel and a copper palm shall be considered for termination kit for RMU application. Refer Annexure E for details.</p> <p>e) 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>f) For 66KV 1cX1000 or 630mm² aluminium lugs shall be used.</p> <p>g) For 66Kv , 3CX300 lug shall be 300 sqmm.</p> <p>h) All the lugs shall be long barrel.</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.</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>

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

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 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	450 (650 for RMU)	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	Termination Kit shall be of type-tested quality. In the absence of type test or in the case of type test is more than 5 years old, seller shall carry out the type test from CPRI/ERDA from BSES sample at their own cost. BSES may witness type test if required. All the cost of inspector shall be borne by seller as mentioned in inspection expenses clause. For new vendor, type test is mandatory from CPRI/ERDA of BSES sample at their own cost.
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 advance to purchaser.</p>
	c) Test Certificates	Three sets of complete Test Certificates (Routine & Acceptance tests) shall be submitted along with the delivery of Cable Termination Kits.

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

	d) Type Test	<p>a) Straight-Through Joint shall be of type-tested quality from CPRI/ERDA.</p> <p>b) In addition to this, in case of rate contract, vendor will be required to conduct type-testing on heat/cold -shrinkable and moulded components, stress grading mastic, etc., in line with EA TS 09-13 standard, at third party test laboratory once in 6 months on randomly selected sample of each voltage rating without any commercial implication to BSES. Also special test shall be done as per IS 13573.2.2011, Table-7 without any cost implication to BSES. Cable for type test may be provided by buyer at the cost of bidders.</p> <p>C) If product is not type tested or test report is more than 5 years old from CPRI/ERDA, same shall be carried out by seller, sample shall be selected randomly by BSES, test cost to be borne by seller. For new vendor, type test is mandatory from CPRI/ERDA of BSES sample at their own cost. All the cost of inspector shall be borne by seller as mentioned in inspection expenses clause</p>
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	<p>Vendor shall submit signed 3 sets (plus 1 set of soft copy) of following documents:</p> <p>a) GTP (duly filled-in) (as per Annexure - A).</p> <p>b) Cross-sectional drawings for components Assembly</p> <p>c) Type Test Certificates</p> <p>d) Complete Catalogue and Instructions.</p> <p>e) Any other document.</p>
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.

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

a)	Identification Labels:	Markings / Labels shall be on both sides of every packed box. 1) Identification number/type designation (as per manufacturer's standard) 2) Voltage grade, size, description of the Kit (including the voltage grade, size, type of the cables, for which it is to be used) 3) Batch no., lot no., etc. 4) Quantity 5) a) Purchase Order no. & date b) Purchaser's name c) BSES's SAP code number 6) Weight (kg) of each Cable Termination Kit and of each box containing kits. 7) Manufacturer's name 8) Month & Year of Manufacturing 9) Date of packing, Shelf life (if applicable) 10) In case, the termination kit is for RMU, following text shall be written in bold letters, with higher font size : "For RMU Application".
b)	Transit damage	The seller shall be responsible for any transit damage due to improper packing.

5.0.0 Quality Assurance (QA)

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

6.0.0 Deviations

6.1.0.	Deviations	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.. 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. c) Any deviations mentioned in any other submitted bid documents (i.e.in filled GTP, Catalog, BSES old approval, buyer's/seller's standards etc) by seller without separate deviation sheets will not consider as a deviation from this tech spec at any stage of contract.
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Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 KV, 33 KV, 66 KV Cables)**7.0.0 Delivery**

7.1.0.	Delivery	Despatch of Material: Vendor shall despatch the material, only after the Routine Tests/Final Acceptance Tests (FAT) of the material witnessed/waived by the Purchaser, and after receiving written Material Despatch Clearance (MDC) from the Purchaser.
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8.0.0 Inspection Expenses

Inspection (i.e. routing test, acceptance test, type test, factory visit etc.) shall be done any time by BSES on the basis of PO or may involve 3rd party as per BSES requirement. Inspection expenses like accommodation, fooding, local transport, air fair, train fair, taxi (NCR) etc shall borne by seller.

Any kind of test (routine/type test/acceptance test if any) at 3rd lab (i.e. CPRI/ERDA/NABL approved lab) shall be carried out by seller at their own cost. BSES may witness the test and the expenses like accommodation, fooding, local transport, air fair, train, taxi etc. shall borne by seller.

Above expenses shall be applied at each and every inspection and shall stand till closing of PO/WO/Rate contracts etc.

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 Seller is deemed to have examined all parts of the Specification documents and to have been fully informed, as to the nature of work and the conditions related to its performance.

S No.	Description	Purchase requirement	Vendor's data
1	Manufacturer's name		
2	Purchase Order no. & date		
3	Guarantee Period (minimum)	60 Months (from date of commissioning) / 66 Months (from date of receipt at Purchaser's store), whichever is earlier	
4	Applicable IS / IEC Standard followed by Vendor (incl. type test standard)		
5	Voltage Grade (kV)		

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

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	
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	

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

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 cable)	Yes/no	

Annexure – B: Kit Content Table (KCT)

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

A. Heading

1. Voltage grade, size, description of the Kit
(Including the voltage grade, size, type of the cables, for which it is to be used)

2. Type designation (as per manufacturer's standard)

B. Details / Parameters

(For each component/item of the KCT)

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

1. Lot no. /Batch no., etc.
2. Item number (manufacturer's standard)
3. Description
 - a) Material, type, make and grade
 - b) Dimensions cross sectional area
 - c) Colour,
 - d) Other description, if any
4. Function of the item
5. Quantity
6. Make/Name/Location of manufacturer/sub-vendor
7.
 - a) Minimum supplied (or in expanded form) diameter
 - b) Maximum freely recovered diameter
8.
 - a) Minimum supplied (or in expanded form) thickness
 - b) Maximum freely recovered thickness

C. Notes on the KCT

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

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

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

Annexure – C: Routine and Acceptance Test**A. Visual Examination**

Condition of selected items / components, as per sampling method, shall be recorded. Some of the normal check-points can be as follows:

1. Every component shall be verified in quantity and description as per KCT.
2. All items shall be free from any defects, pin holes, cracks, etc.
3. Metallic components to be free from sharp edges.

B. Measurements of Dimensions

(Required / observed dimension — length, diameter, etc.)

1. Supplied dimensions
2. Recovered dimensions

C. Destructive Testing

On various heat-shrinkable / moulded components of ready Kits

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

(Items 3 and 4 are applicable only for heat-shrinkable components)

1. Tensile Strength
2. Wall Thickness Ratio
3. Heat Shock
4. Longitudinal Change, after full recovery
5. Ultimate Elongation
6. Low Temperature Flexibility
7. Dielectric Strength
8. Volume Resistivity

D. Routine Test Reports (RTR)

(Typical)

Each RTR shall clearly indicate P.O. no. & date and also BSES's SAP code no. RTR shall record the serial numbers of the kits selected, as per vendor's sampling method. Following details, besides vendor's/manufacturers standard check-points, shall appear in every RTR.

Annexure – D: Technical Deviation Sheet

Sr No.	Clause No.	Deviation

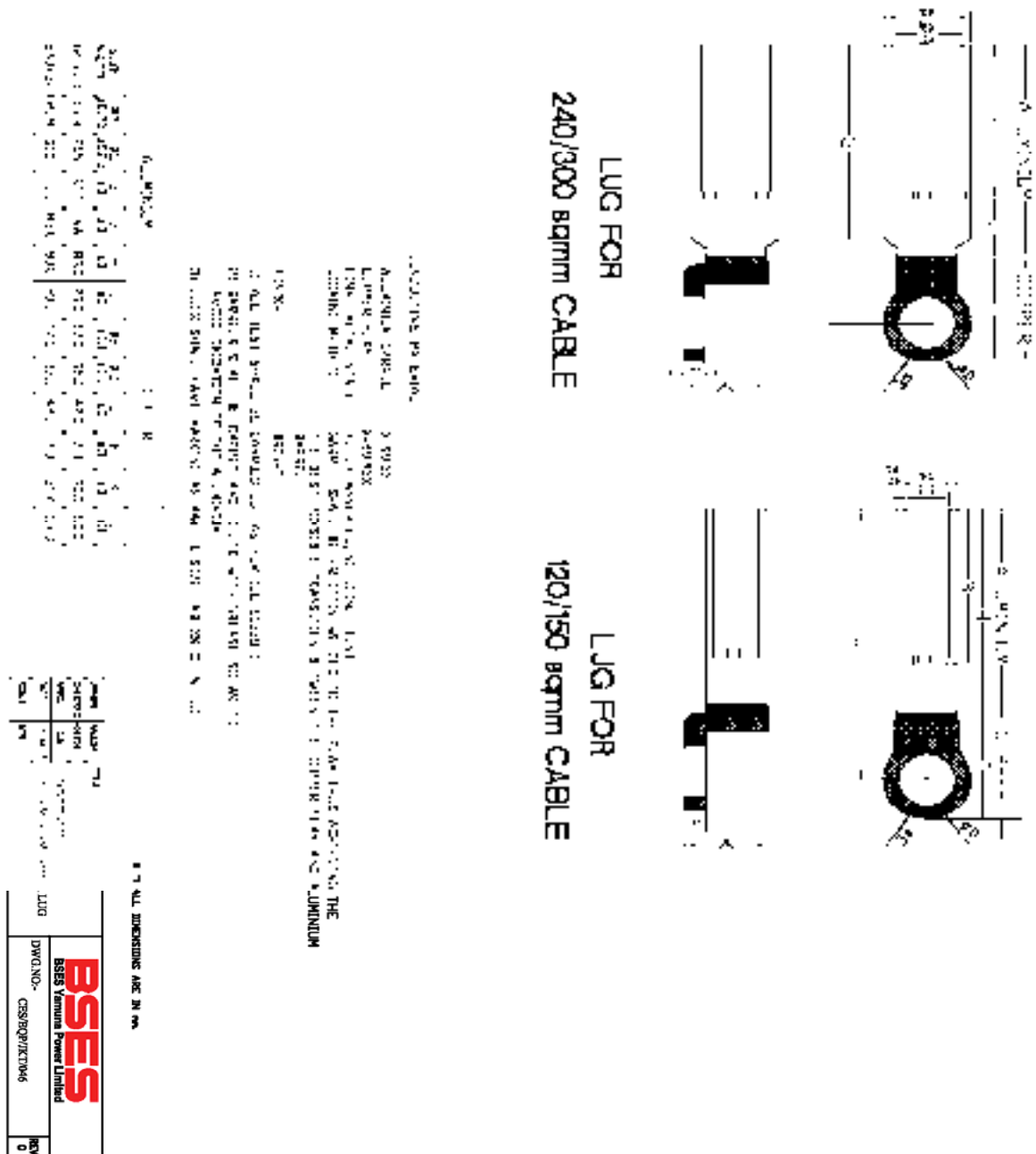
Annexure – E: Service Conditions

(Atmospheric conditions at Site)

1	Delhi	
a)	Average grade Atmospheric Condition:	Heavily Polluted, Dry
b)	Maximum altitude above sea level	1000 M
c)	Ambient Air temperature	Highest 50 deg C, Average 40 deg C
d)	Minimum ambient air temperature	0 deg C
e)	Relative Humidity	90 % Max
f)	Thermal Resistivity of Soil	150 Deg. C cmm
g)	Seismic Zone	4
h)	Rainfall	750 mm concentrated in four months

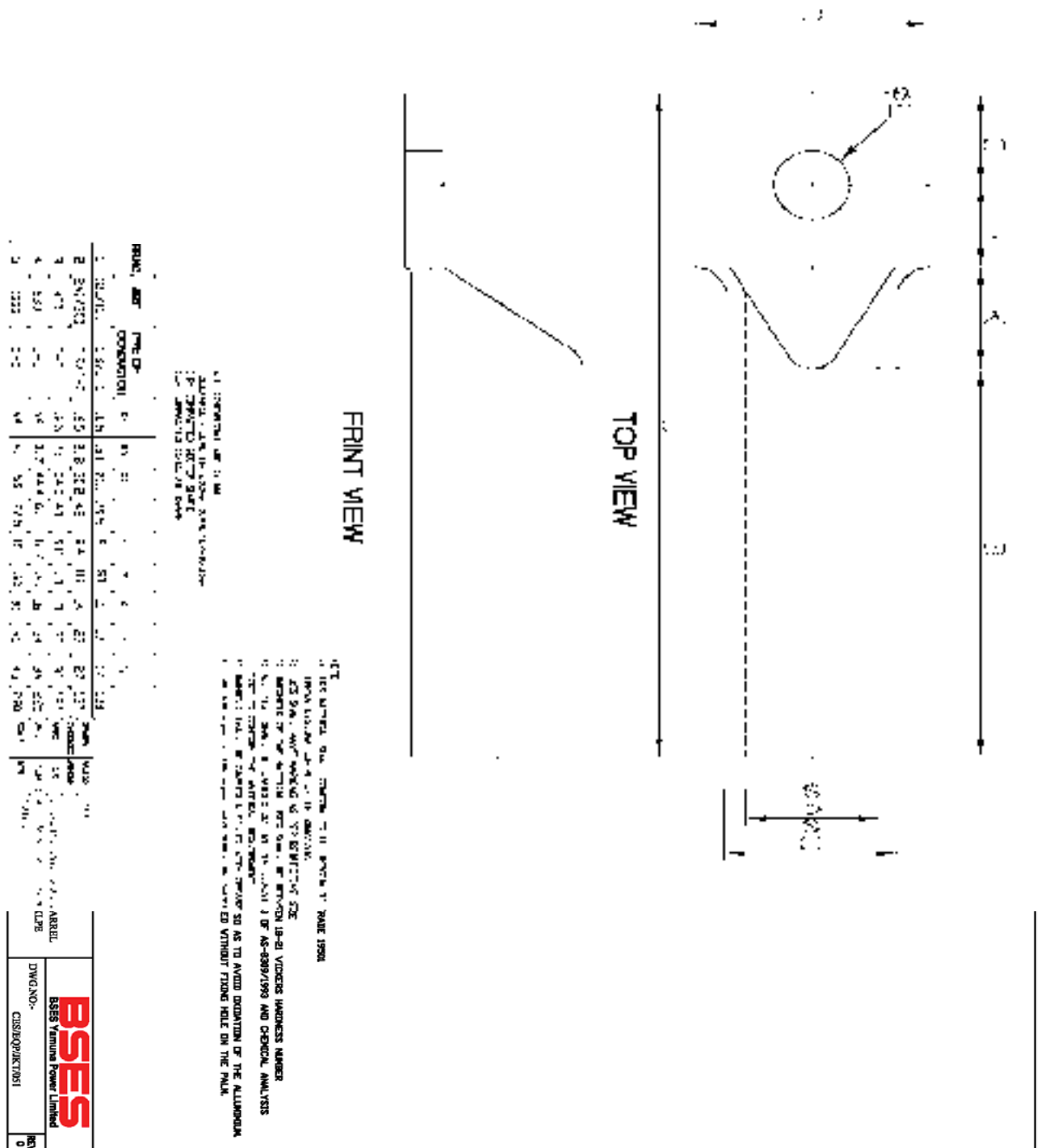
Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 KV, 33 KV, 66 KV Cables)

Annexure – F: Bimetallic Aluminium / Copper Lug



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

Annexure – G: Aluminum Lug For XLPE Cable



Job Card For Cable Jointing Work

Job Card No. Date Fault ID

Division Purpose Project / Scheme O&M

Contractor

Voltage Grade 11kv 33kv 66kv 1.1 KV/LT

No. of cores 1 3 3.5/4

Cable Size: 1000 / 800 / 630 / 500 / 400 / 300 / 240 / 225 / 185 / 120 / 95 / 70 / 50 / 25 sqmm

Joining Details	Type of Joints	No. of Joints		Docate No.	IR Ref.
		Single	Double		
	XLPE/XLPE(or PVC/PVC) Straight Through Joints				
	XLPE/PILCA Transition Joint				
	PILCA/PILCA Straight Through Joints				
	XLPE Indoor Termination				
	XLPE Outdoor Termination				
	PILC Indoor Termination				
	PILC Outdoor Termination				

Feeder Details From To

Location From To

Landmark:

Fault Occurance Date:

Job Allocated By: PWT Ref:

Date and Time of Spiking Work Completed On:

Digging Details (In Meter) Length Wedth Depth

Details of cable laid Size Length (In Meter) Docate Ref.:

Contractor Supervisor : Signature : Date :

Joiner Details:

Stage Verification	Stage/Work Verification	Name & Signature	Date & Time
ie : Digging / Jointing etc.			

Scrap Details including Qty:

New Kit Details:

Old Kit Details:

Type of Fault:

Remark If any :

Job Certified By :

Shift Incharge Name Signature Date

1* COPY - BILLING COPY

Registered Office: BSES Rajdhani Power Ltd. BSES Bhawan, Nehru Place, New Delhi-110019

Annexure-I

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

Annexure-I

	of work done, material consumption, location, feeder name and joint tag no., date, supervisor name, jointer name) sent to SDO	
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	Updation of information in OMS including supervisor name, jointer name, feeder name	GNIIT
10	Information to include GPS location of cable fault.	GNIIT



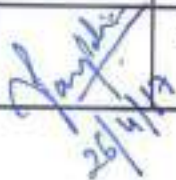
Special Note-

- 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.



Specification
for
1.1kV LT Outdoor Termination Kit

Specification no.: GN101-03-SP-52-01

Prepared by:		Approved by :		Approved by:		Rev	Dated
Name	Sign	Name	Sign	Name	Sign		
Pronab Bairagi		Amit Tomar	 26/04/17	Vijay Pampalia	 26/4/17	01	26.04.2017

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Records of Revision

Item/Clause No.	Change in Specification	Approved By	Rev
5.5.0	Type test		01
8.0.0	Deviation		01
9.0.0	Inspection Expenses		01
4.1.3 (A)	Hydraulic Crimping		01
Annexure-G	Job Card		01
Annexure-H	SOP		01
10.0.0	Failure Analysis and Penalty		01

1.0.0 Scope of work

Heat Shrinkable Outdoor Termination Kits, suitable for 1.1 kV LT Power , XLPE Insulated, PVC sheathed 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:

S. No.	Standard Number	Title
2.1.1	IS - 13573: 2011	Including Amendment part 1, Joints & Terminations, for Polymeric cables for working voltages 1.1 kV up to and including 3.3 kV - Type test requirements.
2.1.2	IS – 7098 Part 1 : 1988	Cross-linked Polyethylene (XLPE) Insulated PVC sheathed cables : Part 1 : For working voltages from up to and including 1.1 kV
2.1.3	IS - 10810: 1984	Methods of test for cables

2.2.0 International standards

S. No.	Standard Number	Title
2.2.1	EA TS - 09 - 13	Electricity Association - Technical Specification -09-13 Material component for use in Electric Power Cable Termination & Joints for System voltage above 1000 V up to 36 kV
2.2.2	IEC - 885 Part 1-3	Electric test methods for electric cables
2.2.3	IEC 60502-2009	Power cables with extruded Insulation and their accessories for rated voltages from 1kV up to 30kV.
2.2.4	ASTM D 2303	Standards Methods for Liquid, Inclined -Plane Tracking and Erosion of Insulation Material.
2.2.5	EN 50393	Specification, for 1.1 kV Cable joint & Terminations kit.

3.0.0 Cable Construction

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

XLPE type Cables: **4-core x 150 or 300 sq.mm. Al**

3.1.0	Conductor	For XLPE : a) Electrolytic Grade stranded Aluminum Conductor b) Grade: H2/ H4 as per IS: 8130/84 (For Al) c) Shape: compacted sector shaped stranded d) Class 2
3.2.0	Insulation	For XLPE: Extruded XLPE Insulation
3.3.0	Inner Sheath	Extruded Inner Sheath of Black PVC type ST-2.
3.4.0	Armour	Galvanised steel flat strip armour
3.5.0	Outer Sheath	Extruded outer sheath of PVC (ST-2)

4.0.0 Cable Termination Kits

4.1.0 General Construction:

The material shall be constructed in accordance with the applicable standards. The kits shall be suitable for storage without deterioration at temperatures up to 50 degrees C and shall have unlimited shelf life. The heat shrink system of the identical type brand as offered in the bids shall have proven performance of at least 5 years in Indian conditions. It should be supported by type test report and purchase orders of other utilities.

4.1.1 Type of Termination:

Termination shall be heat shrinkable suitable for 1.1kV (E) four core XLPE Insulated and armoured cables (In line with BSES Specification & IS 7098-part1/IS 13573 (Part1)) having sector shaped stranded aluminium conductors of sizes 150 mm² & 300 mm². Bidder shall furnish documentary evidence confirming adherence to these or the dimensions as per the type test report, whichever is higher. Fault level as well as duration withstands capacity of termination kits shall be matched with the parameters of cables (or which the kits are intended to be used for).

4.1.2 Class of Terminations:

The heat shrinkable cable terminations are of Outdoor Termination suitable for pole top

mounting or on outdoor ACB terminal

4.1.3 Heat shrinkable component- General Properties:

Components shall be capable of being stored without deterioration upto a temperature of 50 Deg. C and shall have unlimited shelf life. Sealant activated by heat shall be used in conjunction with heat shrinkable components to provide on environmental to the completed termination.

A) Aluminum Lug:

Long barrel Aluminum Lugs with Anticorrosive/Antioxidation paste suitable for use in termination kits low voltage distribution system. Connectors (Lugs) used should be in line with IS 8337 and as **Annexure-F**.

All the lugs shall be crimped with hydraulic crimping tools during termination work. Using of Hydraulic crimping tool is mandatory.

B) Tinned Copper Earthing Braid:

A flexible tinned copper braid Insulated with Heat shrink tube shall provide electrical continuity of steel wire armour. The fault current capacity of copper braid should withstand the cable fault current capacity based upon different size of cable as defined in IS: 13234. The conductor shall be bonded to the armour wires by a combination of galvanized steel ring inserted under the wires and stainless steel horse clips (steel grade SS 304). The arrangement shall ensure that temperature rise at bonding points shall be limited to permissible temperature of cable.

Earthing braid should be provided with length sufficient to take one complete turn on armour and then continue to the other end of the armour with one turn around, This one turn will ensure the firm contact with the armour to tighten this braid worm drive clips two per side to be provided with back up ring the remaining 70 % of braid will be insulated with heat shrink tubes to ensure the Insulated earth at Heat shrink breakout region.

Braid terminal lug shall be suitable to accommodate M12 bolts for connection with earthing.

C) Heat shrink Insulating tube:

The minimum length of outer sleeve shall be . It shall also have UV rating to protect from direct sun light exposure.

Each Phase and neutral tube shall have different colour for easy identification. Preferably, Red, Yellow, Blue colour to be used for Phases and Black for neutral. If the same is not possible then at least, Red colour to be used for Phases and Black for neutral. Lug seal with HMA to be provided for lug sealing.

D) Sub kit:

The sub kit consists of Mopping cloth, PVC Tape, Core cleaning solvent, Black mastic tape Al2O3 Paper and other standard accessories essential for installation and satisfactory performance of the kit.

4.2.0 Properties of Heat shrinkable components:

Property	Requirement
Electric Strength	≥ 8 kV/mm
Heat shock at 250 deg C for 15 Min	No spilling, cracking, dripping or flowing
Tensile strength	≥ 12 Mpa (120 kg/sq.mm)
Elongation	$\geq 200\%$
After Thermal Ageing at 120 deg C for 500Hrs.	
Tensile strength	≥ 10 Mpa (100 kg/sq.mm)
Elongation	$\geq 100\%$

4.3.0 General Kit contents of the Termination For 1.1Kv Cable:

BOM FOR 1.1 KV XLPE TERMINATION		
S.No.	Item	Quantity
1	Lugs/Connector with Anticorrosive/Antioxidation paste	4Nos
2.	Lug seal tube	4 nos
3.	Heat Shrink Core Protection Sleeves	4Nos
4	Earthing Set (with tinned copper braid)	1No
5.	Heat Shrink Breakout	1No
6.	Sub-kit (of Mopping cloth, PVC Tape, Core cleaning solvent, Black mastic tape and Al2O3 Paper etc)	1Set
7.	Installation Instruction manual with field quality plan	1No
8.	Packing Box	1No

5.0 TESTS

All routine, acceptance & type tests shall be carried out accordance with the relevant IS/IEC. All routine & acceptance tests shall be witnessed by the purchaser/his authorized representative.

All the components shall also be type tested as per the relevant standards.

Following tests shall be necessarily conducted on the Termination kits in addition to others specified in IS/IEC standards

5.1.0 Type Tests

- a) Impulse voltage withstand test
- b) Heat cycle test.
- c) A.C. withstand voltage test (Air and Water)
- d) Load cycle test
- e) Heat cycle test in water
- f) Insulation resistance test (Air and Waler)

5.2.0 Routine Test:

The bidder shall provide material wise routine test report conducted at their works during inspection.

5.3.0 Acceptance tests:

- a) Visual Inspection- The offered kits shall be free from any visible defects,
- b) Physical verification of contents - all the contents shall be checked as per kit contents list enclosed by the bidder,
- c) Electric Strength test for Insulation tubing.
- d) Elongation tests for all types of tubing.
- e) Wall thickness ratio
- f) Longitudinal change after full recovery.
- g) Tracking and corrosion resistance test.
- h) Tensile strength.

5.4.0 TYPE TEST CERTIFICATES

The bidder shall furnish the type test certificates for the tests mentioned above as per the corresponding standards. All the tests shall be conducted at CPRI/ERDA as per the relevant standards. Type tests should have been conducted from CPRI/ERDA during the period not before 5 years from the date of opening the bid. In the event of any discrepancy in the test reports, i.e. any test report not acceptable, same shall be carried out without any cost implication to the Purchaser.

5.5.0

If product is not type tested or test report is more than 5 years old from CPRI/ERDA, same shall be carried out by seller, sample shall be selected randomly by BSES, test cost to be borne by seller. For new vendor, type test is mandatory from CPRI/ERDA of BSES sample at their own cost. All the cost of inspector shall be borne by seller as mentioned in inspection expenses clause

6.0.0 DRAWINGS, DATA & MANUALS

6.1.0	Documents	Copy of signed documents also shall be part of entire soft file (e-file) or CD.)
6.2.0	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 Instructions. e) Manufacturing quality plan f) Field Quality Plan g) Lug dimension sheets. e) Any other document.
6.3.0	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.
6.4.0	"As-Built" documents	Final signed "As-built" documents for the equipment in 3 sets (hardcopy), 1 no. soft copy and 1 no. CD. These documents shall include signed Routine & Acceptance Test Certificates also.
6.5.0	Packing, Marking, Shipping, Handling and Storage	Every component/kit/box shall be properly sealed/ packed for protection against damage.
6.6.0	Identification Labels:	Markings / Labels shall be on both sides of every packed box. 1) Identification number/type designation (as per manufacturer's standard) 2) Voltage grade, size, description of the Kit (including the voltage grade, size, type of the cables, for which it is to be used) 3) Batch no., lot no., etc. 4) Quantity 5) a) Purchase Order no. & date b) Purchaser's name c) BSES's SAP code number 6) Weight (kg) of each Cable Termination Kit and of each box containing kits. 7) Manufacturer's name 8) Month & Year of Manufacturing 9) Date of packing, Shelf life (if applicable)
6.7.0	Transit damage	The seller shall be responsible for any transit damage due to improper packing.

7.0.0 Quality Assurance (QA)

7.1.0	Vendor's Quality Plan (QP)	To be submitted for Purchaser's approval.
7.2.0	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.
7.3.0	Inspection Hold-Points	To be mutually identified, agreed and approved in Quality Plan.

8.0.0 Deviations

8.1.0.	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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9.0.0 Inspection Expenses

Inspection (i.e. routing test, acceptance test, type test, factory visit etc.) shall be done any time by BSES on the basis of PO or may involve 3rd party as per BSES requirement. Inspection expenses like accommodation, fooding, local transport, air fair, train fair, taxi (NCR) etc shall be bore by seller.

Any kind of test (routine/type test/acceptance test if any) at 3rd lab (i.e. CPRI/ERDA/NABL approved lab) shall be carried out by seller at their own cost. BSES may witness the test and the expenses like accommodation, fooding, local transport, air fair, train, taxi etc. shall be borne by seller.

Above expenses shall be applied at each and every inspection and shall stand till closing of PO/WO/Rate contracts etc.

10.0.0 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 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	Units	Vendor's data
1	Manufacturer's name		
2	Purchase Order no. & date		
3	Guarantee Period (minimum)	60 Months (from date of commissioning) / 66 Months (from date of receipt at Purchaser's store), whichever is earlier	
4	Applicable IS /IEC Standard followed by Vendor (incl. type test standard)		
5	Voltage Grade	kV	
6	A.C. withstand voltage Dry (Ph./ground)	kV	
6.1	Time duration	Minutes	
7	A.C. withstand voltage wet (Ph./ground) immersed in water	kV	
7.1	Time duration	Minutes	
8	Impulse Withstand Voltages	kV	
9	Load Cycle Test		

	a) Each Cycle – Heating Duration Temperature Cooling Duration b) Number of Cycles	Hrs. Deg. C Hrs	
10	Heat Cycle test in water on outer sheath		
11.	Leak Tightness		
12.	Insulation Resistance in Air	500volt 50 Mega ohm	
13.	Insulation Resistance immersed in water	500volt 50 Mega ohm	
14.	Dielectric Strength of Insulating Material		
15.	DC Voltage Withstand test	kV/Min	
16.	Accelerated ageing test		
17	KIT PARTICULARS		
17.1	Material of the tubing /moulded parts		
17.2	Method of environmental seal		
17.3	Allowable Kit storage Temperature (50 deg. C)	Deg. C	
17.4	Shelf life of H.S. components	unlimited	
17.5	Cable Termination Installation Instructions manual	Yes/No	
17.6	Method of earth bond a) Size and no. of braids b) Size of armour support c) No. of hose clips		
17.7	Method of mechanical protection a) for 4-core Cable		

17.8	Method of protection against corrosion (type & coating thickness of protective layer on steel mat)		
17.9	Method of conductor continuity a) For crimping connector b) For mechanical connector	Hydraulic Crimping for Lugs	
18	Description of items in the Kit, which are imported /sourced From Principal /Sub-suppliers		
19	Names of items in the Kit and their respective shelf life (months/years)		
20	Kit Content Table (KCT) enclosed? (Refer Annexure - B)	Yes / No	
21	Drawing for Aluminum lugs with dimension(ferrule) enclosed	Yes / No (If yes, mention the document reference)	
22	Is Annexure - D (Technical Deviation Sheet) duly filled-in?		
23	Packing (Qty) i) Packing of every Kit h) Group Packing	1 no -- No. of Kits per Box -- No. of Boxes	
24	Installation Procedure enclosed?	Yes / No (If yes, mention the document reference)	
25	Quality Assurance Plan (QAP for raw materials, in-process inspection, factory testing) is enclosed?	Yes / No	
26	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.)	
27	Type Test Reports (TTR) (Relevant test report no. & date, With type, size, other details of each type of Kit.)		

	a) Prepared termination CPRI/ERDA TTR as per BIS / IEC enclosed?	Yes/No	
	b) Loose Components: CPRI/ERDA TTR as per EA TS 09-13 enclosed?	Yes/No	
28	Printing details on each of the Heat- shrinkable and Moulded components	(Mention the text, presently Printed on each of the component)	

Annexure – B: Kit Content Table (KCT)

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

A. Heading

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

B. Details / Parameters

(For each component/item of the KCT)

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

C. Notes on the KCT

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

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

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

Annexure – C: Routine and Acceptance Test

A. Visual Examination

Condition of selected items / components, as per sampling method, shall be recorded. Some of the normal check-points can be as follows:

1. Every component shall be verified in quantity and description as per KCT.
2. All items shall be free from any defects, pin holes, cracks, etc.
3. Metallic components to be free from sharp edges.

B. Measurements of Dimensions

(Required / observed dimension — length, diameter, etc.)

1. Supplied dimensions
2. Recovered dimensions

C. Destructive Testing

On various heat-shrinkable /moulded components of ready Kits (Items 3 and 4 are applicable only for heat-shrinkable components)

1. Tensile Strength
2. Wall Thickness Ratio
3. Heat Shock
4. Longitudinal Change, after full recovery
5. Ultimate Elongation
6. Low Temperature Flexibility
7. Dielectric Strength
8. Volume Resistivity

D. Routine Test Reports (RTR)

(Typical)

Each RTR shall clearly indicate P.O. no. & date and also BSES's SAP code no. RTR shall record the serial numbers of the kits selected, as per vendor's sampling method. Following details, besides vendor's/manufacturers standard check-points, shall appear in every RTR.

Annexure – D: Technical Deviation Sheet

Sr No.	Clause No.	Deviation

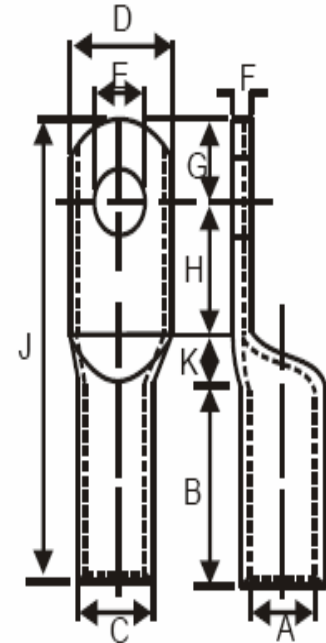
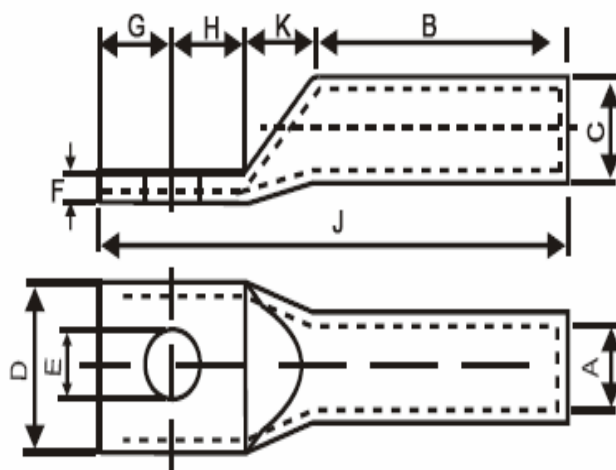
Annexure – E: Service Conditions

(Atmospheric conditions at Site)

1	Delhi	
a)	Average grade Atmospheric Condition:	Heavily Polluted, Dry
b)	Maximum altitude above sea level	1000 M
c)	Ambient Air temperature	Highest 50 deg C, Average 40 deg C
d)	Minimum ambient air Temperature	0 deg C
e)	Relative Humidity	90 % Max
f)	Thermal Resistivity of Soil	150 Deg. C cmm
g)	Seismic Zone	4
h)	Rainfall	750 mm concentrated in four months

Annexure – F: Aluminum Lug for XLPE Cable

Cable Size											
Cable details	Conductor shape	E	A	C	D	F	B	K	H	G	J
CABLE ARM XLPE 1.1KV 4C 300MM ² AL	SECTOR SHAPE	17	23.5 - 24.1	30.9 - 31.2	44.2 - 45.2	7 - 7.5	89	14	27	27	157
CABLE ARM XLPE 1.1KV 4C 150MM ² AL	SECTOR SHAPE	13	16.2 - 16.6	21.4 - 21.6	30.6 - 31.2	4.7 - 5.3	83	11	17	17	128



NOTE: ALL DIMENSIONS ARE IN MM

Job Card For Cable Jointing Work

Job Card No. Date Fault ID

Division Purpose Project / Scheme O&M

Contractor

Voltage Grade 11kv 33kv 66kv 1.1 KV/LT

No. of cores 1 3 3.5/4

Cable Size: 1000 / 800 / 630 / 500 / 400 / 300 / 240 / 225 / 185 / 120 / 95 / 70 / 50 / 25 sqmm

Joining Details	Type of Joints	No. of Joints		Docate No.	IR Ref.
		Single	Double		
	XLPE/XLPE(or PVC/PVC) Straight Through Joints				
	XLPE/PILCA Transition Joint				
	PILCA/PILCA Straight Through Joints				
	XLPE Indoor Termination				
	XLPE Outdoor Termination				
	PILC Indoor Termination				
	PILC Outdoor Termination				

Feeder Details From To

Location From To

Landmark:

Fault Occurance Date:

Job Allocated By: PWT Ref:

Date and Time of Spiking Work Completed On:

Digging Details (In Meter) Length Wedth Depth

Details of cable laid Size Length (In Meter) Docate Ref.:

Contractor Supervisor : Signature : Date :

Jointer Details:

Stage Verification	Stage/Work Verification	Name & Signature	Date & Time
ie : Digging / Jointing etc.			

Scrap Details including Qty:

New Kit Details:

Old Kit Details:

Type of Fault:

Remark If any :

Job Certified By :

Shift Incharge Name Signature Date

1* COPY - BILLING COPY

Registered Office: BSES Rajdhani Power Ltd. BSES Bhawan, Nehru Place, New Delhi-110019

Annexure- H

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

Annexure-H

	of work done, material consumption, location, feeder name and joint tag no., date, supervisor name, jointer name) sent to SDO	
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	Updation of information in OMS including supervisor name, jointer name, feeder name	GNIIT
10	Information to include GPS location of cable fault.	GNIIT

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- 1) Joints to be done preferably during day. In case of constraints, DGM (O&M) to authorize for night time jointing with supervisor
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- 4) Certification of job card for payment by DGM (O&M) subject to OMS compliance CES to check any gaps.

TECHNICAL SPECIFICATIONS OF INSULATING MAT

TECHNICAL SPECIFICATIONS

OF

INSULATING MAT

BSES RAJDHANI POWER LTD.

Prepared by	Naved Ahmad	<i>Naved Ahmad</i> 15/5/18	Date:	15.05.2018
Reviewed by	Amit Tomar	<i>Amit</i>	Revision	R0
Approved by	K. Sheshadri	<i>K. Sheshadri</i> 17/5/18	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.	Descriptions	BRPL 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

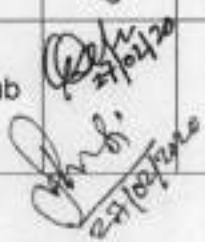

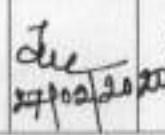
Deviation from this specification is only acceptable in cases where the bidder has submitted deviation list along with the technical bld. It may also be noted that the deviation can only be accepted by BRPL in case it does not hamper the basic purpose of safety helmets with sensor

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 Ring Main Unit

Technical Specification for 11 kV Ring Main Unit

Specification no – SP-ERMUX-15-R9

Prepared by		Reviewed by		Approved by		Rev	Date
Name	Sign	Name	Sign	Name	Sign		
Gautam Deka/Pronab Bairagi	 27/02/2020	Amit Tomar	 27-02-2020	K. Sheshadri	 27/02/2020	R9	27/02/2020

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

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

Revision No	Item / clause no.	Nature of Change	Approved By
R5	1, Annex. 1.9	Service performance requirements during guarantee period specified.	DS
R5	1, Annex. 1.11	Training requirements for RMU & Self powered relay specified.	DS
R5	2	IEC 62271 specified	DS
R5	4.4.1	Solid Shielded Insulation Added	DS
R5	5.6	Added – Operating Handle support	DS
R5	5.13.3	Cable termination height is increased to 900 mm.	DS
R5	5.14.2	Bus bar short time withstand capacity changed to 20kA for 3 sec	DS
R5	5.24	Added – Avoid any type of Gaps or holes on the cable termination chamber wall.	DS
R5	6.5.4	Included provision of 2nos AC incoming supply MCB	DS
R5	6.6.2	LBS short time withstand capacity revised to 20kA for 3 sec	DS
R5	6.7	LBS fault making capacity revised to 50kA peak	DS
R5	6.8	Mechanism endurance class M1 and Electrical Endurance class E3 specified	DS
R5	6.9	Minimum no. of operations at rated fault current specified – Electrical endurance class E3	DS
R5	6.10	Fault Passage Indicator specifications included	DS
R5	7.2	CB arc interruption medium only in Vacuum bottle	DS
R5	7.4	Added – Protective flap on Emergency PB	DS
R5	7.5.2	20kA short time withstand capacity specified	DS
R5	7.6	Mechanical – M1 & Electrical-E2 endurance class specified for circuit breaker module	DS
R5	7.7	CB fault making capacity revised to 50kAspecified	DS
R5	7.8	CB fault breaking capacity revised to 20kA	DS
R5	8.7	No load mechanical endurance class M0 specified for earth switch	DS

Technical Specification For 11 kV Ring Main Unit

R6	8.8	Making capacity endurance class E2 specified	DS
R5	10.6	Added – Prevent electrical operation if handle is inserted for manual operation	DS
R5	12.1	Sticker type mimic diagram non acceptance specified	DS
R5	13.3	Process audit included in the Quality systems for RMU, self powered relay	DS
R5	13.4	Approved sub vendor list specified for FPI self powered relay	DS
R5	Annexure A – 1.5	2 nos. is changed to 2 sets of Operating handle	DS
R5	Annexure C – 21 to 26	Earth Switch , Self powered relay, FPI, CT, VPI details included in GTP particulars, to be provided by supplier	DS
R5	Annexure F	BSES 11kV terminal connection lug dwg. – Bimetallic Ring type, provided for supplier to provide suitable terminal fixing arrangement at 11Kv bushing.	DS
R6	Annexure I	Requirement of 11 kV "Metering Cubicle" requirement added	DS/GS
R7	4.2	Added Both side extensible (L.H.S. and R.H.S.) requirement	VP
R7	18.0	Added Equipment ID requirement	VP
R7	1.10	Added Equipment ID requirement	VP
R7	7.11	Circuit breaker (TCB / FCB): Added all the CTS shall be bushing mounted requirement	VP
R7	Annexure G(1)	Added Servicing and Warranty requirement-Equipment supply (11kV Ring Main Unit) requirement	VP
R8	6.10	FPI (for both Earth Fault and Over Current Protection)	VP
R8	Annexure-I	Make List	VP
R8	16	Deviation Clause	VP
R8	1.0A	Motorized Compatibility	VP
R8	7.13	Self Powered –shall be communicable	VP
R8	9.4	Digital Manometer for SF6 gas pressure measurement	VP
R8	Annexure-E (f)	4 Way Outdoor RMU (2VCB+2LBS)	VP
R9	5.1, 5.7	Panel Construction –CRCA/GI with 2 to 2.5 mm thick sheet	KS
R9	5.8	Base frame shall be constructed with 75mm ISMC/ISA channel and HDPE cleat shall be adjustable to hold the cable	KS
R9	5.12	11kV, 3CX400 sqmm cable added provision of termination facility.	KS

Technical Specification For 11 kV Ring Main Unit

R9	5.15	Earth Bus bar-Tinned Copper flat sized for rated fault duty for 3 sec	KS
R9	5.20	TBs shall be push on type in the place of screw type.	KS
R9	6.10.2	Connection of CBCT with FPI shall be with only PVC wire	KS
R9	7.11	Position of CTs inside compartment shall be adjustable in vertical and horizontal direction	KS
R9	7.12	CT accuracy class shall be 5P10	KS
R9	7.16	VCB breaking timing shall be 40 to 60ms	KS
R9	8.8	Making capacity endurance of earth switch- E2 Class with 5 operation as per IEC 62271-102	KS
R9	9.1	Stainless steel Tank enclosure suitable for IP67. Metal thickness shall be 3mm	KS
R9	Annexure-H-8.14 and 9.10	Make and grade of Epoxy Resin shall be Cycloaliphatic	KS
R9	12.8	Printed copy of termination and wiring diagram shall be fixed/mounted inside each and every compartment	KS
R9	Annexure-I	Make list	KS
R9	Annexure-K	Special Technical Requirement	KS

Proposed by

Gautam deka/
Pronab Bairagi

Reviewed By

Amit Tomar

Approved by

K. Sheshadri

Technical Specification For 11 kV Ring Main Unit**1.0 Scope of work**

- A. 11kV Manual RMU shall be supplied as per the specification. All the manual RMU shall be compatible for retrofit solution of motorized RMU in future
- B. Metering Cubicle (Only with Outdoor RMU, if specified with purchase requisite) **[R6]**
- C. For scope of supply, refer annexure – A

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
IEC 60265 part 1	High voltage switches
IEC 60056	High voltage alternating current circuit breakers
IEC 60059	Preferred current ratings of high voltage switchgear
IEC 60185	Current transformers
IEC 60694	Specification for high voltage switchgear
IEC 60298	AC metal enclosed switchgear
IEC 60129	Ac disconnect and earth switches
IEC 60529	Classification of degrees of protection provided by enclosures
IEC 60255	Electrical relays

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. Other documents

3.0 Electrical Distribution System Data

3.1	Supply	3 phase AC, 3 wire
3.2	Voltage	11000 volt $\pm 10\%$

Technical Specification For 11 kV Ring Main Unit

3.3	Frequency	50 Hz \pm 5%
3.4	System neutral	Earthed at upstream 11kv source

4.0 11kv RMU System layout

4.1	RMU Configuration	As per scheme given in Annexure E & type as per Purchase requisition
4.2	Extensibility	Both side extensible (L.H.S. and R.H.S.) [R7]
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 from the main insulated tank. (Desirable feature)
4.6	Maximum dimensions for a 3 way panel (1 CB + 2 LBS)	
4.6.1	Width (measured from front)	1250 mm
4.6.2	Depth	800 mm
4.6.3	height	2000 mm

5.0 RMU panel construction

5.1	Panel type	CRCA/GI Metal enclosed, framed, Compartmentalized panel construction {R9}
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)

Technical Specification For 11 kV Ring Main Unit

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 for rear access, with handles. Support for handle shall be provided at suitable place on RMU body. [R5] 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.
5.7	Construction	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. Sheet thickness below 2 mm in any part of RMU shall not be accepted {R9}
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. {R9}
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 (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	3c x 150 / 240 / 300/400 sq mm Aluminum conductor XLPE/ PILC with armor & PVC outer sheath {R9}
5.13	Terminals for 11kv cable termination	Suitable for Ring Type Bimetallic lug as per annexure F [R5]
5.13.1	Right angled boots	Single piece cold shrink type per bushing
5.13.2	Brass Nut bolt	M16 size
5.13.3	Bimetallic washers	Required
5.13.4	Termination type	suitable for heat shrinkable type
5.13.5	Termination height	For Indoor / Outdoor : Min. height from gland plate shall be 900mm [R5]

Technical Specification For 11 kV Ring Main Unit

5.14	Bus bar	Copper with sleeve (Sizing Calculation to be submitted in support of its Guaranteed S.C. rating / Capability) {R9}
5.14.1	Bus bar continuous rated current	630amp (at designed 40 deg.C ambient) {R9}
5.14.2	Bus bar short time withstand capacity	20 KA for 3 sec (R5)
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 IEC60694
5.15	Earth bus bar	Tinned Copper flat sized for rated fault duty for 3 sec {R9}
5.16	Earth bus internal connection to all non current carrying metal parts	By 2.5 sq 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 / Tinned Copper)
5.21	Gasket	Neoprene rubber
5.22	Marshalling terminal blocks	1 Sq mm, Nylon 66 material, push on type + 20% spare in each row of TB. {R9}
5.23	Panel cover fixing bolts	Allen head 6mm with hexagonal slot
5.24	Padlock facility	Required for all earth switches & all handles
5.25	Bushings for future extensions of RMU	Should be duly insulated & covered with metallic covers in unused condition
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. Internal

Technical Specification For 11 kV Ring Main Unit

		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. [R5]
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.

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
6.4.2		Clause deleted. [R5]
6.6.1	Continuous rating of LBS	630 Amp at design 40 deg C ambient
6.6.2	Short time withstand capacity	20 KA for 3 sec [R5]
6.7	Fault making capacity	50 kA peak [R5]
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) [R5]
6.9	Minimum number of operations at rated fault current (as per IEC 62271-102)	Class E3 (Min 10 operations) [R5]
6.10	Fault passage indicator (FPI) (For both Earth fault and Over Current Protection) [R8]	To be provided on right hand side of one LBS for panel type 1CB + 2 LBS. For all other configuration of RMU, FPI to be provided on all LBS. Wherever, there are two cables per LBS, two FPI needs to be considered for that particular LBS
6.10. 1	Earth Fault Indicator	CBCT – Split open type suitable for mounting without disconnection of cable.
6.10.2	Connection of CBCT with FPI	Cable connection of FPI with CBCT shall be of pre moulded type on the CBCT side. Cable shall be 2.5 sq.mm cu cable or {R9}

Technical Specification For 11 kV Ring Main Unit

6.10.3	Fault Passage Indicator (For both Earth Fault and Over Current Protection) [R8]	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.
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 , 70 sq.mm to 400 sq.mm {R9}
6.10.4.5	Earth Fault Indicator	
6.10.4.5.1	Sensing Current	100 to 400A {R9}
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 50 Deg C {R9}

7.0 Circuit breaker (TCB / FCB)

7.1.1	Type	Three pole, operated simultaneously by a common shaft
7.1.2	Transformer circuit breaker -TCB	For controlling transformer, manual operation only
7.1.3	Feeder circuit breaker - FCB	For controlling cable feeder, manual operation. Remote trip operation by SCADA
7.2	Arc interruption in dielectric medium	Vacuum Bottle (R5)
7.3.1	Operating mechanism - TCB	Manual spring charged stored energy type
7.3.2	Operating mechanism - FCB	Manual spring charged stored energy type, remote electrical close / open operation possible.
7.4	Emergency trip / open push button	On panel front with Protective flap to prevent any accidental tripping of breaker. [R5]
7.5.1	Continuous rating at design 40 deg C	630amp

Technical Specification For 11 kV Ring Main Unit

	ambient {R9}	
7.5.2	Short time withstand capacity	20 KA for 3 sec (R5)
7.6	Minimum number of operations at rated current (as per IEC 62271-100)	Mechanical Endurance – Class M1(2000 operations) Electrical Endurance – Class E2 (R5)
7.7	Fault making capacity	50 KA peak (R5)
7.8	Fault breaking capacity	20 KA Minimum (R5)
7.9	Maximum number of operations at rated Fault current (as per IEC 62271-100)	Electrical Endurance – Class E2 . To be guaranteed by manufacturer with authorized lab test reports (R5)
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 {R9}
7.12	CT accuracy class	5P10 minimum {R9}
7.13	Protection relay	Self powered, Microprocessor based Numerical relay (with LCD display), IDMT over current / earth fault protection with high set element, manual reset type Relay mounting flush to panel front. Relay shall be communicable for automation purposes
7.14	Relay auxiliary contacts for remote indication	Potential free contact 1NO + 1NC wired to terminal block
7.15	Shunt trip 230v AC (for WTI 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.
7.16	Breaking Timing	40 to 60 ms {R9}

8.0 Earth switch (ES)

Technical Specification For 11 kV Ring Main Unit

8.1	Type	Three Pole (ON, OFF and Earth), 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	Manual
8.4	Fault making capacity	50 kA (Desirable)
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) [R5]
8.8	Making capacity endurance of earth switch (as per IEC 62271-102)	Class E2 (Min 5 operations) [R5] {R9}

9.0 Requirements of sealed housing live parts

9.1	Enclosure	Stainless steel enclosure suitable for IP67. Metal thickness shall be 3mm. {R9}
9.2	SF6 gas pressure low alarm	To be given
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	Digital Manometer with non return valve
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 (Desirable)

10.0 Operational interlocks

10.1.1	Interlock type	Mechanical
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

Technical Specification For 11 kV Ring Main Unit

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
10.4		® clause deleted
10.5	Cable test plug for LBS/CB accessible only if Earth switch connected to earth	Mechanical

11.0 Indication & signals (for 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 resettable 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
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 on LBS	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
11.9.4	CB close / open	potential free contacts
11.9.5	Protection relay operated	potential free contacts

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11.9.6	FPI operated	potential free contacts
11.9.7	SF6 gas pressure low	potential free contacts (Desirable)
11.10.1	Commands from SCADA- to be wired to marshalling terminal block	LBS close / open
11.10.2		FCB close / open
11.10.3		FPI Reset

12.0 Mimic diagram, labels & finish

12.1	Mimic	<ol style="list-style-type: none"> 1. Mimic diagram (Shall not be accepted with Stickers) [R5] 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 Hindi / local language to be displayed on left / front side of panel enclosure on anodized Al Sheet 16SWG, duly affixed on panel.
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
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.
12.4	Danger plate on front & rear side	Anodized aluminum 16 SWG with white letters on red background
12.5	Painting surface preparation	Shot blasting or chemical 7 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
12.8	Termination Drawing and Wiring Drawing	Printed copy shall be fixed/mounted inside each and every compartment. {R9}

13.0 Quality assurance

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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	BSES 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 List	[R5]
13.7.2	Fault Passage Indicator	pls refer make list
13.7.4	Self Powered O/C & E/F Relay	Ashida ADR241S-761 {R9}
13.7.5	Boots	3M / Raychem/K.D.Joshi

14.0 Inspection & testing

14.1	Type test	<ol style="list-style-type: none"> Equipment of type tested quality only, including internal arc test on various compartments like cable chamber, SF6 gas tank etc. Type test certificate to be submitted along with offer for scrutiny. Type test more than 5 years old will not be acceptable. <ol style="list-style-type: none"> <u>temperature rise test</u> <u>voltage regulation test</u>
14.2	Routine test	As per relevant Indian standard
14.3	Acceptance test	<p>To be performed in presence of purchaser at manufacturer works</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

15.0 Shipping, Handling and Site support

Technical Specification For 11 kV Ring Main Unit

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, Manual, 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 due to improper packing.
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 (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.</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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Technical Specification For 11 kV Ring Main UnitDeviation sheet format.

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

17.0 Drawings 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	
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	

Technical Specification For 11 kV Ring Main Unit

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	
Note :	Duly signed & stamped copies of the drawings / documentation are required to be submitted to BRPL for approval.	

18.0 Equipment ID [R7]

- I. Equipment ID shall be painted on any appropriate face of the equipment at a clearly readable height from the base level of the equipment.
- II. Font: Recommended type face for the signage is True type or Post script
- III. Font Size: All painting should be in UPPERCASE. Recommended height of 50 mm with spacing between alphabets of 3 mm.
- IV. Total No's of Character: 18
- V. Height of Font: 50 mm
- VI. Height of Base: 100 mm
- VII. Spacing between alphabets: : 3 mm
- VIII. Paint: Base coat – Dense Yellow. Letters – Black Quick Drying paint 2 coats.
- IX. Equipment ID shall be separately provided by BRPL

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). All the manual RMU shall be compatible for retrofit solution of motorized RMU in future 11kV RMU shall be as per scheme enclosed as Annexure E.
- 1.2 Configuration of 11kV RMU shall be as per Purchase Requisition.
- 1.3 Control Center has to be carried out at all sites by vendor engineer. [R5]
- 1.4 Guarantee Period for RMU shall be 66 months from the date of supply or 60months from date of commissioning, whichever is earlier. [R5]
- 1.5 Service Performance Requirements During Guarantee Period: [R5].
- 1.6 Each RMU shall be supplied with 2 sets of Operating Handle. [R5]
- 1.7 Supplier scope includes training of BRPL team – Minimum 4 batches (each batch with 4-5 engineers) for minimum 3 days at factory for erection, commissioning,

Technical Specification For 11 kV Ring Main Unit

maintenance trouble shooting of mechanism, FPI and all other components. This shall be carried out within 1 week from date of 1st shipment/ dispatch. Supplier shall also provide training for Self Powered relay at respective manufacturer' factory for 12 engineers/ technicians in 2 batches. [R5].All the trainings shall be applicable for each P.O.

1.8 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.

1.9 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				

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 one side is required -	Yes / No

Technical Specification For 11 kV Ring Main Unit

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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.

Bidder to submit duly filled GTP in hard copy format with company seal.

Sr. No.	Description	Data to be filled by Manufacturer
1	11kv 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
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 both sides – Yes / No	
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) –	

Technical Specification For 11 kV Ring Main Unit

	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 50 deg.C ambient {R9} 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	
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	

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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	
	Manual Spring charge type	
14.14	Feeder circuit breaker (FCB) –VCB	
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	

Technical Specification For 11 kV Ring Main Unit

	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	
15.13	Minimum permissible SF6 gas pressure (For SF6 type RMU only)	
15.14	Capacitor type cable voltage indication provided?	Yes / No
15.15	Operation counter provided	Yes/ No
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
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 no 12	Yes / No
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	

Technical Specification For 11 kV Ring Main Unit

21.2	Making capacity endurance of earth switch – Electrical endurance class	
22	Self Powered Relay – Make / Model	As per make list (refer annexure I (Relay shall be communicable with SCADA))
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 – Curves 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	
22.14	Thermal Withstand Capacity of Relay	
23	Fault Passage Indicator	Over Current and Earth Fault
23.1	CBCT	
a	Type	
b	Mounting Arrangement	
c	CT to indicator connection	

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d	ID of sensor	
23.2	Earth Fault Indicator	Make / Model as per Annexure-I
a	Sensing Current	
b	Sensing Time	
c	Indication	
d	Reset Time	
e	Resetting Facility	
f	Output Contact	
g	Contact Rating	
h	Aux Power Supply	
i	Degree of Protection	
j	Mounting Arrangement	
k	Ambient Temperature	
24	Current Transformer- Make	As per Annexure-I
24.1	Ratio	
24.2	Burden	
24.3	Accuracy Class	
25	Voltage Presence Indicator	
	Make	As per Annexure-I
	Rating	
	Model No	
26.8	Terminal Blocks, Disconnecting type fuses make	

Bidder / Vendor seal / signature

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

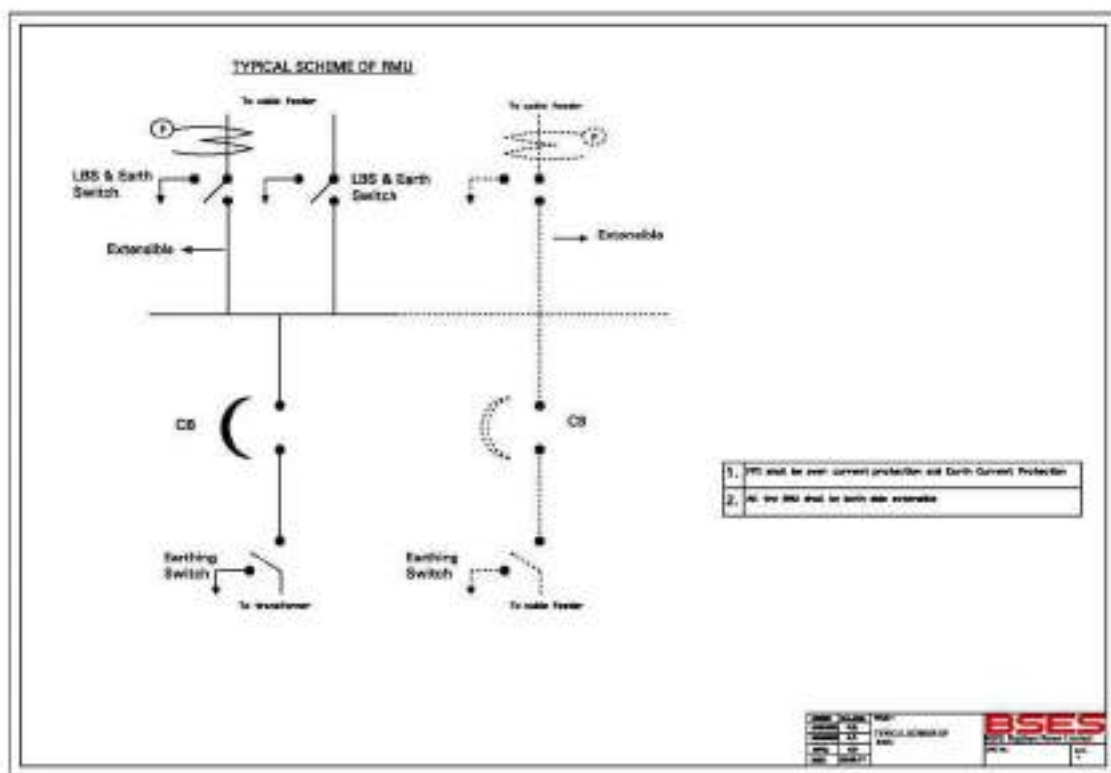
Technical Specification For 11 kV Ring Main Unit

Annexure D Recommended spares (Data by supplier)

List of recommended spares as following

Sr No	Description of spare part	Unit	Quantity
1		No	
2		No	
3			
4			
5			
6			

Annexure E Typical scheme of RMU



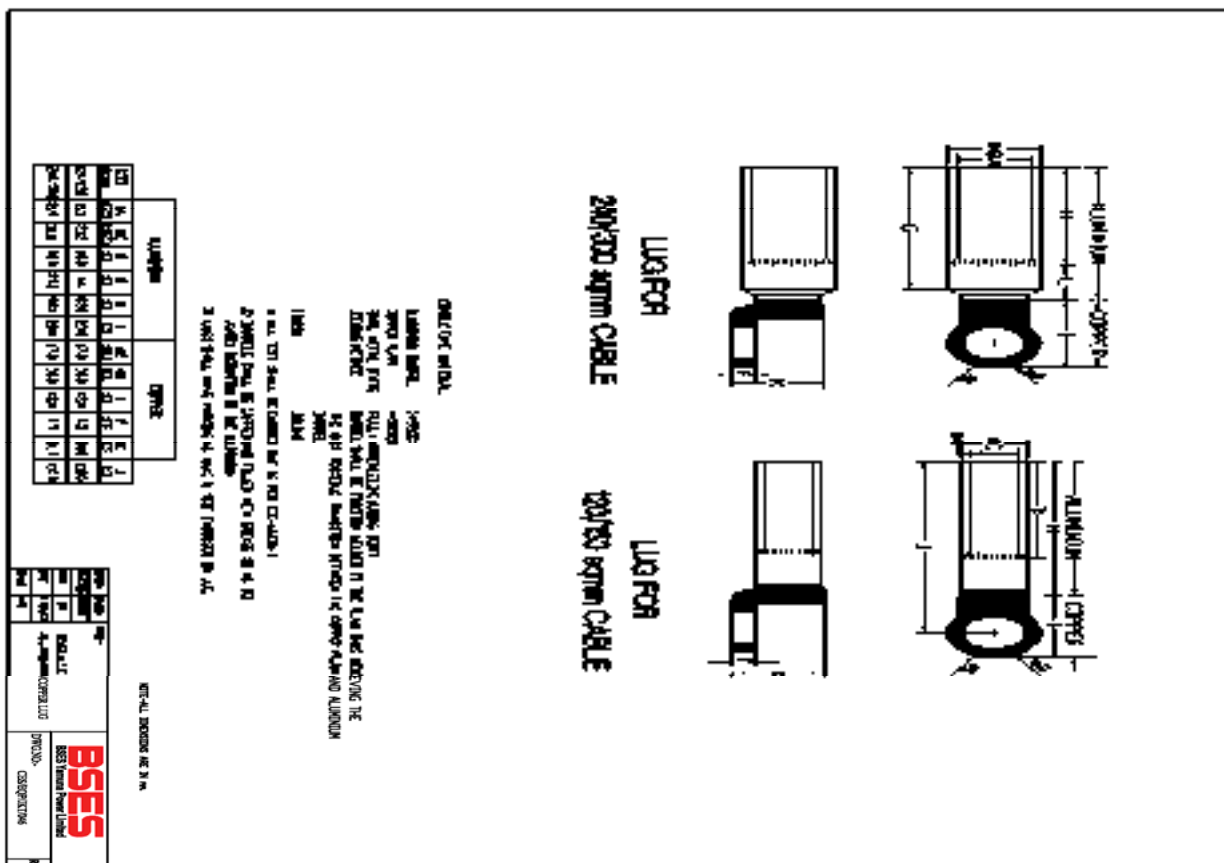
a) 11kv RMU shall have Transformer circuit breakers (TCB) with Load break switches (LBS) or Feeder circuit breakers (FCB) as per configuration defined in Purchase Requisition.c) TCB shall be operated manually only with facility for remote shunt trip.

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- d) 11kv RMU shall be suitable for extension on sides for addition of LBS, TCB or FCB.
- e) Fault passage indicator (For Both Earth Fault and Over Current Protection) including associated CT & connecting cable is shown by letter 'F'.
- f) RMU Configuration-

S.no.	Item description	Type	Combination
1	3 Way	Indoor	2LBS+1VCB
2	4 Way	Indoor	2LBS+2VCB
3	3 Way	Outdoor	2LBS+1VCB
4	4 Way	Outdoor	2LBS+2VCB
5.	1 way	Outdoor	1VCB

Annexure F Drawing of Bimetallic Ring Type Lug



**Annexure G(1) [R7] SERVICING AND WARRANTY REQUIREMENT-
EQUIPMENT SUPPLY (11KV RING MAIN UNIT)****INDEX**

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Technical Specification For 11 kV 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 BSES Rajdhani Power Limited.

2. Applicability

It is applicable to any equipment supplied directly or indirectly for installation / use in BSES 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 BSES 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 Ring Main Unit

- i) The equipment failed / malfunctioned within stipulated warranty period shall be attended free of cost for the reasons not attributed to BSES 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 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.

Technical Specification For 11 kV Ring Main Unit

- v) Service engineer to intimate necessary precaution required to prevent repetition of problem to respective area BRPL engineer as well as CES Team.
- 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: -

Technical Specification For 11 kV Ring Main Unit

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

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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

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.

Technical Specification For 11 kV Ring Main Unit**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.

Annexure 'H' 11 Kv Metering Cubicle**1.0 General Requirement**

1	Panel Type	Outdoor, Metal enclosed, framed, Compartmentalized panel construction
2	Service Location	Outdoor
3	Mounting	Free Standing
4	Overall Enclosure Protection	IP 54 Minimum (Complete unit i.e. RMU coupled to Metering unit shall be IP54)
5	Panel Fabrication	The metering cubicle shall be fabricated with 2.0mm CRC sheet. Load bearing members and high voltage compartments shall be 3.0 mm. The panel shall be vermin proof and totally enclosed. CT/PT compartment shall be fabricated after bending the M.S. 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 rear side.
6	Compartmentalized panel construction	The panel shall have four separate compartments. All the compartments shall be completely segregated from each other. 1. Meter Compartment 2. CT- PT compartment 3. Incoming 4. Outgoing

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7	Meter Compartment	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.
7.1	Double door	<ol style="list-style-type: none">1. Double door arrangement as front and back door to meet IP54 requirement. Both the doors should have 02 no’s concealed type (Anti Theft) hinges.2. Front door should have at least 01 no’s padlocking and 02 no’s sealing arrangements.
7.2	Meter reading Window	<p>Provided on front and back door to enable the meter reader to perform inspection of meter compartment and note down the reading of meter.</p> <ol style="list-style-type: none">1. Front Door: window of size 350 (W) X 300 (H) mm approximately with colour-less transparent acrylic sheet and wire mesh welded from inside.2. Back door: window of size 350 (W) X 300 (H) mm approximately with colour-less transparent acrylic sheet.
7.3	Data Downloading slot	<p>Slot to facilitate installation of data downloading cable with DB9 serial connector.</p> <ol style="list-style-type: none">1. Front door: Slot of size 25mm X10 mm (+/- 2 mm) should be provided on front door with sealable cover.2. Back door: Slot of size 30 mm X 50 mm shall be provided to facilitate installation of data downloading cable.
7.4	Meter hanging arrangement	The meter compartment shall contain hanger arrangement of slotted angle for mounting meter so that meter can be adjusted vertically and horizontally. Two horizontal and two vertical slotted channels should be provided for the same.
8	CT PT Compartment	The CT/PT compartment shall be completed welded type and house the 11 KV dry type current transformers (3 no’s) and 3 phase dry type potential transformer.
8.1	Current Transformers	The metering current transformers shall be suitable for 11 KV; 50Hz effectively earthed neutral system. The CT shall be single core, epoxy resin cast, copper wound primary type with rated burden 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.

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		SL	CT ratio	Short time rating	Size of main Bus bar
8.2	STC of CT	1	15 / 5 A	6 KA for 1 sec.	30 x 4 sqmm
		2	30 / 5 A	6 KA for 1 sec.	30 x 4 sqmm
		3	60 / 5 A	18KA for 1 seconds	30 x 4 sqmm
		4	100 / 5A	18KA for 1 seconds	30 x 4 sqmm
		5	150 / 5 A	18KA for 1 seconds	30 x 4 sqmm
		6	300 / 5 A	18KA for 1 seconds	40 x 6 sqmm
8.3	Potential Transformer	The Potential Transformer shall be dry type Epoxy resin cast, Copper wound suitable for 3 phase 11KV, 50Hz effectively earthed neutral system. The PT shall be connected in star to have ratio $11KV/\sqrt{3} / 110/\sqrt{3}$ 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.			
8.4	Pressure release device	Pressure release device/ explosion vent should be provided on the CT PT compartment at the rear side.			
9	Incoming	1. Coupled to the breaker module of RMU. 2. Coupling arrangement should meet the IP54 requirement.			
10	Outgoing	Cable compartment with cover/ door.			
10.1	Cable type & size	3C x 300 to 400 sq mm Aluminum conductor XLPE with armor & PVC outer sheath {R9}			
10.1	Cable Entry	1. Bottom 2. Gland plate - 3mm metallic, removable & split type in two parts, with 1no. 90 mm diameter knocks out punch/hole in the centre. Approval should be taken for the same during drawing submission			
10.2	Cable support	'HDPE' cleat(s) shall be provided.			
10.3	Termination Type	Suitable for heat shrinkable type			
10.4	Terminals for cable termination 11kV	1. Suitable for Ring Type Bimetallic lug. 2. Material of Nut, bolts and spring washer- Brass 3. Size of Nut bolt- M16			

Technical Specification For 11 kV Ring Main Unit

10.5	Termination height	From gland plate 900 mm minimum
10.6	Right angled boots	Single piece cold shrink type (make – 3M/K.D.Joshi Raychem) {R9}
11	Panel Wiring	<ol style="list-style-type: none">1. Secondary wiring of CTs and PTs shall be done with 2.5 sq. mm PVC insulated cables with stranded copper conductor.2. CT and PT wiring should run in independent rigid steel conduit pipes of appropriate size from CT/PT compartment to meter compartment.3. 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.4. Current transformer and Potential transformer secondary wiring shall be colour coded as per IS and shall be suitably ferruled for identification.5. No link or test terminals shall be provided in wire from CT/PT to meter terminals.
12	Earthing	<ol style="list-style-type: none">1. The assembly comprising of the chassis, framework and the fixed parts of the metal casing shall be provided with two separate earthing terminals of M10 or above.2. 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.3. 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.4. The earthing terminals shall be protected against corrosion and shall be metallically clean.5. Earth continuity shall be provided to all Gasketed joints by copper braid suitable for rated fault current.6. 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.7. The earthing terminals shall be identified by means of the symbol marked in a legible and indelible manner on or adjacent to the terminals.

Technical Specification For 11 kV Ring Main Unit

13	Bushing	<p>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 porcelain bushings shall conform to IS-5621.</p> <p>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 silver plated. The creepage distance of the bushing shall not be less than 31 mm/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.</p>
14	Connections	<ol style="list-style-type: none">1. No joint in the primary winding of CT shall be acceptable.2. Connection between CT terminal and bushing terminals shall be done with solid copper busbar of adequate size.3. Flexible copper strip / rope are not acceptable for primary connection.4. PT should be connected to primary busbar through bus bar of appropriate size (connections using flexible conductor are not acceptable).5. All bus bars/ connections in the CT/PT compartment shall be encapsulated in epoxy.
15	Lifting Lug	<ol style="list-style-type: none">1. 04 No's lifting lugs shall be provided at the top of the metering cubicle for transportation.2. All nuts, bolts, flat and spring washers shall be SS only.
16	Height of the Base frame	<p>The total height including base channel shall not be more than 2000 mm. Width and depth should be minimum possible and may be increased suitably to accommodate CT's/PT's.</p>
17	Provision for Sealing	<p>Welded Stud with nut must be provided for the purpose of sealing on the following compartments/ locations.</p> <ol style="list-style-type: none">1. Meter compartment2. Coupling arrangement of RMU and metering cubicle.3. Outgoing cable compartment

2.0 Labels & painting

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1	Name plate	The metering cubicles shall be provided with a non detachable type nameplate with legible and indelible marking fixed on the enclosure sheet with welded arrangement so that in case name plate is removed no passage holes are left. (separate name plate should be provided for RMU & metering cubicle)
2.1	Location	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.
2.2	Material	Anodized aluminum 16SWG / SS
2.3	Background	SATIN SILVER
2.4	Letters, diagram & border	Black
2.5	Process	Etching
2.6	Name plate details	<ol style="list-style-type: none">1. BRPL Property2. Supplier's name3. P.O. No. & Year of manufacturing4. Sr. No. of metering cubicle5. Particulars of CT's such as ratio, VA burden, accuracy class, SC rating, BIL.6. Particulars of PT's such as ratio, accuracy class, VA burden, BIL.7. Standard connection diagram8. Consumer account no9. Sanctioned load.10. Date of release of connection.
2.7	Labels for CT Ratio	On CT PT compartment by anodized aluminum with white character on black background OR 3 ply lamicoid
2.8	Danger plates	<ol style="list-style-type: none">1. On CT PT compartment and each cable compartment2. Anodized aluminum 16 SWG with white letters on red background
2.9	BSES Insignia	<ol style="list-style-type: none">a) 01 no'sb) Shall be etched on anodized aluminium 16SWG / SS

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		plate. c) Details shall be finalized during drawing approval.
2.10	Enclosure painting surface preparation	7 tank chemical process
2.11	Enclosure painting internal/ external finish Powder coated epoxy polyester base	Hot dip galvanizing – 80 micron thick grade A, shade - RAL 7032, uniform thickness 60 micron minimum.

3.0 Technical requirement of CT and PT

SL	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 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 30 seconds
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 short time thermal current rating	N / A

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13	One minute high voltage power frequency withstand voltage		
13.1	On primary winding KV rms On secondary winding KV rms	28KV (rms) for 1 minute for 11 KV class 3KV (rms) for 1 minute	28KV (rms) for 1 minute for 11 KV class 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

4.0 Inspection & testing

1	Type test	<ol style="list-style-type: none"> 1. Metering cubicle shall be type tested as per IS 3427 2. CT and PTs shall be type tested as per IS2705 and IS3156 respectively. 3. Bushings shall be type tested in accordance with IS2099. 4. Type tests should not pertain to period earlier than five Years.
2	Routine test	<ol style="list-style-type: none"> 1. Metering cubicle shall be tested as per IS 3427 2. CT and PTs will be tested in accordance with IS2705 and IS3156 respectively. 3. Temperature rise test will have to be carried out during Inspection. 4. During inspection, all routine and acceptance tests shall be carried out in presence of purchaser's representative.
3	Physical Inspection	<ol style="list-style-type: none"> 1. Checks of all mounting plates / fasteners. 2. Checking of components as per drawing. 3. Electrical circuit's fasteners tightness / surface area contacts. 4. Labels / identification / nameplates. 5. All doors checks – safety and accessibility. 6. Panel surface finish / smoothness.

Technical Specification For 11 kV Ring Main Unit

4	Right to waive off tests	Reserved by Purchaser
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5.0 Guaranteed Technical Particulars (Data by Supplier)

SL	Description	Requirement	Data By Supplier
1	Name of Manufacturer		
2	Type and Designation	Outdoor type with resin cast CT and PT	
3	Normal system voltage	11KV	
4	Highest system voltage	12KV	
5	Frequency	50Hz	
6	Insulation Class		
7	Impulse Withstand Voltage (On assembled CT-PT set)	75 KV peak	
7.1	One minute power frequency dry withstand voltage (On assembled CT-PT set Primary)	28KV rms	
7.2	Secondary	3KV rms	
8	Current Transformers:	(3 nos. total, 01 no. per phase)	
8.1	Type	Resin cast wound type	
8.2	Transformation ratio (CT Ratio)	As per requirement	
8.3	Rated Output (VA Burden)	5VA	
8.4	Class of accuracy	0.5s	
8.5	Rated continuous thermal current	1.2 times of rated primary current	
8.6	Short time thermal current rating for one second	As per CT ratio and specification	
8.7	Rated Dynamic current	2.55 times of short time thermal current rating	
8.8	Security factor	Less than 10	

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SL	Description	Requirement	Data By Supplier
8.9	Insulation level	28KV for 1 min	
8.10	No. of cores	One	
8.11	Max Ratio error	As per IS:2705/1992	
8.12	Max phase angle error	As per IS:2705/1992	
8.13	Max. temp rise over max ambient temp of 50 deg C at rated continuous thermal current at rated frequency & withstand burden	As per IS:2705/1992	
8.14	Make and Grade of epoxy resin	<u>Cycloaliphatic</u> {R9}	
9	Potential Transformers	(3 Phase 4 wire unit)	
9.1	Burden in VA/Phase	10 VA/phase	
9.2	Transformation ratio	11KV/110V (L-L)	
9.3	Class of accuracy	0.5	
9.4	Winding connection	Star/Star	
9.5	Insulation level	28KV for 1 min	
9.6	Rated voltage factor and time	1.2 continuous and 1.5 for 30 seconds	
9.7	Temp rise over max ambient temp	Within limits of IS-3156/1992	
9.8	Max phase angle error	Within limits of IS-3156/1992	
9.9	Max Ratio error	Within limits of IS-3156/1992	
9.10	Make and Grade of epoxy resin	<u>Cycloaliphatic</u> {R9}	
10	Size of main bus bar		
10.1	For CT ratio less than and equal to 150/5	30 x 4mm (minimum)	
10.2	For CT ratio of 400/5 {R9}	40 x 6mm (minimum)	

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SL	Description	Requirement	Data By Supplier
11	Core material	CRGO (Virgin grade)	
12	Minimum creepage for HT Bushing	341mm	
13	Clearances a. Phase to phase clearance b. Phase to earth clearance		
14	No. of Paint coats a. Primer b. Enameled RAL 7032	2 coats 2 coats	
15	Weight of complete unit		
16	Gauge of a. Meter box b. HT compartments	2mm (min) 3 mm (min)	
17	Dimensions of complete Metering cubicle a. Height (mm) b. Breadth (mm) c. Length (mm)		
18	Meter compartment		
18.1	Dimensions of meter compartment with double door (minimum sheet thickness 2mm) a. Height (mm) b. Breadth (mm) c. Length (mm)		
18.2	Protection class	IP 5X	
18.3	Provision of Acrylic window		
18.4	Provision of slotted channel (40*12mm) suitable for 6mm bolts (4 Nos)	Required	
18.5	Provision of Pad locking & sealing arrangement of door		
18.6	Provision of mounting metering reading port on door.		
19	Metering cubicle mounting	Floor mounting	

Technical Specification For 11 kV Ring Main Unit**Annexure 'I' Make list**

Make List of RMU's Accessories {R9}		
Sl. No.	Descriptions	Make
1	Relay (Self Power+ AUX DC/ACSupply+ Communicable)	Ashida 241S-761
2	CT	Narayan Power Tech (NPT)/Gilbert Maxwell, 400/75-1/1, 5P10, 2.5 VA, Pragati, Nortex
3	FPI (Both for Earth Fault and Over Current Protection)	EMG/C&S/Schneider/SIEMENS
4	CBCT (Both for Earth fault and Over current protection)	EMG/C&S/Schneider/SIEMENS
5	Boot	3M/Raychem/K.D.Joshi
6	Wire	Polycab/Havells/Finolex/KEI
7	AC & DC MCB	SIEMENS/Havells/C&S/Schneider
8	Disconnecting type fuses	Connectwell/Wago/Phoenix/Elmex
9	TB (disconnecting type)	Connectwell/Wago/Phoenix/Elmex
10	Vacuum Interrupter	CG/ ABB/Schneider/SIEMENS/other type tested

Annexure 'J' Type test

The entire product shall be type tested from CPRI / ERDA. In case of new offer or type test report is older than 5 years, bidders shall carry out type tests from CPRI / ERDA without any cost implication to BRPL

Annexure-K -Special Technical Requirement: {R9}

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
4	NO/NC contact for manometer shall be provided

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Sl. No	Descriptions
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 assets 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 fresh 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) of internal arc for 1 sec (AFLR 20kA for 1 sec) from CPRI/ERDA is mandatory with minimum 3 way RMU configurations.
9	Complete Civil foundation Drawing along with sectional view (RCC casting shall be followed) and Bar Bending Scheduled (BBS) shall be submitted by bidders

Technical Specification For 11 kV Ring Main Unit

Sl. No	Descriptions
	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)
13	BRPL may conduct stage wise inspection of RMU manufacturing at vendor works. OEM is liable to intimate the manufacturing scheduled along with related dates before commencement of manufacturing.



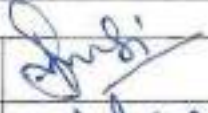
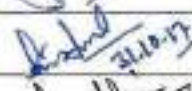

TECHNICAL SPECIFICATION

FOR

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

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

BSES RAJDHANI POWER LTD

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

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General Specification**1.0 Codes & standards**

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

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

2.0 Design guidelines and Parameter for cable laying-

S. No.	Parameter	Details
2.1	Selection of Cable Route	<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 sides of the drum to make the pay-off arrangement stable. Suitable arrangement be made to stop the drum rotation, during cable laying preferably by square wooden poles kept temporarily pivoted over cable roller under the flanges which when required can be applied on the flange as a brake by personnel manning the drum.</p> <p>b) The cable should always be paved off from the top of the drum. The drum must be positioned in such a way that the arrow on the drum points opposite to the direction of rotation marked on the drum.</p> <p>c) It must be ensured that the cable is not dragged over sharp object or on the road surface, so as to avoid damage to the outer sheath of the cable.</p> <p>d) The pulling method to be used shall be approved by BSES. Cable supplier's recommended maximum pulling tension shall not be exceeded.</p> <p>e) Rollers shall be placed at intervals and the cable shall be pulled over the rollers. The rollers shall be kept lubricated so that they rotate freely, minimize friction to the cable in motion. Rollers shall be positioned at the bends to minimize side wall friction. The contractor shall ensure that PVC/HDPE sheath of cable is free from damage due to abrasion.</p> <p>f) The cable should not be pulled out from the drum by lifting of the coil while the drum is lying flat on the flange. This leads to twisting of the armour and cores resulting in permanent damage to the cable.</p> <p>g) To avoid ingress of moisture, it must be observed that the end capping of the cables is not damaged. Cut pieces of the cables must be capped immediately, before laying of the same is taken-up.</p>
3.4	Excavation of the Trenches	<p>a) The excavation of the trenches shall be commenced, with proper co-ordination with BSES, so that all the necessary clearances for the route are already obtained from the competent authorities, well in time.</p> <p>b) Before opening of the section of the trench, the contractor shall satisfy himself that the line of the trench is clear of underground obstructions, by taking out trial pits on the line of the trench.</p> <p>c) The exact location of each trench shall be approved on site by BSES. The trenches shall be kept as straight as possible and each trench shall be excavated to approved formation and dimensions. If necessary, the trenches shall be adequately shored by wooden planks and bracing to avoid trench cave-ins which would cause injury to the persons and also damage the cables laid.</p> <p>d) The bottom of each trench shall be firm and of smooth contour. The contractor shall take reasonable precautions to prevent damage to the highway or ground surface from a slip or breaking away of the sides of the trench.</p> <p>e) The trench excavation and filling in shall be so executed that all</p>

		<p>walls, roads, sewers, drains, pipes, cables, structures, places and things shall be reasonably secured against risk of subsidence or injury and shall be carried out to the satisfaction of the authorities concerned. Should, however, a damage to an existing or other services be made, the Contractor will arrange and pay for any necessary repair, to make good the damages.</p> <p>f) Where trenches pass from a footway to a roadway or at other positions where a change of level is necessary, the bottom of the trench shall rise or fall gradually. The rate of rise or fall shall be approved by BSES.</p> <p>g) Contractor shall ensure that during excavation and until restoration has been completed, for reasonable access of persons and vehicles to property or places adjacent to the route.</p> <p>h) When the excavation of the trenches has been accurately executed, the contractor shall inform BSES for approval. Laying of cables or building of structure shall not be started until the contractor has been advised by BSES to proceed with the work.</p>
3.5	Excavated material	<p>a) The materials excavated from each trench shall be placed so as to prevent nuisance or damage to adjacent ditches, drains fences, gateways and other property or things. Excavated material shall be stacked so as to avoid undue interference with traffic.</p> <p>b) Where, owing to traffic or for reasons of safety or other considerations, this is not permissible, the excavated material shall be removed from the site and returned for refilling the trench on completion of laying; surplus material shall be disposed off by the contractor at his own cost.</p>
3.6	Pipes and Ducts	<p>a) Care shall be taken to make the bend of the pipes or duct lines as easy as practicable and in no case of radius less than 3 meters. Where approved, split pipes may be used on bends, the pipes being fitted round the cable after laying.</p> <p>b) All road crossings shall be ducted. This applies to present and future roads as indicated on the route plans. The pipes and the ducts shall be laid in an approved manner and shall be surrounded by 150 mm of PCC (1:2:4)</p> <p>c) Ducts under the road shall be provided by the contractor, by non-disruptive method, if road cutting is not permitted by the concerned authorities Cable laying shall be done by Horizontal Direct drilling method (HDD).</p> <p>d) The cables shall be suitably protected at entry and exit from the pipes, so that the outer sheath does not come in contact with the edges of the pipes / ducts. The pipes and ducts shall have slope so that the seepage water can drain through the small opening provided on the lower side of the pipe sealing.</p> <p>e) The pipes and ducts shall be secured to the base at both ends and at regular interval, throughout the length, so that at no point the ducts or pipes get suspended over the threaded cable, and damage the same, thus defeating the very purpose of providing the pipe / duct.</p>

		<p>f) At all road crossings at least one spare duct / pipe shall be provided for future use. The pipe shall be thoroughly cleaned of obstructions. A draw wire or rope shall be left in each pipe to facilitate the drawing in of the cables. The duct end shall be sealed temporarily to prevent the entry of foreign matter. End caps and permanent markers shall be placed flush with footpath / roadways at both the ends. The pipes and ducts shall be cleaned again immediately before the cables are drawn in.</p> <p>g) The internal diameter of the pipe / duct should be such that the cables occupy only 40% of the area of the pipe / duct to avoid de-rating.</p>
3.7	Joint Bays	The contractor shall provide all help so as to enable jointers to carry out their work efficiently and expeditiously. The method of securing and supporting cable joints and cables also the bonding and earthing thereof, shall be detailed on the drawing. The details shall be approved by BSES prior to commencement of work. The joint position should be staggered.
3.8	Back filling of trenches	<p>a) Filling in of trenches shall not be commenced until BSES has inspected and approved the cables and accessories at site. The inspection should be got done on daily basis so that the trenches do not remain open unnecessarily, to avoid inconvenience to public.</p> <p>b) The trench shall be backfilled after putting all protections for cables.</p> <p>c) Soft soil shall be backfilled for 300 mm above the cable protection cover.</p> <p>d) Caution Tape shall be laid all along the cable route above the soft soil filling.</p> <p>e) Complete backfilling shall be done above the caution tape.</p>
3.9	temporary Reinstatement	<p>a) Where cables routes are in public highways, footpaths, gardens etc., the method of reinstatement will be subject to approval by MCD. All costs incurred will be at the contractor's expenses.</p> <p>b) The contractor shall be responsible for proper permanent reinstatement of the upper levels, which shall be carried out to the satisfaction of BSES and the MCD authorities concerned.</p> <p>c) Before finally leaving site, permanent reinstatement shall be executed by the contractor to the approval of MCD and the property owners and all costs incurred shall be to the contractor's account.</p>
3.10	Permanent Reinstatement of Public Road,	<p>a) In public roads and footways the surfaces and foundations shall be temporarily reinstated by the contractor. After settlement, temporary reinstatement material shall be removed as necessary and the permanent reinstatement shall be carried out to the approval of the appropriate highway authority / MCD. Stone and pre-cast concrete paving kerbs and channels shall also be finally reinstated by the contractor.</p> <p>b) Temporary reinstatement shall be maintained by the contractor until commencement of final reinstatement to ensure that the surface is always safe for the passage of pedestrians and vehicular traffic.</p>

3.11	Identification	All cables shall be identified below the gland at each end, at joint position and at approved positions by means of bands engraved or punched with cable no. feeder name, size of cable, number of cores, phase colour etc. The bands shall be secured fastened in a permanent manner, and shall be made of material able to resist corrosion, dampness and mechanical damage.
3.12	Cable Route Markers	All cables routes shall have markers at suitable location with a gap not exceeding 30 meters. The route markers shall be approved design. Additional markers shall be provided at joint locations with approved markings.
3.13	Cable supports / Clamps	<ul style="list-style-type: none"> a) The contractor shall supply and install all the supports, racks, trays, cleats, saddles, clips and other parts required to carry and secure the cables, without risk so that there is no undue mechanical load or stress due to weight of the cable at each end. Cleats, saddles and clips shall be of the design as approved by BSES. No cable shall be laid on the trench floor. They shall be run in a neat and orderly manner and the crossing of cables within the trench shall be avoided as far as possible. Where cable runs unavoidably cross, a suitable supporting arrangement shall be provided to maintain an adequate gap between the cables b) Every cable shall be supported at a point not more than 500 mm from its termination.
3.14	Installation of Cables in tunnels / basement / below the panels etc	<ul style="list-style-type: none"> a) The design of cable support for cables installed in air in cable tunnels, basements etc. shall consist of vertical steel members spaced at approved interval and secured to the walls, floors and ceilings as necessary by means of bolts either cemented in position or expanded into cored holes. Each vertical support shall have bolted to it a number of steel brackets spaced at the intervals and designed to support and retain trays constructed of galvanized sheet steel of adequate section to carry the weight of the cables, plus space for an additional quantity of future cables at least 25% by weight and dimensions in excess of the cables installed under the contract and an additional load of 100 kg at the extremity without distortion. The trays shall be designed with raised edges to retain the cables and shall incorporate an interlocking feature so as to prevent movement between supports. b) The design and construction of all cable cleating and supporting arrangements shall suit the cable system design. The spacing of cable supports shall be approved by BSES. c) Cable run on trays shall be neatly dressed and where not provided with cleats shall be secured by heavy gauge, type approved metal reinforced, clips or saddles. Not more than six cables shall be embraced by one clip. d) Mild steel of appropriate sections, duly painted in an approved manner, shall be used for fabrication of cable supports. The steel shall be free from blisters, scales, laminations or other defects. Before final painting, the steel sections shall be provided with double coat of red primer.

3.15	Cable Protection at overhead Towers or Poles	Where the cables terminate on overhead line poles or towers located outside substation compounds the contractor shall provide suitable cable supporting galvanized steel work attached to the pole or tower and comprising backboard, runners, sheet, steel cover of not less than 3.0mm thickness, stays, cable cleats, anti climbing guard and all incidental items to provide secure protection for the cables. Isolators and Lightning arrestor if required to be installed shall be provided as free issue item to the contractor, however the erection and steel structure required shall be in scope of the contractor.
3.16	Sun Shades	All cables shall be protected from direct solar radiation by ventilated sun shields as approved by BSES.
3.17	Route Plan	<ul style="list-style-type: none"> a) BSES intends to show all the cable routes, location of joints and other underground obstructions on a GPS map. b) During the progress of the contract works the contractor shall record on a set of route plans and cross section drawings of an approved form, these details so that the same can be transferred on the GPS maps. Such particulars will allow an accurate reference to be made in the case of any fault or projected modification. These records shall show, amongst other data, both indoors and outdoors the exact position of every joint, cable end termination and also the particulars of the depth of the trench, the arrangement of the cables, with cable numbers and the position of all obstructions revealed during the course of excavations. These completed records shall be submitted to BSES within 15 days of completion of any particular route/feeder. The final bill shall not be processed by BSES unless this activity has been completed to the entire satisfaction of BSES
3.18	Site Facilities to be maintained by the Contractor	<ul style="list-style-type: none"> a) The contractor shall arrange for all the tools and tackles required for cable laying as per this specification. BSES shall arrange for all the material and manpower required for jointing and end termination. b) Illumination and Power supply shall be arranged by the contractor so that the work can be carried out round the clock. c) The contractor shall maintain functional dewatering pumping facility with suitable power supply so as to protect the cables and the joints from ingress of water due to rain or otherwise d) The contractor shall make arrangement to provide suitable scaffolding arrangement to carry out the termination work e) The contractor shall carry out proper barricading of the dug cable route and the joint bays and shall take all necessary precautions to avoid any public hazard f) Also refer Annexure-7: Barricading and Safety.
3.19	Type of Roads and guidelines for road restoration	<p>The typical section of type of Roads (based on width) under PWD and MCD are :-</p> <ul style="list-style-type: none"> - 20 Feet Wide road - 30 Feet wide road - 40 to 60 Feet Road - Other (which include Kota stone, Agra stone, Cement concrete, interlocking paving tiles, brick road, chequered tiles

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

S. No.	Parameter	Details
4.1	Tests to be carried out during and after completion of Cable Laying	<p>Testing of cable before jointing –</p> <ul style="list-style-type: none"> - Cable shall be tested for Insulation Resistance prior to laying by opening the end and resealing end properly. <p>Testing on complete Cable Installation –</p> <ol style="list-style-type: none"> a) Insulation resistance of each core shall be measured against all the other cores and the metal screen connected to earth. b) The resistance of the conductor shall be measured. c) DC High voltage. For old cables test voltage shall be 1.5 times rated voltage or less depending on age of cable.(refer annexure # 2 for values) d) Charging of Cable at No-Load at Nominal working voltage for 24 Hours. e) After laying and before termination of cable a sheath test shall be conducted for 66KV Single core Cable as under :- <p>At both ends the cable shall be raised from ground. From the end graphite coat applied over the outer PVC jacket shall be removed with a piece of glass for a length of 300mm. A spiked steel rod with an eye for attaching a wire shall be driven into the ground and connected to a nearby water or hydrant pipe. Insulation resistance of PVC jacket shall be measured between the aluminium wire armour and the spike with a 500/1000V insulation tester. Measured resistance shall not be less than 2.5M OHM per KM. Thereafter 10KV DC shall be applied for one minute in the same way. After the test the armour shall be kept earthed to the steel spike for 15 minutes for discharging residual charge.</p>
4.2	Statutory	<ol style="list-style-type: none"> a) Road cutting permission

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

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

6.0 Drawing, Data & Manuals:

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

7.0.0 Deviations

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

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

The format for approval of deviation attached in annexure # 1

Annexure # 1 – DEVIATION REPORT FORMAT

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

Annexure # 2 – DC HIGH VOLTAGE TEST

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

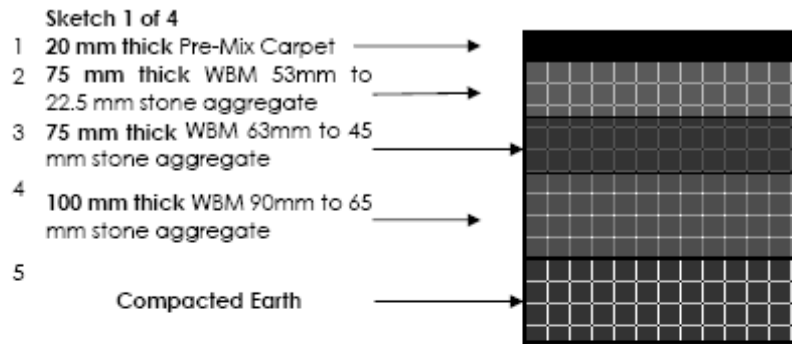
Reference value for DC High voltage Test.

Annexure # 3 – CABLE TRENCH DETAILS

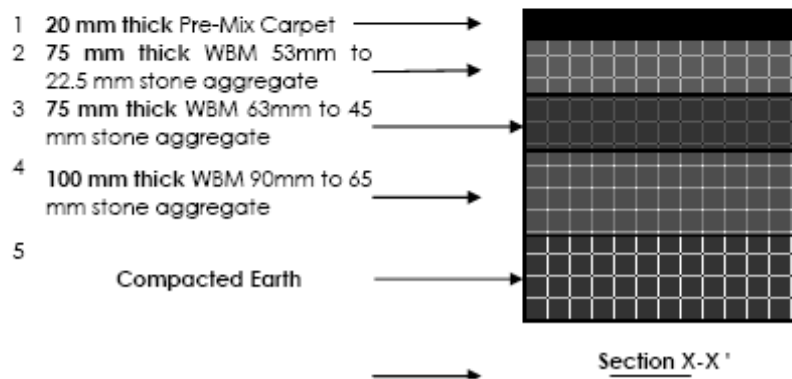
S. No.	Cable Size	Trench		Cable Trench drawing reference
		Width (mm)	Depth (mm)	
1	1.1 kV LT Cables			
a	3.5Cx150 mm ² - Single Circuit	400	875	A – 1 (Drg. # 9)
b	3.5Cx150 mm ² - Double Circuit	400	875	A – 1 (Drg. # 9)
c	3.5Cx150 mm ² - Triple Circuit	400	875	A – 1 (Drg. # 9)
d	3.5Cx300 mm ² - Single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

Annexure # 4 – Standard Road Profile

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

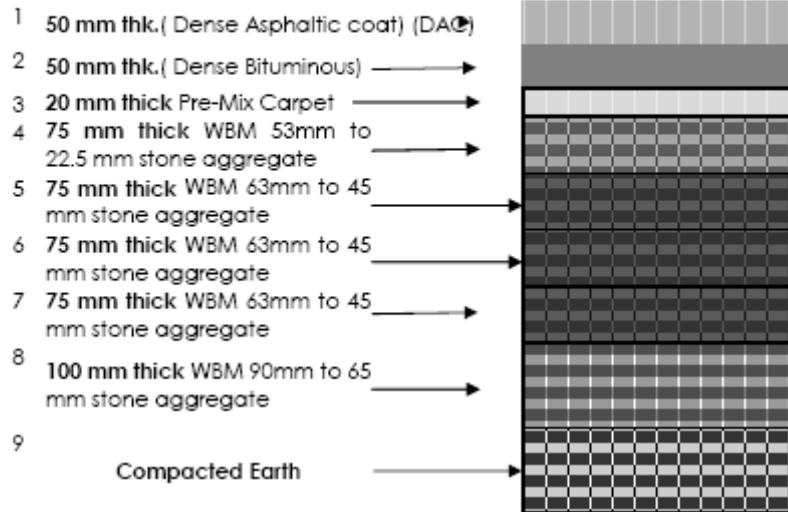


Sketch 2 of 4 **30' - 00" FEET WIDE ROAD (ROAD TYPE II)**



Sketch 3 of 4

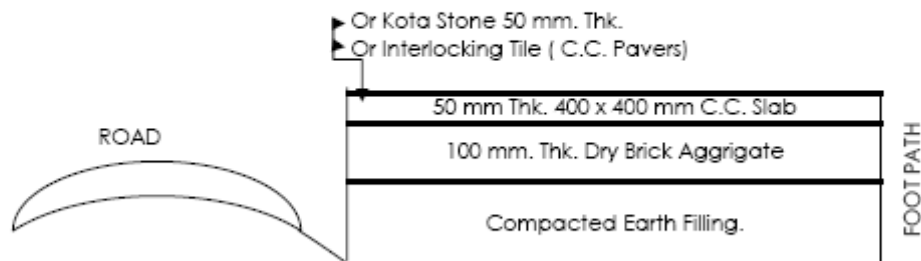
40'-00" TO 60'-00" FEET WIDE ROAD



Section A-A'

Sketch 4 of 4

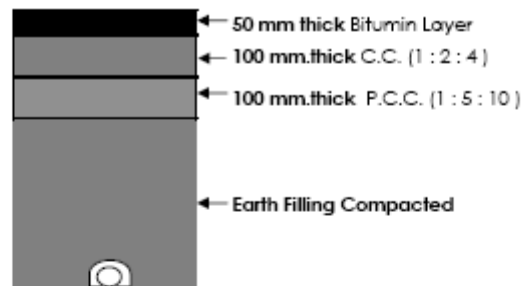
General drawing for cases other than roads.



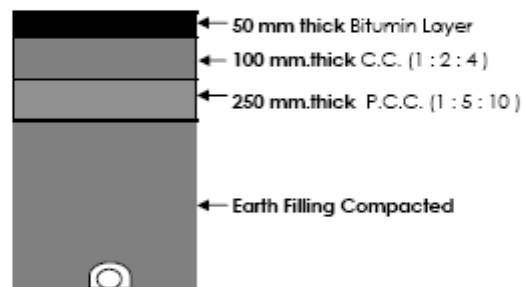
Details of Foot Path Along roads under PWD & MCD.

Annexure # 5 – Road Restoration Sectional Drawing

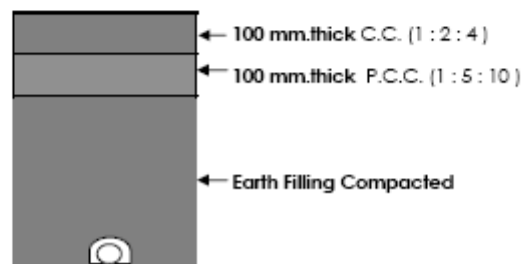
ROAD RESTORATION SECTIONAL DRAWINGS



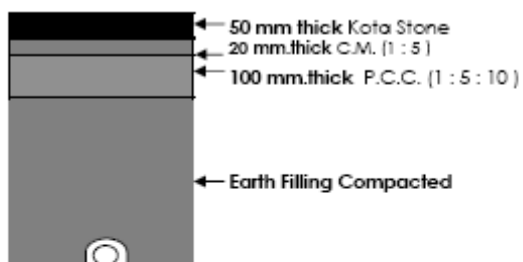
Bituminous Road Type - I (Category 1 & 2) Road width 20 to 30 feet and 30 to 40 feet.



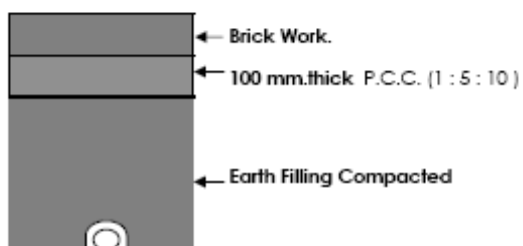
Bituminous Road Type - II (Category 3)



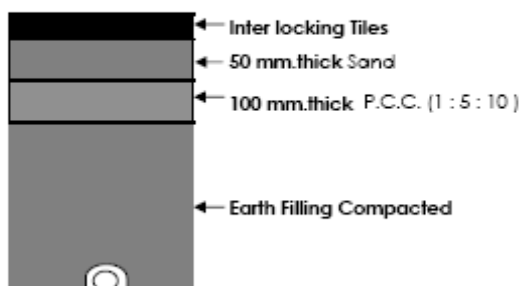
Cement Concrete Road



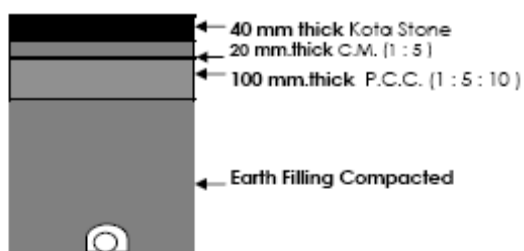
Kota / Rajasthan stone Road



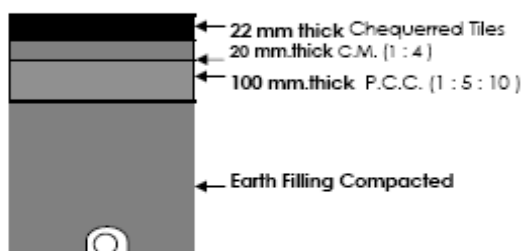
Brick Road



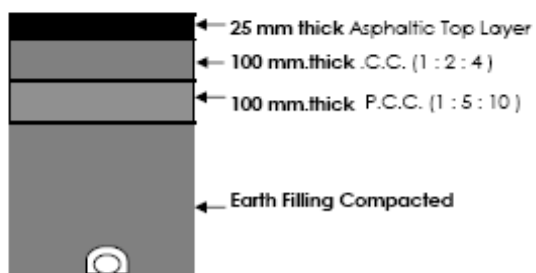
Interlocking Paving Tiles



Agra stone Road .



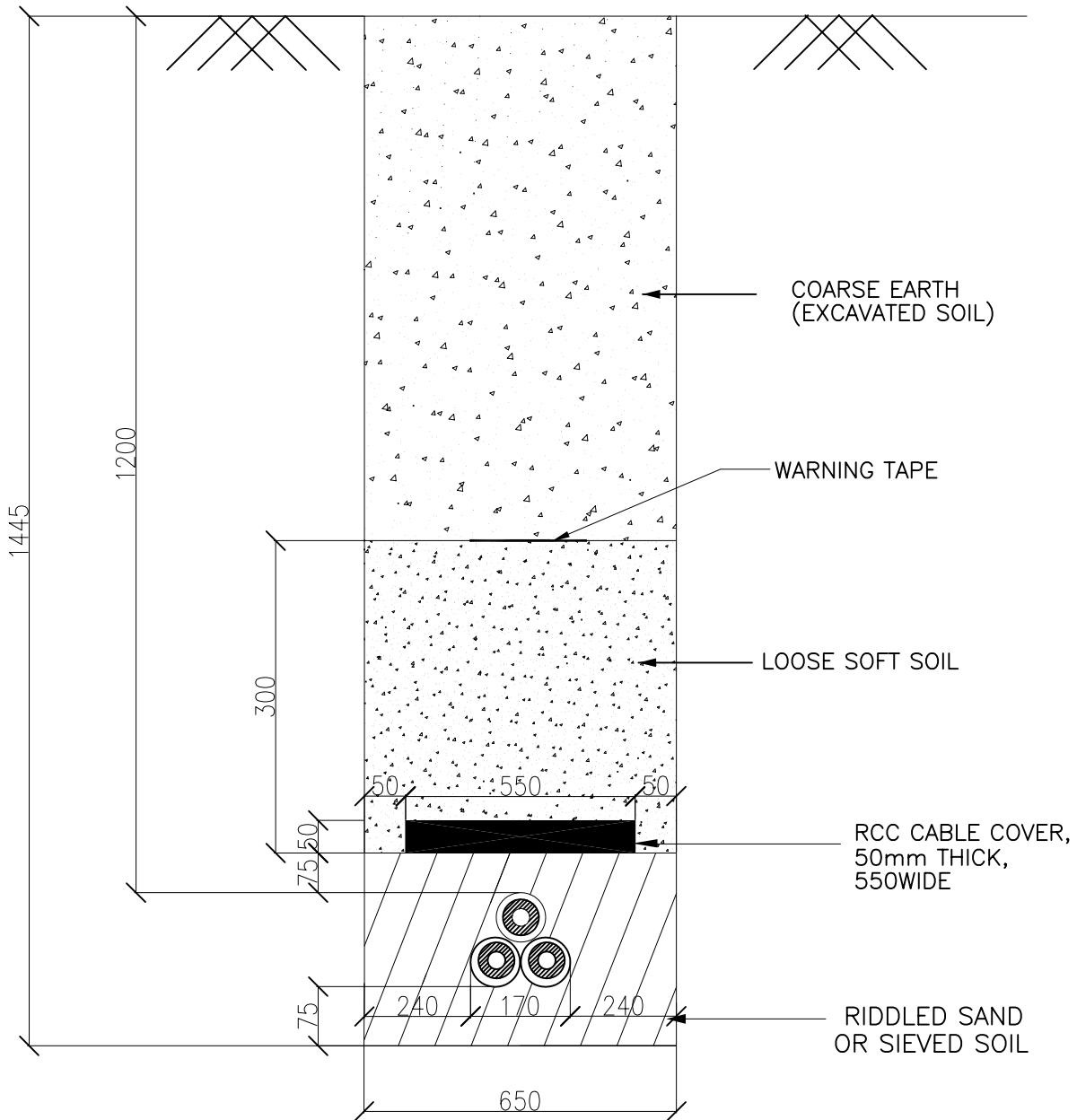
Chequerred Tiles .



Asphaltic Road .

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

DRAWING # 1



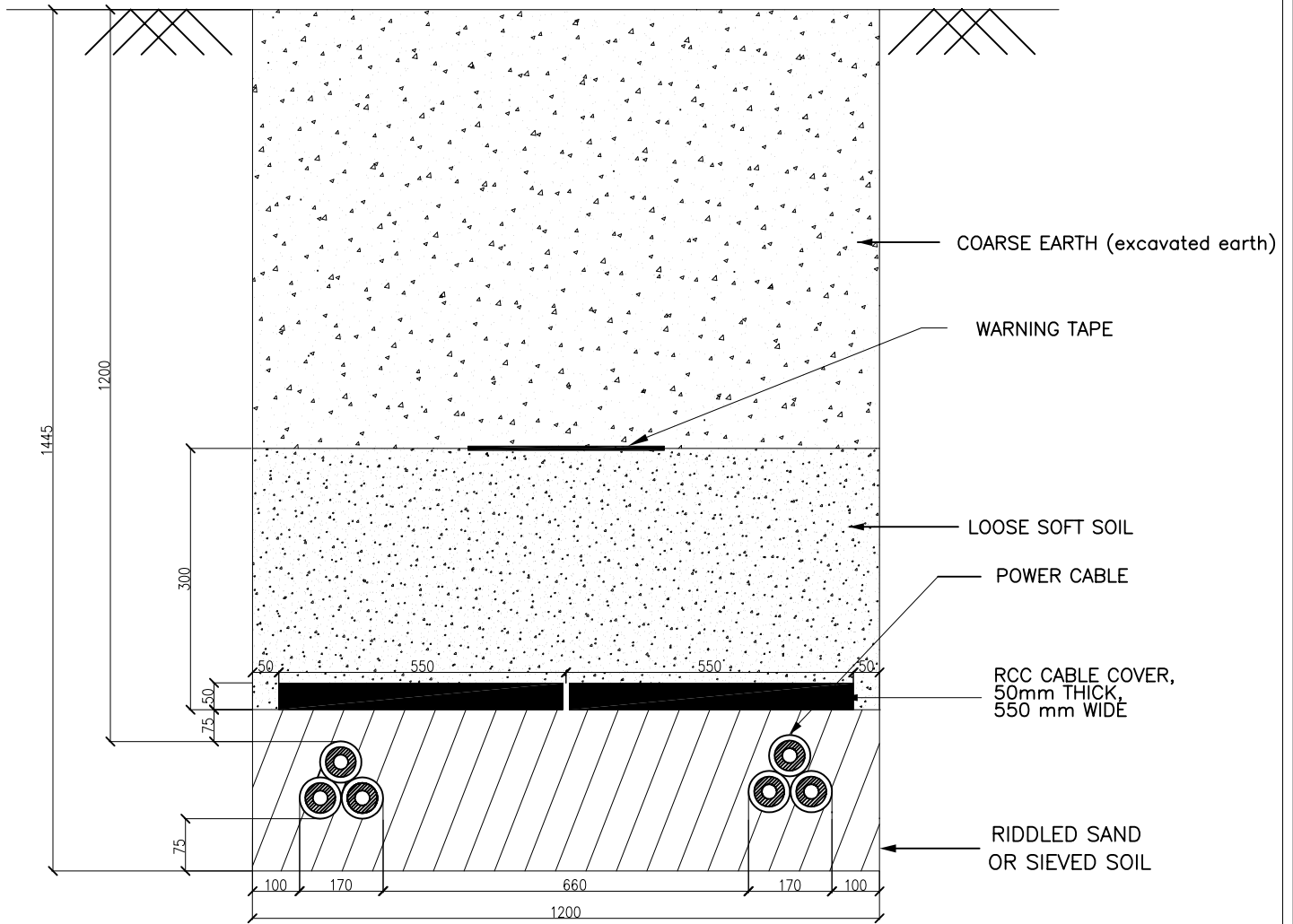
TYPICAL DETAILS FOR 66KV BURIED CABLE FOR SINGLE CIRCUIT
TYPE – B 4

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

BSES

REV.
00

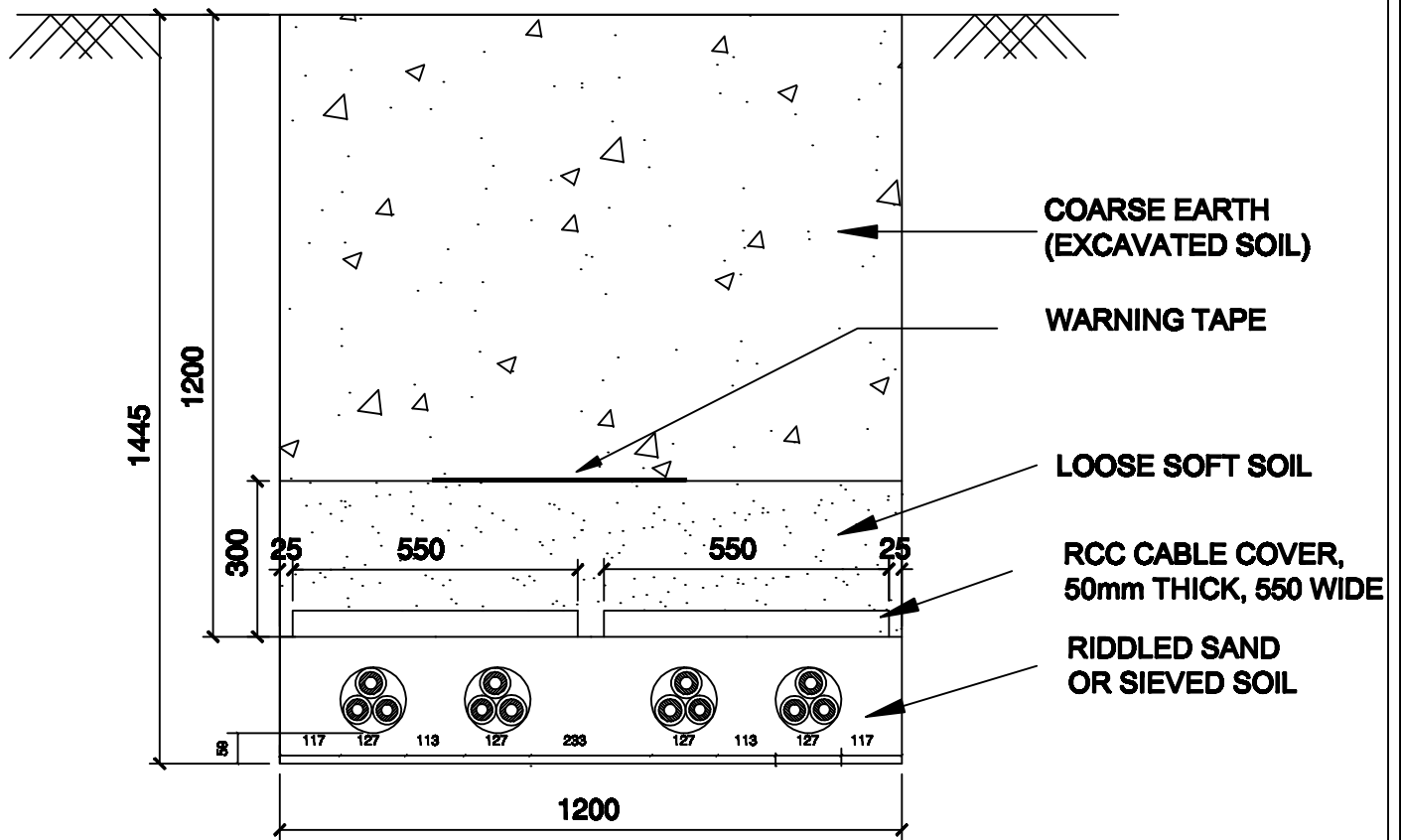
DRAWING # 2



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				REV. 00
SCALE				

DRAWING # 2 A

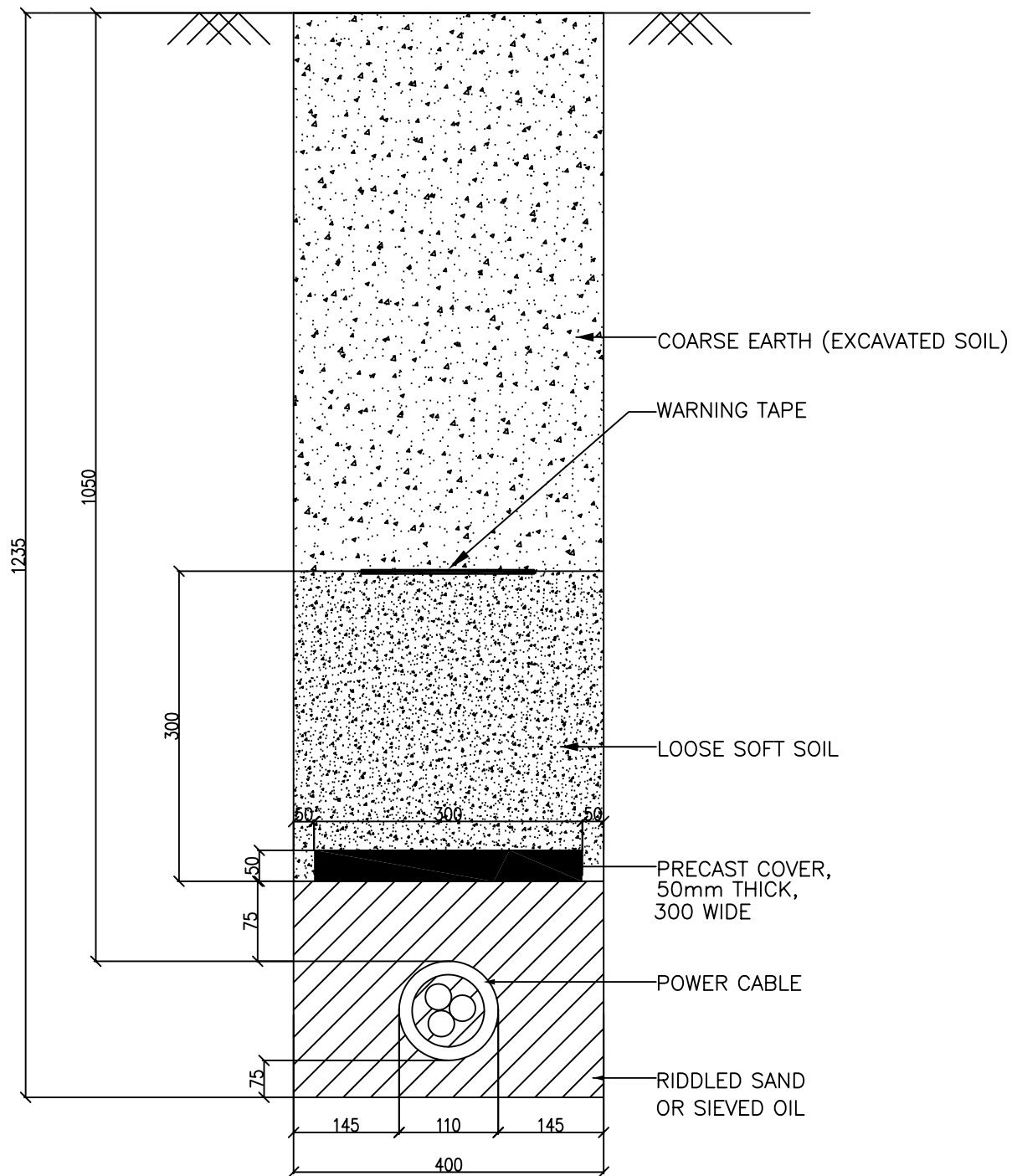


**TYPICAL TRENCH SECTION DETAILS FOR 66KV SINGLE
CORE 300 Sq. mm. BURIED CABLE FOR DOUBLE CIRCUIT**

TYPE - C 2

DRAWN	SAURABH	TITLE:-	
CHECKED	A.S	TYPICAL TRENCH SECTION DETAILS FOR 66KV SINGLE CORE 300 mm BURIED CABLE FOR DOUBLE CIRCUIT	
APPD.	K.S		
DATE	09.01.15		
SCALE			
			BSES Rajdhani Power Limited
			REV. 00

DRAWING # 3



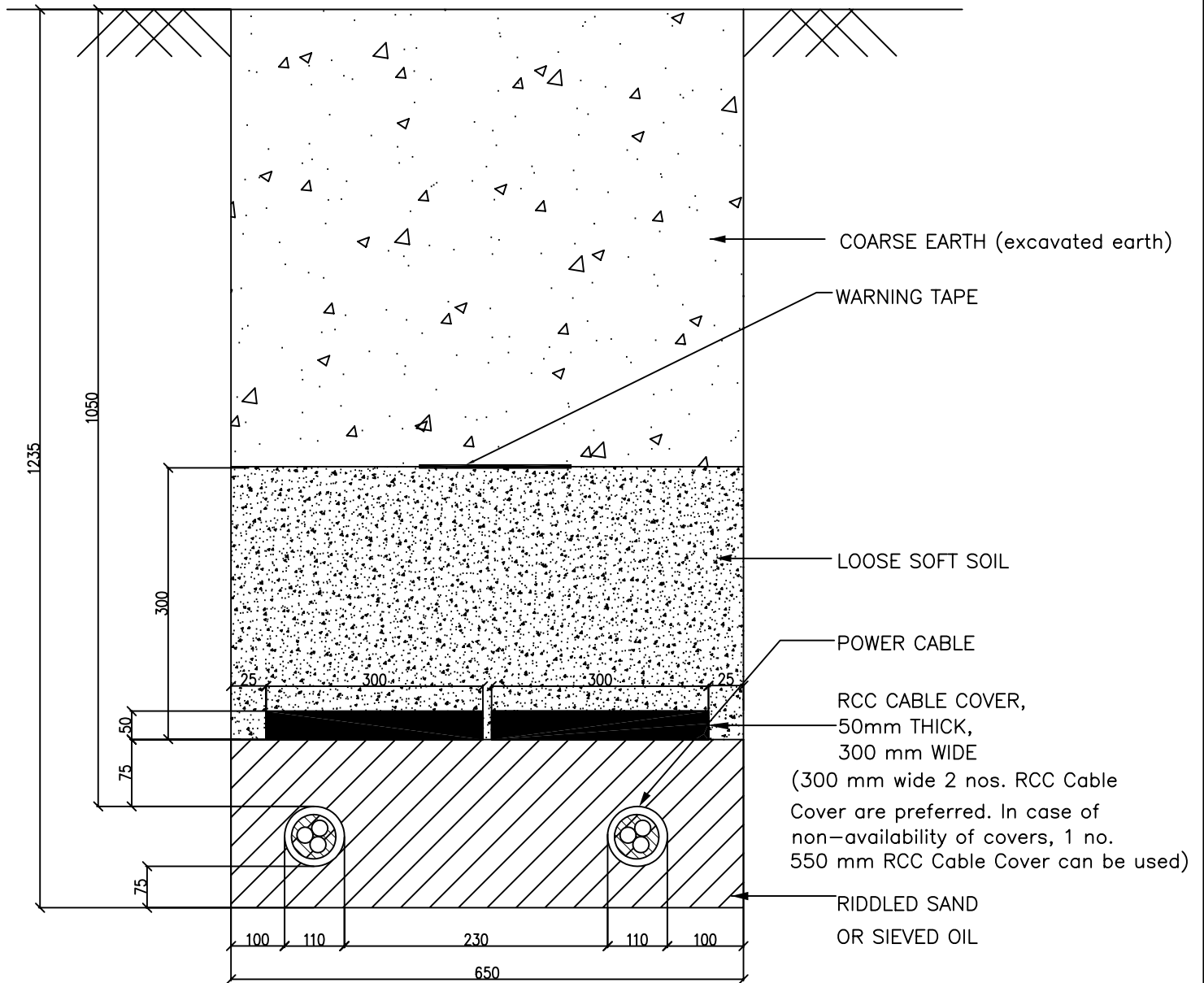
TYPICAL DETAILS FOR 33KV BURIED CABLE FOR SINGLE CIRCUIT
TYPE - A 3

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

BSES

REV.
00

DRAWING # 4



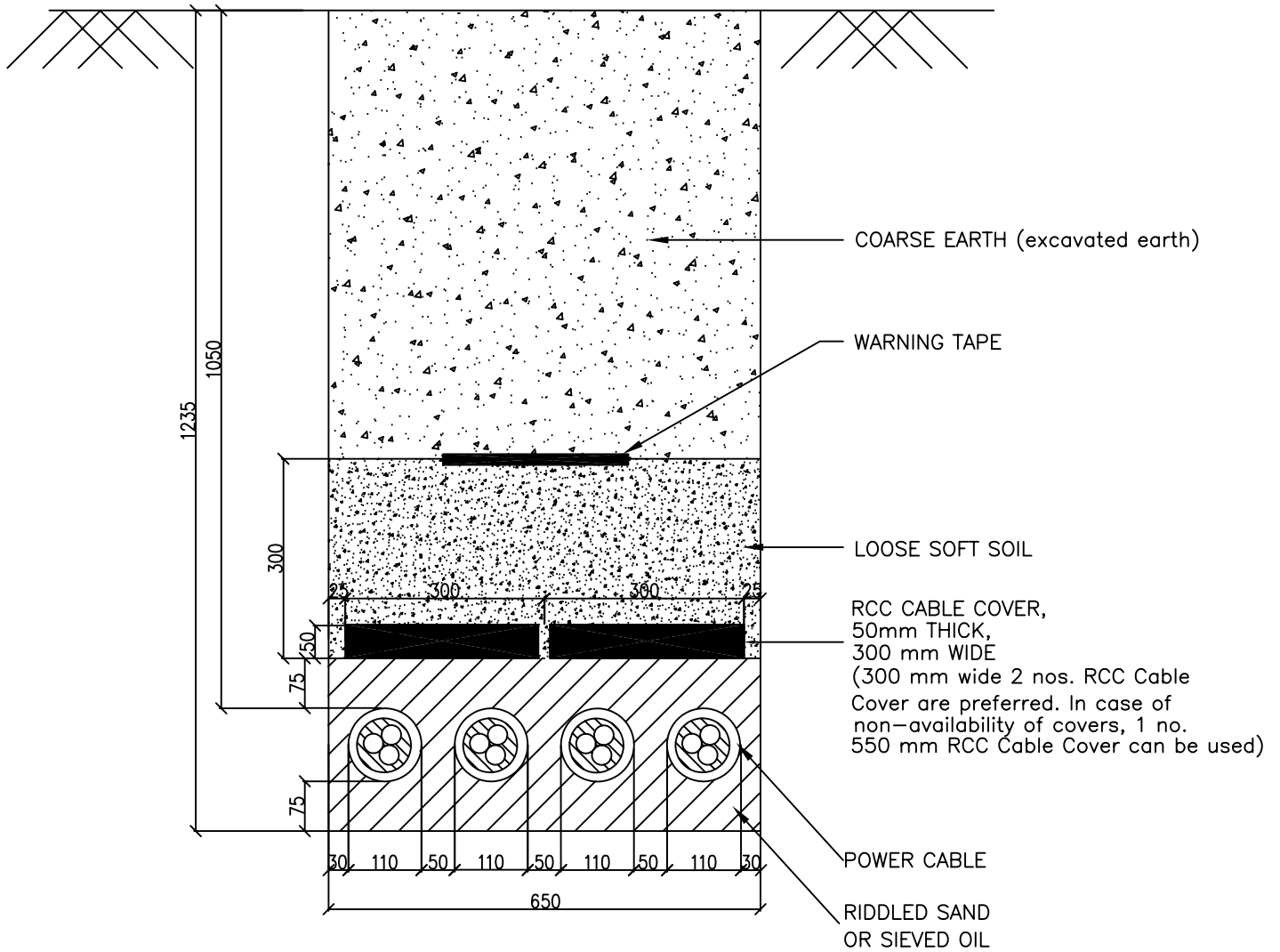
TYPICAL DETAILS FOR 33KV BURIED CABLE FOR TWO CIRCUIT
TYPE – B-2

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

BSES

REV.
00

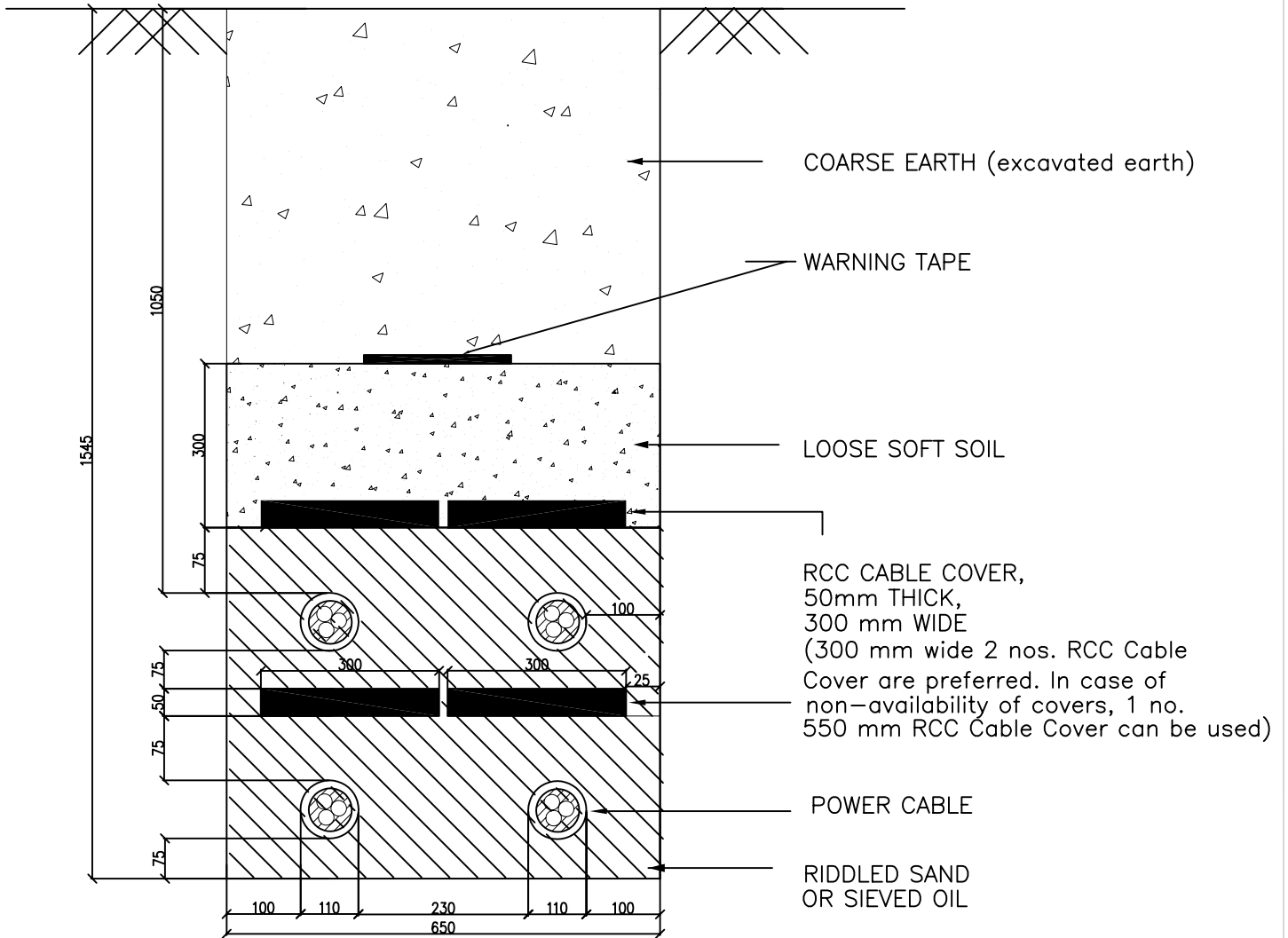
DRAWING # 5 A



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

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

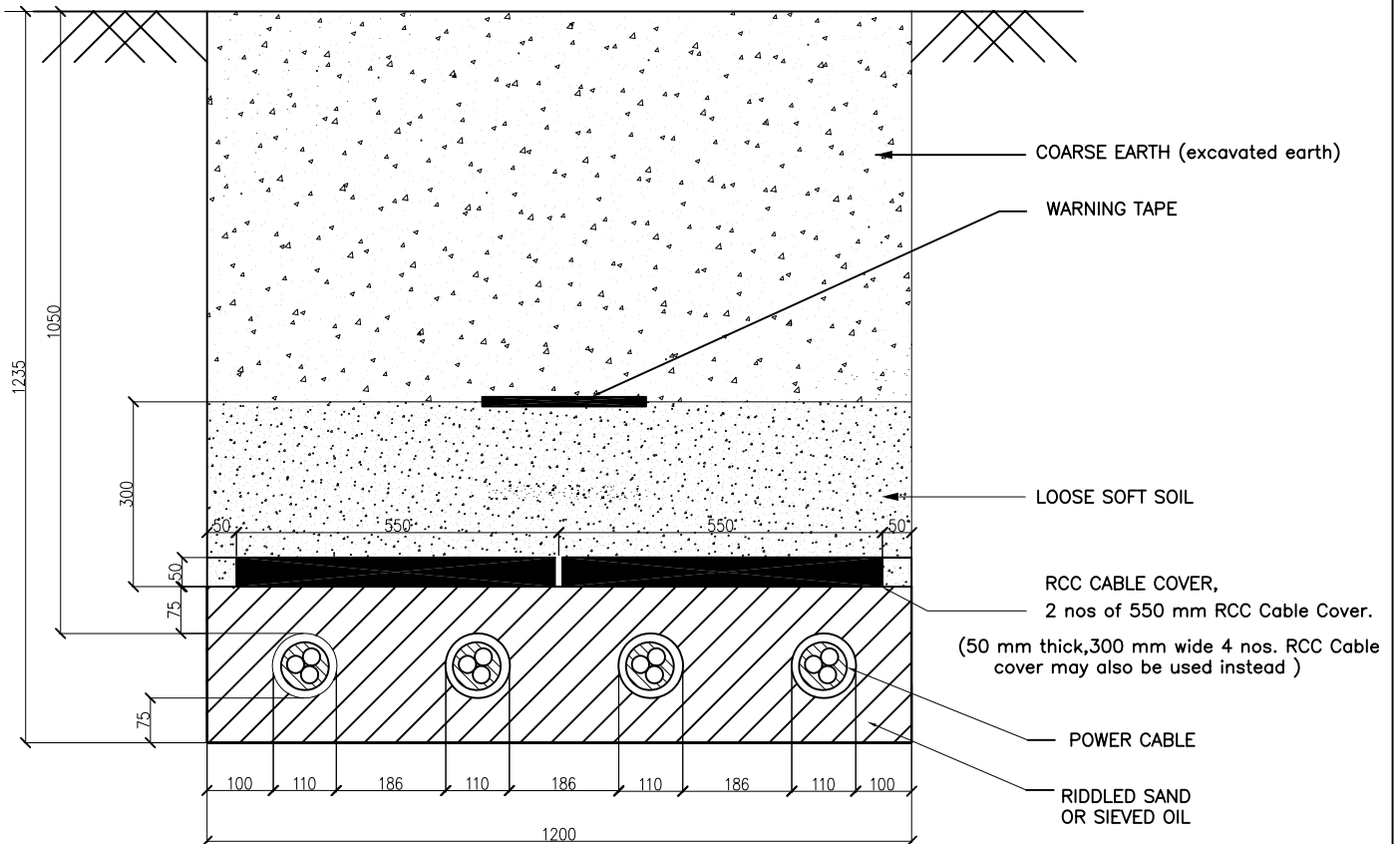
DRAWING # 5 B



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

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

DRAWING # 5 C



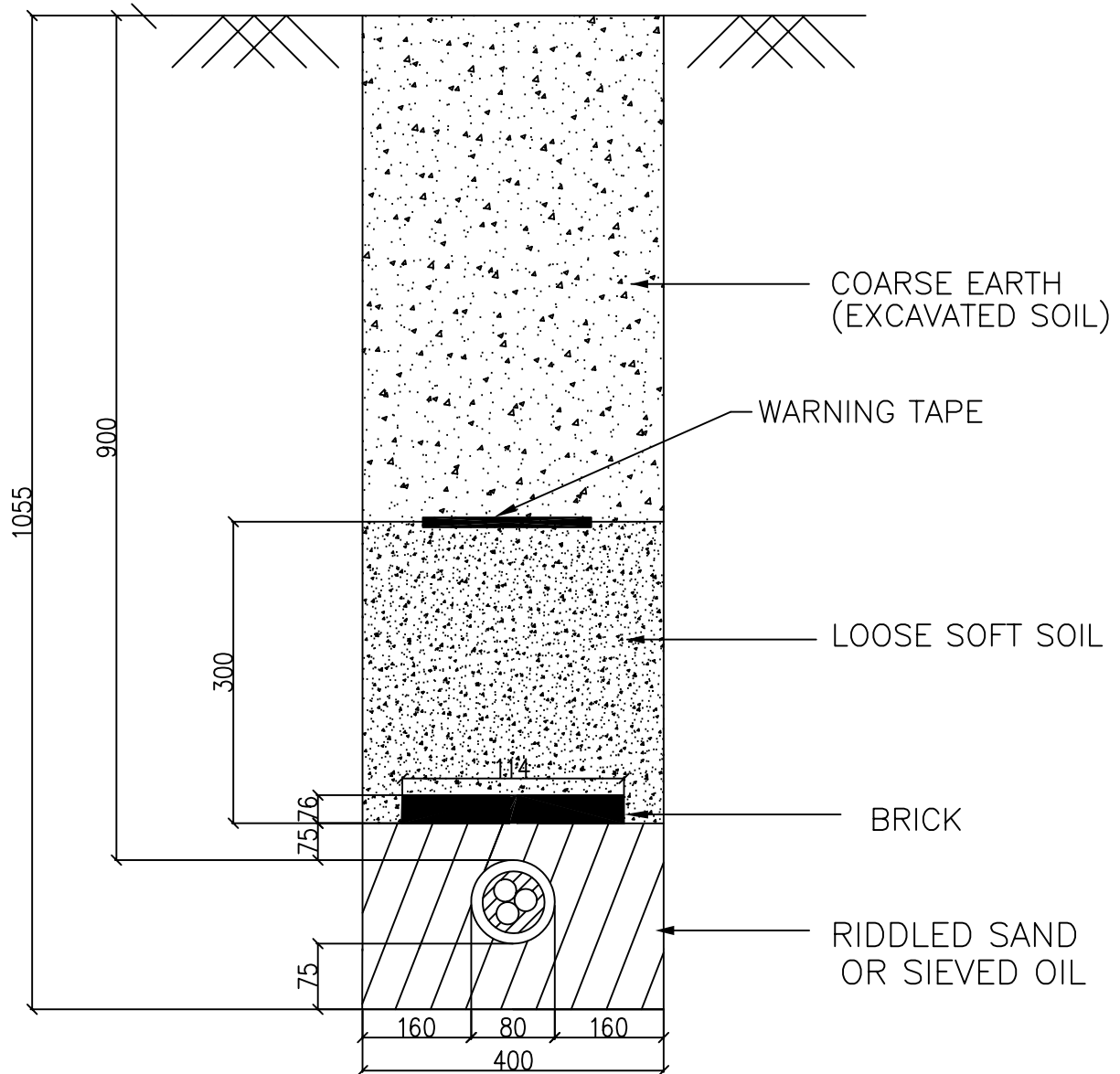
TYPICAL DETAILS FOR 33KV BURIED CABLE FOR FOUR CIRCUIT
TYPE – C 1

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



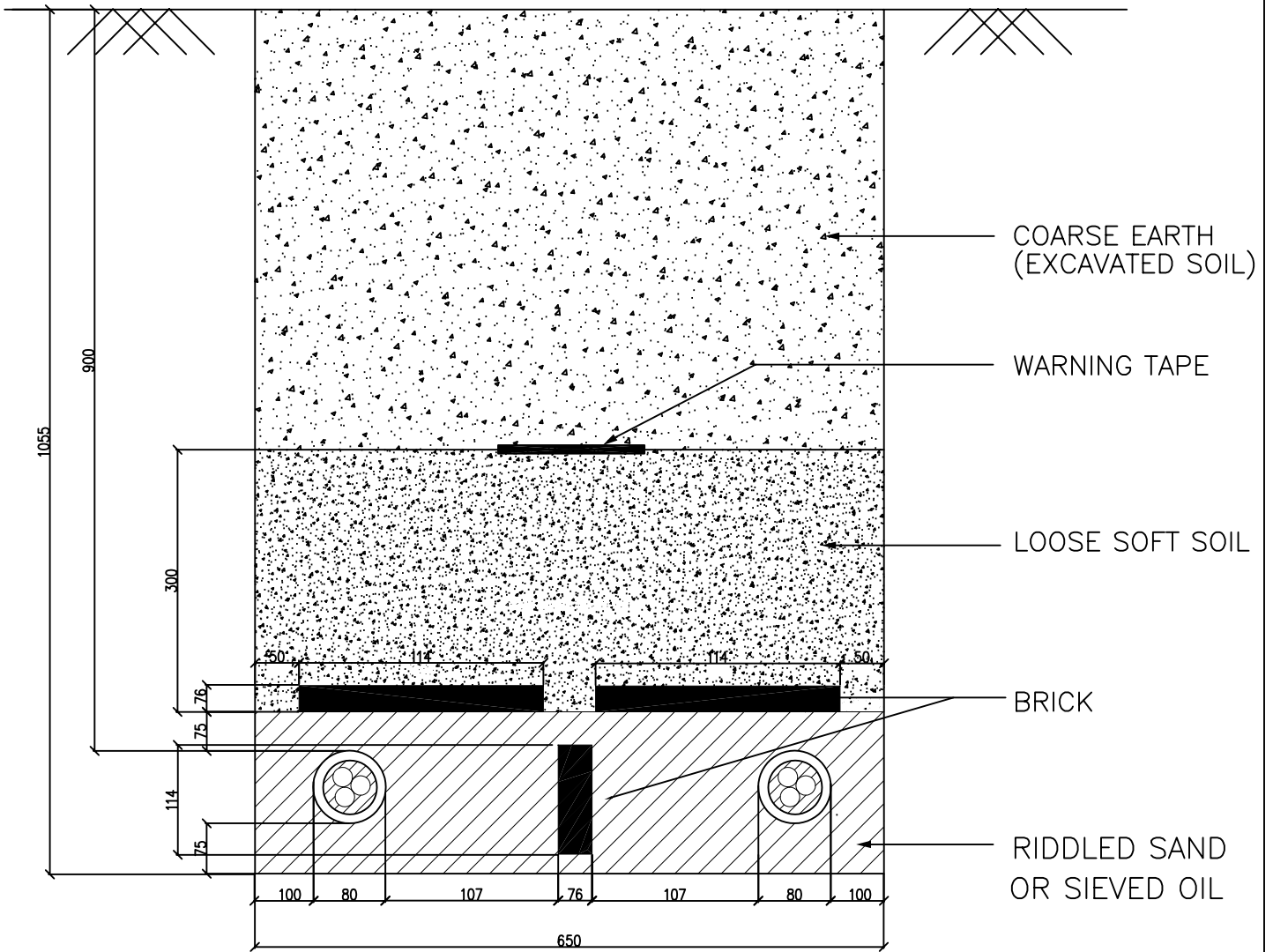
TYPICAL DETAILS FOR 11KV BURIED CABLE FOR SINGLE CIRCUIT
TYPE – A 2

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



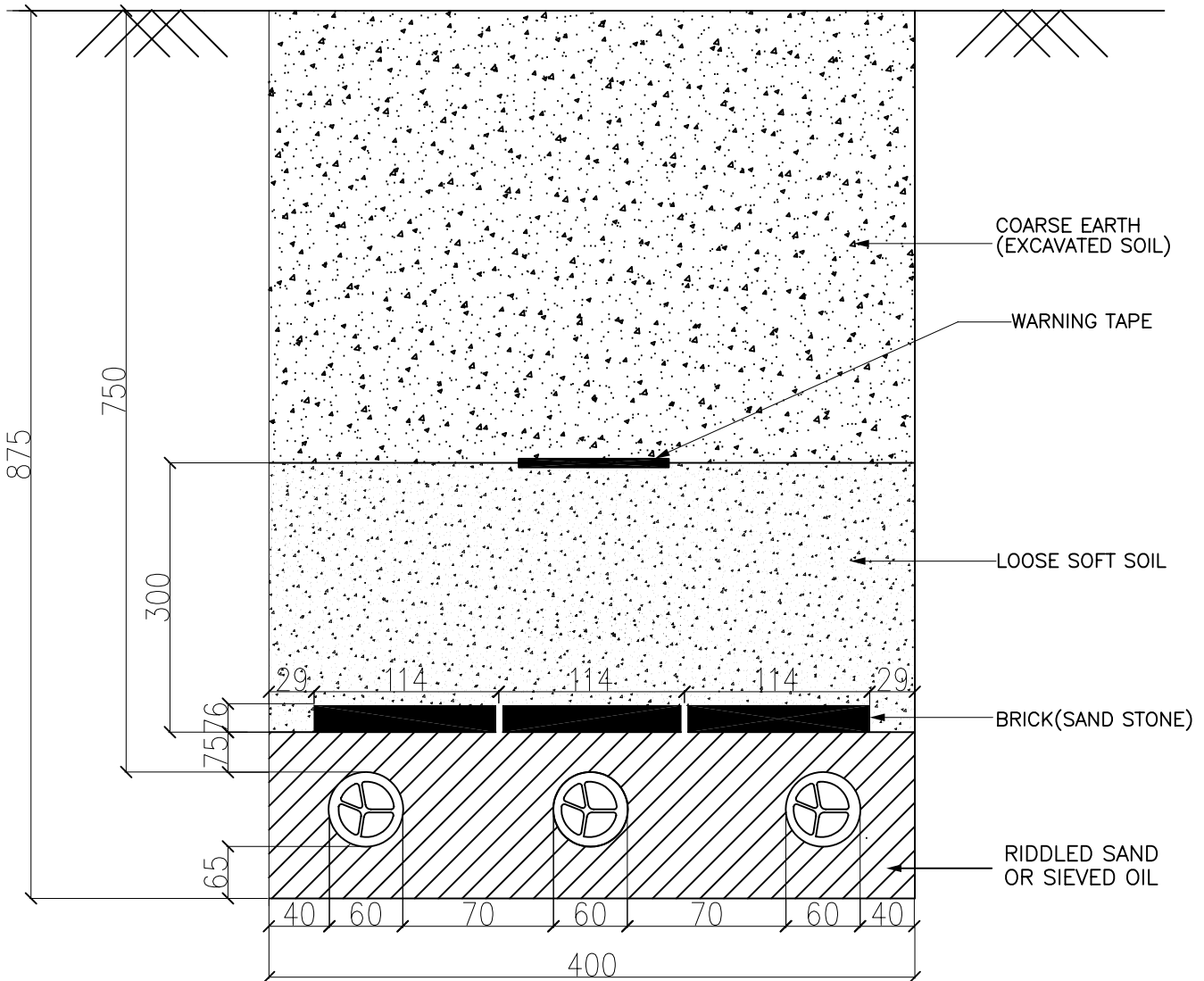
TYPICAL DETAILS FOR 11KV BURRIED CABLE FOR TWO CIRCUIT
TYPE – B 1

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

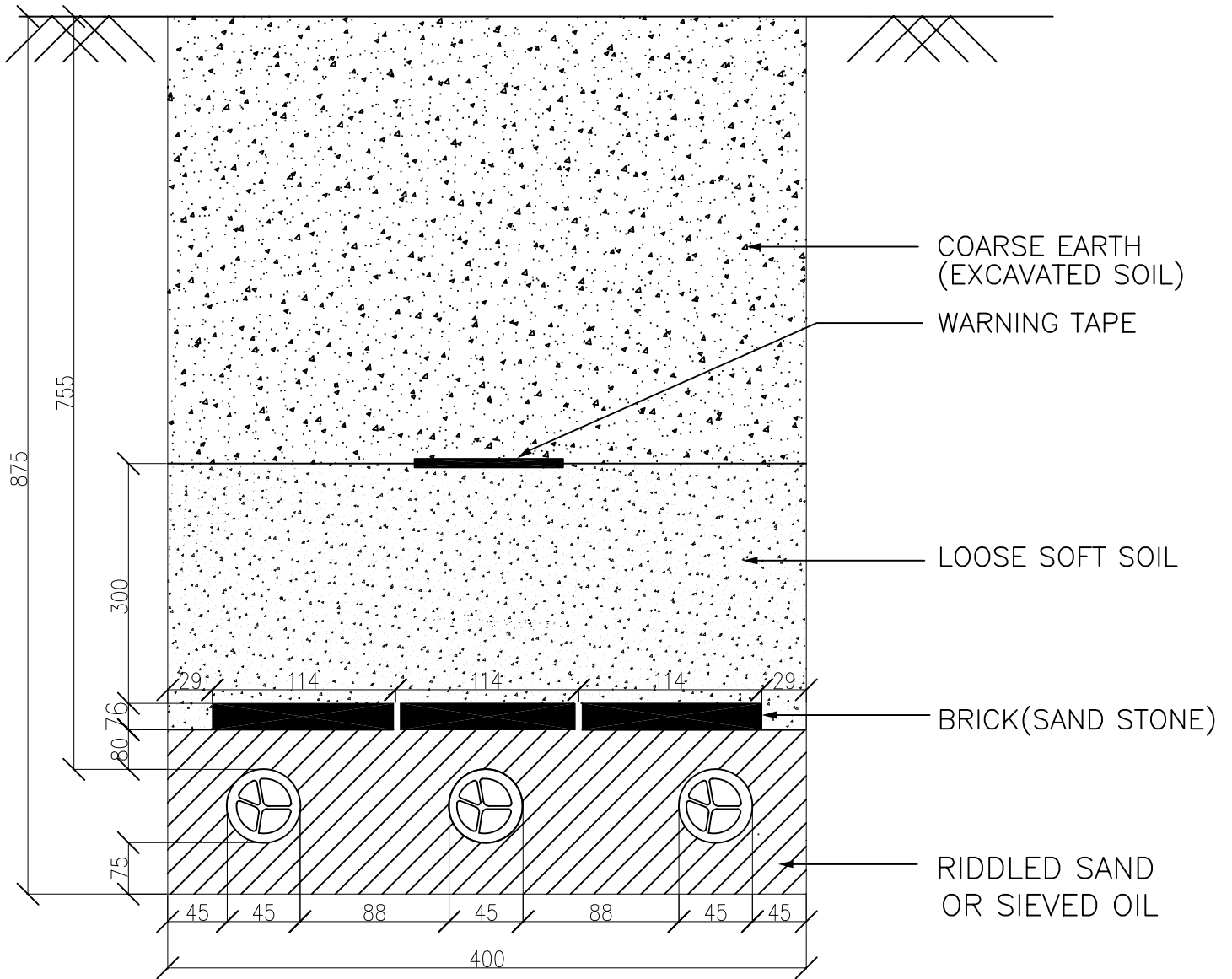
DRAWING # 8



TYPICAL DETAILS FOR 1.1KV BURIED CABLE
TYPE – A 1

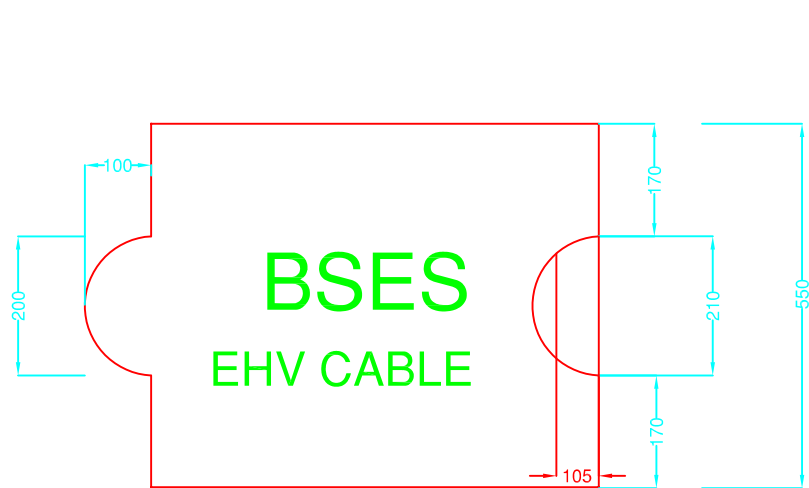
DRAWN	DS	TITLE:-	<div>BSES</div> <div>REV. 00</div>
CHECKED	SGD	TRENCH DRAWING FOR	
APPD.	D.GUHA	3.5Cx300Sqmm 1.1 KV	
DATE		XLPE CABLE	
SCALE			

DRAWING # 9

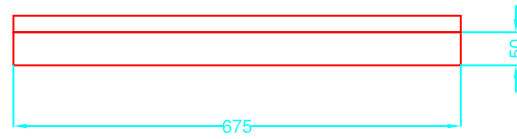


TYPICAL DETAILS FOR 1.1KV BURRIED CABLE
TYPE – A 1

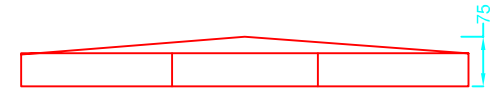
DRAWN	DS	TITLE:–	<div>BSES</div> <div>REV. 00</div>
CHECKED	SGD	TRENCH DRAWING FOR	
APPD.	D.GUHA	3.5Cx150Sqmm 1.1 KV	
DATE		XLPE CABLE	
SCALE			



PLAN



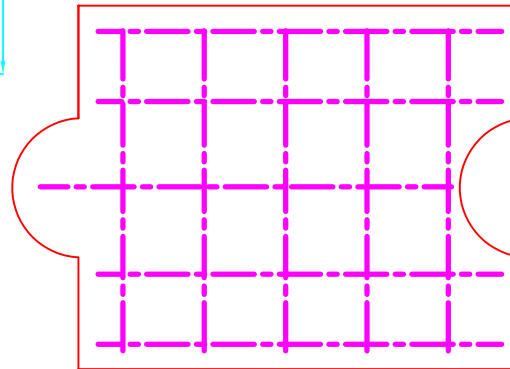
ELEVATION



SIDE VIEW

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.

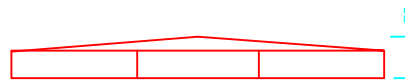
1. STEEL ROD - AS PER IS 432/1139
2. CONCRETE MIX SHALL BE NOT LESS THAN M200 GRADE AS PER IS 456.
3. MOULDING SHALL BE WITH COMPACTION NOT LESS THAN 7 MN/Sq.m.(70 kgf/Sqcm)



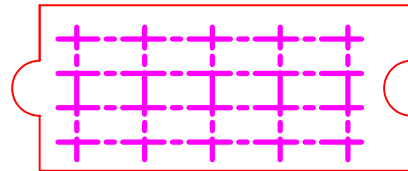
PLAN



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

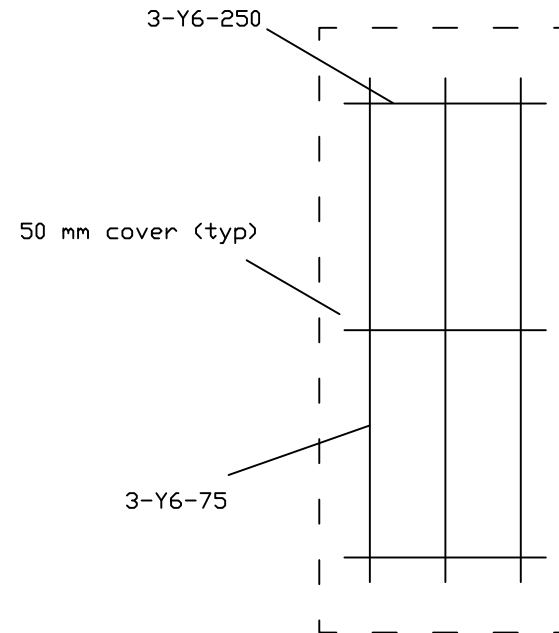
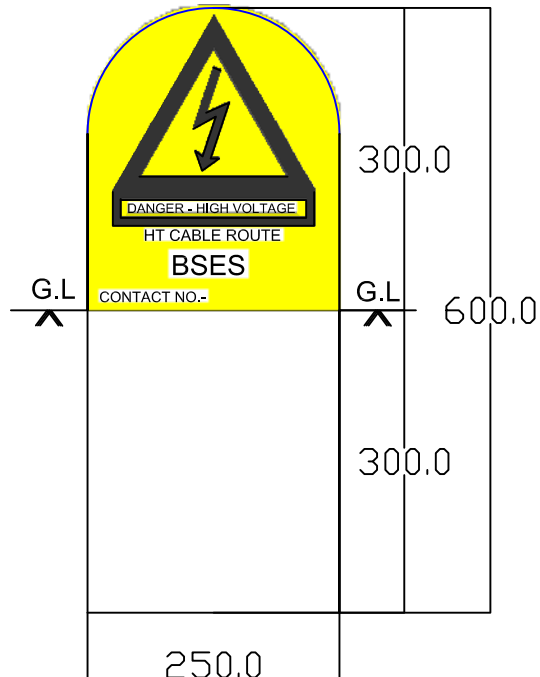
- Mask
- Jacket
- Shoes
- First Aid Box etc.

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:-

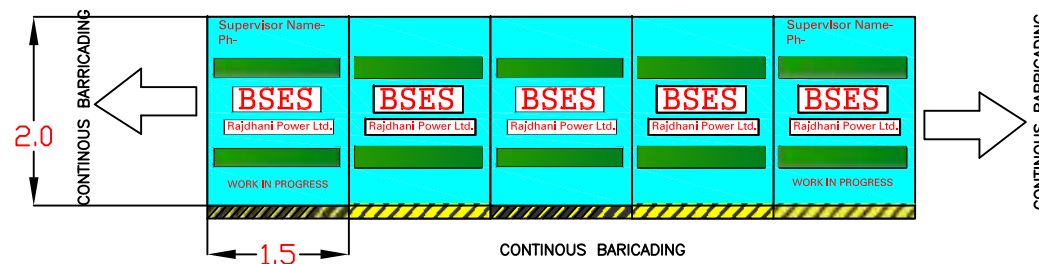
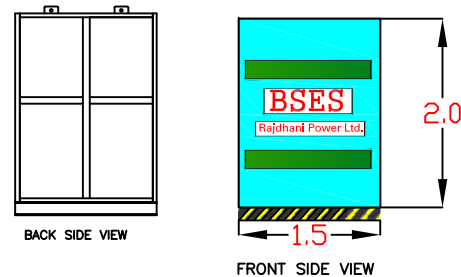
1	RCC Cable route marker with 6 mm Dia. Road and M25 concrete grade.
2	The litter/number shall be engraved on both the side route marker.
3	All dimentions are in mm unless specified.
4	Thickness of RCC shall be 75mm.
5	Yellow colour shall be visible above ground level.
6	Each route marker to be placed 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:—	 BSES Rajdhani Power Limited	
CHECKED	P.B.	DRAWING—BARRICADING FOR CABLE LAYING WORK		
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.

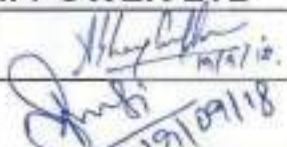

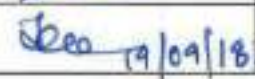
(However, HDPE pipe size with less than 1.5XOD of cable shall not be allowed at any stage)

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			

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TECHNICAL SPECIFICATIONS OF CHEMICAL EARTHING

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REVISION RECORD

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

1.0 SCOPE

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

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. CLIMATE 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 1980 & 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 CPR/VERDA which are mandatory. Copper coating shall be 250 micron minimum.
2. Earth enhancing material shall have lower ground resistivity, better conductivity, corrosion protection of electrode, non leaching and environment friendly properties. 25kg shall be normal packaging.
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 aluminium silicate, sodium montmorillonite etc. It improves conductivity of the earth electrode and ground contact area. It shall have following characteristics-

1. It should have low resistivity preferably below 0.2 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

6.3.3	Type test shall be done from CPR/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.
6.3.4	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 mentioned above in respect of bought out accessories.
7.1.3	List of manufacturing facilities available.
7.1.4	Level of automation achieved and list of areas where manual processing exists.
7.1.5	List of areas in manufacturing process, where stage inspections are normally carried out for quality control and details of such tests and inspections.
7.1.6	List of testing equipment available with the Manufacturer for final and calibration certificate

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-

- Cross 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.

BSES

BSES Rajdhani Power Ltd

GN101-03-SP-63-01

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

BSES**BSES Rajdhani Power Ltd****GN101-03-SP-63-01****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 clad 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	

BSES

BSES Rajdhani Power Ltd

GN101-03-SP-63-01

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	Technical Requirement	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	Materials	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) 50x8 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) Nut 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 clad rod below 500mm depth for formation of mesh	
		8) Chemical earthing kit (copper bonded rod, chemical and polyplastic pit cover) installation	

1.1.1 SCOPE DELINEATION**Supply:**

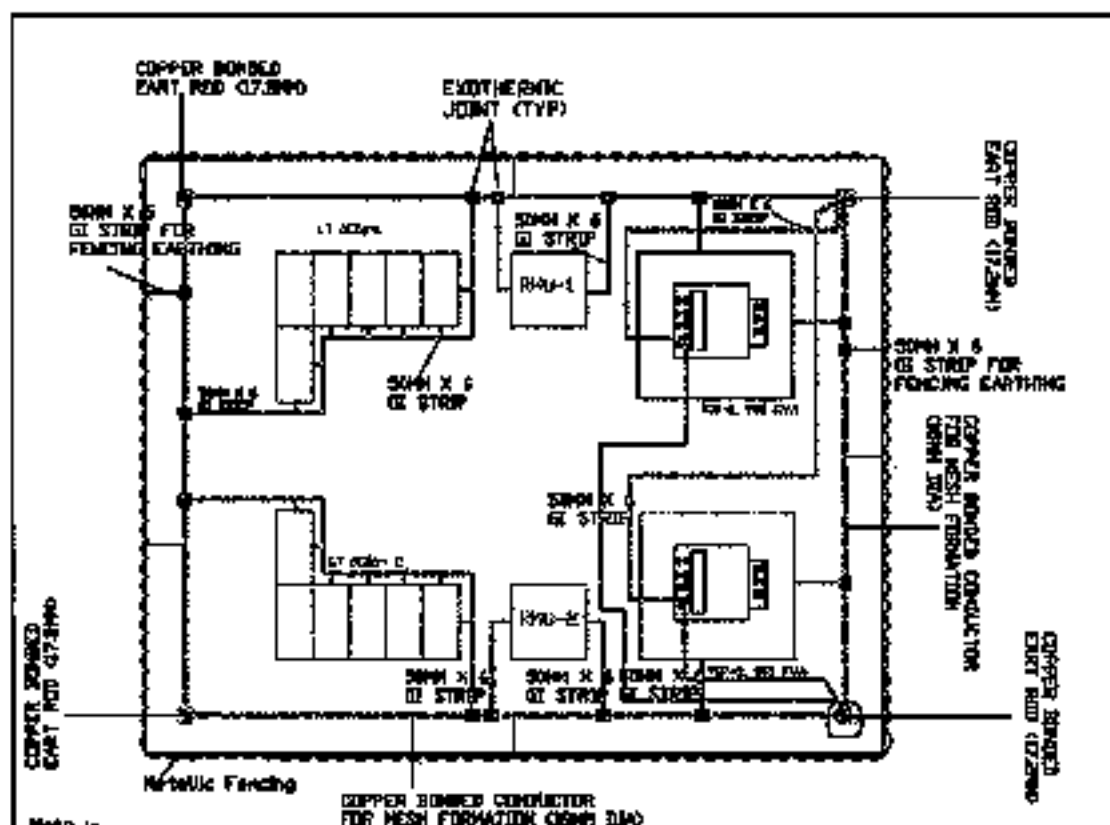
Sl no	Descriptions	BRPL	Vendor	Remarks
1	Chemical Earthing Kit (Copper Bonded Rod, 25 kg chemical and Polyplastic Pit Cover)	X	✓	
2	Copper Bonded Steel conductor for mesh formation	X	✓	
3	Exothermic Joint	X	✓	
4	Exothermic Joint Accessories	X	✓	
5	50X6 GI Strip	✓	X	
6	GI Bolt required for connecting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

Note:-

1. Earthing Kit shall consist of 17.2mm Copper Bonded Rod . 25KG Chemical per Bag,Poly Plastic Fit Cover.
2. All the Joint at Mesh side shall be Exothermic Joint.
3. 30mm GI Straps shall be used to connect the equipment to Mesh.
4. ST Bolt shall be used to connect the GI Strip with equipment.
5. Copper Bonded Steel shall be used to form the Mesh.

DRAWN	SUNNY
CHECKED	P.B
REVIEWED	A.T
APPL.	S.K
DATE	19.09.16

TITLE:-
GA DRAWING OF CHEMICAL
EARTHING

BSES
BSES Rajdhani Power Limited

Drawing No.: BSES-EL-601, 00

REV.
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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> 04/05/18	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
xli.	Altitudes	Not exceeding 1000mtrs

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

S. No.	Indian Standard	Title
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>NOTE 1:-</p> <p>1. All dimensions should be carefully checked.</p> <p>2. The dimensions should be checked in the drawing.</p> <p>3. The dimensions should be checked in the drawing.</p> <p>4. The dimensions should be checked in the drawing.</p> <p>5. The dimensions should be checked in the drawing.</p> <p>6. The dimensions should be checked in the drawing.</p> <p>7. The dimensions should be checked in the drawing.</p> <p>8. The dimensions should be checked in the drawing.</p> <p>9. The dimensions should be checked in the drawing.</p> <p>10. The dimensions should be checked in the drawing.</p>			
<p>DANGER NOTICE PLATE FOR HIGH AND EXTRA HIGH VOLTAGE INSTRUMENT</p>			
<p>DRAWN</p> <p>CHECKED</p> <p>REVIEWED</p> <p>APPRO.</p> <p>DATE</p>	<p>BY</p> <p>BY</p> <p>BY</p> <p>BY</p> <p>20.10.17</p>	<p>TITLE :-</p> <p>11KV Danger Plate</p>	<p>BSES</p> <p>BRPL RAJDHANI POWER LIMITED</p> <p>DRAWING NO.</p> <p>0000</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		
7	Material used for Danger plate	Steel Sheet & Strip-Cold-Rolled, Electrolytic Zinc-Coated	
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 PPES ITEMS (DANGER PLATE)**GUARANTEED TECHNICAL PARTICULAR FOR 11KV DANGER PLATE**

Sl. 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	8mm	
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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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

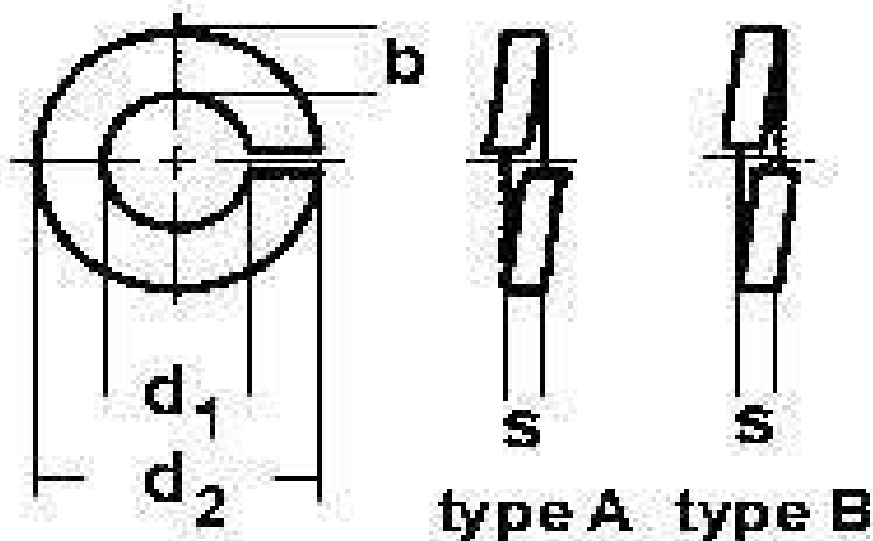
TECHNICAL SPECIFICATION OF NUT, BOLTS & WASHERS

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

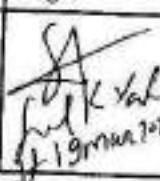

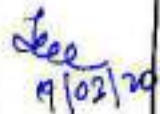


Technical Specification

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 BRPL 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 N/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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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 Bairagi							

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

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11. GTP FOR G.I. PIPE (20 MM / 32 MM) :	6
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13. INSPECTION TESTING CRITERIA:	10

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. (±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/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

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/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
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

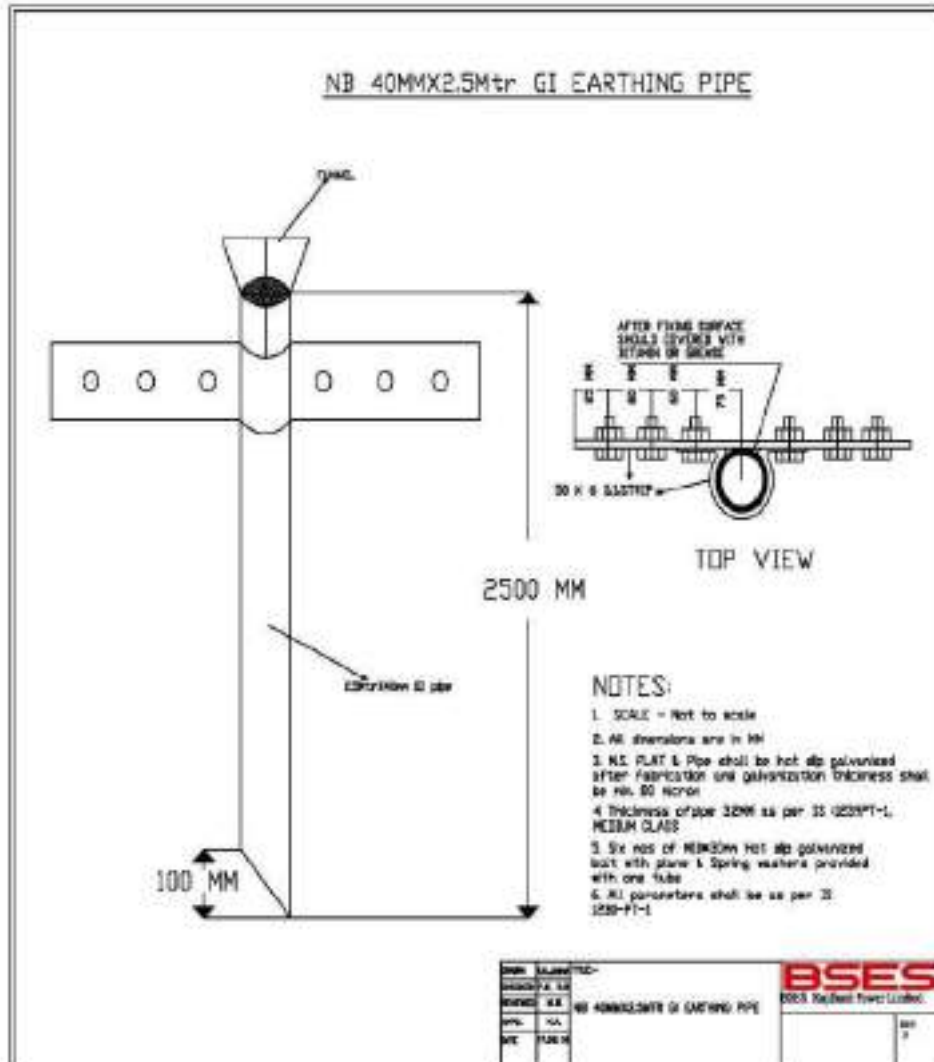


Fig. 1 G.I. EARTHING PIPE DIA 40 MM X 2.50 MTR CLASS B

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 NORMS	FORMAT OF RECORDS	INSP. 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 Cast/Heat	IS-1239 & IS-10748	IS-1239 (Part-04 & IS-10748)	Raw Material Test Certificate/ M.F. Test Certificate	W	R		
				Visual								
				Dimensional	One hour production (Shift Wise)	IS-1239	IS-1239 (Part-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	-		
				Visual	Each Pipe	IS-1239	IS-1239 & P.O.	-----	W	-		
02	IN PROCESS INSPECTION	i) Visual & Dimensional ii) Galvanizing Tests Mass of zinc & uniformity iii) Leak test iv) Identification & marking	MAJOR	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		
				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: -


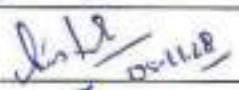
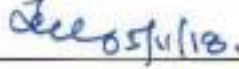
- GI Earthing pipe : Hot marking on every meter Name/logo of manufacturer, ISI monogram, Color of band (Blue Color)
- GI conduit pipe : Hot marking on every meter Name/logo of manufacturer, ISI monogram, Color of band (Yellow Color)

BSES

TECHNICAL SPECIFICATION OF GI STRIP

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

BSES RAJDHANI POWER LTD

Prepared by	Abhay Gupta	 05/11/18	Rev : 00
	Pronab Bairagi		
Reviewed by	Amit Tomar	 05/11/18	Date : 5-Nov-18
Approved by	K. Sheshadri	 05/11/18	Page : 1 of 13
Registered Office: BSES Bhawan, Nehru Place, Delhi - 110019			

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BSES

BSES Rajdhani Power Ltd

GN101-03-SP-150-00

TECHNICAL SPECIFICATION OF GI STRIP**REVISION RECORD**

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

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:2829 (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 (1963)	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**3.6 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 (1986). 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(1984).
- 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)	410 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 $6 \pm 0 \text{ g/m}^2$ 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 Praeca 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**9.1. 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
33kV AND 11kV INDOOR PANEL

Specification No-SP-HTSW01-01- R3

Prepared by Hemanshi Kaul

Approved by Abhinav Srivastava

Rev: 3

Date: 9th Sept 2016

Registered Office: BSES Bhavan, Nehru Place, Delhi - 110019

TECHNICAL SPECIFICATION FOR HT INDOOR SWITCHGEAR (33 & 11kV)

RECORD REVISION

S.No.	Clause No	Change in specification	Rev
1	31 and 32	Included Training and Commissioning support	01
2	16.16.3	Master Trip Relay with Electrical Reset	01
3	Annexure-G	Revised SCADA signal List added	01
4	16.7.1	Line current differential protection along with Distance protection is added in Incomer Panels.	01
5	16.1.5	Relays with IEC61850 Protocol with RJ45 port	01
6	33&34	Inspection and Monitoring of Material Dispatch Status	3

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1.0 SCOPE OF SUPPLY

The HT indoor switchgear shall be as per this specification. Scope of supply should be strictly as per Annexure – A

2.0 CODES & STANDARDS

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

2.1	Indian Electricity Rules 1956	Latest edition
2.2	Indian Electricity act 1910	Latest edition
2.3	Switchgear and control gear	IEC : 60694, IEC: 60298, IEC : 62271-200, IEC : 60529, IS: 3427, IS: 12729, IS: 12063, IS: 13947, IS: 9046
2.4	Circuit breaker	IEC 62271 - 100, IS 13118, IS 2516
2.5	Isolators & earthing switches	IEC 62271 - 102
2.6	Current transformers	IS:2705, IEC:60185
2.7	Voltage transformer	IS:3156, IEC:60186,
2.8	Indicating Instruments	IS:1248
2.9	Energy meters	IS 13010
2.10	Relays	IS:8686, IS:3231, IS:3842
2.11	Control switches and push buttons	IS 6875
2.12	HV fuses	IS 9385
2.13	Arrangement of Switchgear bus bars, main connections and auxiliary wiring	IS:375
2.14	Code of practice for phosphating iron & steel	IS 6005
2.15	Colours for ready mixed paints	IS 5
2.16	Code of practice for installation and maintenance of switchgear	IS 3072

3.0 PANEL CONSTRUCTION

3.1	Enclosure Type	Free standing, Indoor, Fully compartmentalised, Metal clad, Vermin proof,
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3.2	Enclosure degree of protection	IP 4X for high voltage compartment IP 5X for low voltage compartment
3.3	Enclosure material	Pre-Galvanized CRCA steel
3.3.1	Load bearing members	2.5 mm thick
3.3.2	Doors and covers	2.0 mm thick
3.3.3	Gland plate	3.0 mm MS for multicore and 5.0 mm Aluminium for single core cables. All gland plates should be detachable type with gasket
3.4	Height of the panel	Maximum 2700mm, Operating height maximum 1600mm
3.5	Extensibility	On either side
3.6	Separate Compartments for	Bus bar, Circuit Breaker, HV incoming cable, HV outgoing cable, PT, LV instruments & relays
3.7	Transparent inspection window	For cable compartment at height of cable termination.
3.8	Bus end cable box	For direct cable feeder from bus?
3.9	Breaker compartment door	Separate, with lockable handle (Design with breaker trolley as the front cover is not acceptable). Door of one panel should not cause hindrance for opening of adjacent panel.
3.10	Inter compartmental connections	
3.10.1	Breaker to bus bar compartment	Through seal-off bushings
3.10.2	Breaker to cable compartment	Through seal-off bushings
3.11	Pressure relief devices	To be provided for each HV compartment
3.12	Bus support insulator	Non-hygroscopic, track-resistant, high strength, Epoxy insulators (Calculation for validating dynamic force withstand capability to be submitted during detailed engineering)
3.13	Fixing arrangement	Doors - Concealed hinged, door greater than 500mm shall have minimum three sets of hinges Covers - SS bolts Gasket - Neoprene

3.14	Required HV cable termination height in the cable compartment	650 mm for 11 KV. 1000mm for 33 KV
3.15	Panel Base Frame	Steel Base frame as per manufacturer's standard.
3.16	Handle	Removable bolted covers with handle for cable chamber and busbar chamber. Panel no./identification to be provided on cable box cover also.
3.17	Technical particulars	As per Annexure –C

4.0 CIRCUIT BREAKER

4.1	Type	Truck or cassette type
4.2	Mounting	On withdrawable truck or carriage, with locking facility in service position.
4.3	Switching duty	a. Transformer (oil filled and dry type) b. Motor (of small and large ratings – DOL starting with starting current 6 to 8 times the full load current & with a maximum of 3 starts per hour) c. Underground cable with length up to 10 km
4.4	Interrupting medium	Vacuum
4.5	Breaker operation	Three separate identical single pole units operated through the common shaft
4.6	Operating Mechanism	Re-strike free, Trip free, with electrical anti-pumping feature
4.6.1	Type	Motor wound, spring charged, stored energy type with manual charging facility
4.6.2	Operation on supply failure	One O-C-O operation possible after failure of power supply to the spring charging motor
4.7	Breaker indications & push buttons	
4.7.1	ON/ OFF / Emergency trip push button	a. Manual / mechanical. b. Emergency Off push button should be provided with a protective flap. c. Mechanical ON shall have padlocking facility.

4.7.2	Mechanical ON – OFF indication	On breaker trolley front
4.7.3	Operation counter	On breaker trolley front
4.7.4	Test-service position indicator	On breaker trolley front
4.7.5	Mechanism charge / discharge indicator	On breaker trolley front
4.8	Breaker positions	Service, Test and Isolated
4.9	Inter changeability	Possible, only with breaker of same rating
4.10	Breaker Control	On panel front only
4.11	Handle	Breaker shall be provided with handles for easy handling, rack in–out operation and manual spring charging as applicable.
4.12	Technical particulars	As per Annexure-C

5.0 FUNCTIONAL REQUIREMENTS

5.1	Interlocks	
5.1.1	Breaker compartment door opening	Opening of door and rack out to test/isolated position should be possible with breaker in OFF position only.
5.1.2	Breaker compartment door closing	Should be possible even when breaker is in isolated position
5.1.3	Racking mechanism safety interlock	Mechanical type
5.1.4	Racking in or out of breaker inhibited	When the breaker is closed
5.1.5	Racking in the circuit breaker inhibited	Unless the control plug is fully engaged
5.1.6	Disconnection of the control plug inhibited	As long as the breaker is in service position
5.2	Safety Devices	
5.2.1	Exposure to live parts	In case the breaker panel door is required to be opened during a contingency, the personnel should not be exposed to any live part. Suitable shrouds/barriers/insulating sleeves should be provided.

5.2.2	Breaker handing	In case the breaker is mounted on a carriage which does not naturally roll out on the floor, a trolley for handling the breaker is to be provided.
5.3	Operation of breaker	In either service or test position
5.3.1	Closing from local	Only when local/remote selector switch is in local position
5.3.2	Closing from remote	Only when local/remote selector switch is in remote position
5.3.3	Tripping from local	Only when local/remote selector switch is in local position
5.3.4	Tripping from remote	Only when local/remote selector switch is in remote position
5.3.5	Tripping from protective relays	Irrespective of position of local/remote switch
5.3.6	Testing of breaker	In test or isolated position keeping control plug connected
5.4	Safety shutters.	
5.4.1	Automatic safety shutter for female primary disconnects	To fully cover contacts when breaker is withdrawn to test. Independent operating mechanism for bus bar & cable side shutters, separately pad-lockable in closed position.
5.4.2	Label for identification	For Bus side and cable side shutters
5.4.3	Warning label on shutters of incoming and other connections	Clearly visible label "Isolate elsewhere before earthing" be provided
5.5	Breaker electrical operation features	
5.5.1	Trip circuit supervision	To be given for breaker close & open condition
5.5.2	Trip circuit supervision relay contact	For indication, alarm & to inhibit closing of breaker
5.5.3	Emergency trip push button contact	Wired directly to trip coil (wired to Master trip relay if second trip coil provided)
5.5.4	Emergency trip push button contact	Wired to inhibit closing of breaker
5.5.5	Master trip relay contact (if given)	Wired to inhibit closing of breaker

5.6	DC control supply bus in all panels	Fed by two DC incoming sources in Bus coupler panel with auto changeover facility
5.7	PT supply bus in all panels	Fed normally by bus PT with automatic changeover facility to incomer line PT

6.0 SURGE SUPPRESSOR

6.1	Provision	To be provided in all panels except bus coupler and BPT.
6.2	Type	Gapless, metal oxide type
6.3	Technical particulars	As per Annexure -C

7.0 CURRENT TRANSFORMER

7.1	Type	Shall be cast resin type with insulation class of E or better.
7.2	Rating and technical particulars	As per Annexure – C (Technical particulars) and Annexure – F (SLDs)
7.3	CBCT	If specified, bidder shall clearly mention his proposal for mounting the same.

8.0 POTENTIAL TRANSFORMER

8.1	Type	Shall be cast resin type with insulation class of E or better.
8.2	Rating and technical particulars	As per Annexure – C (Technical particulars) and Annexure – F (SLDs)
8.3	Mounting	It shall be mounted on a withdrawable carriage. Mounting of PT on the breaker truck is not acceptable. In case it is mounted on the panel rear top, access to the PT and the reinforcement in the panel for allowing a person to stand should be provided.
8.4	Neutral	The HV neutral connection to earth shall be easily accessible for disconnection during HV test.

9.0 FEEDER AND BUS EARTHING

9.1	Earthing arrangement	Through separate earthing truck for bus & feeder
9.2	Short time withstand capacity of earthing truck	Equal to rating of breaker. Refer technical parameters.
9.3	Operation from front	Mechanically operated by separate switch.
9.4	Interlocks	To prevent inadvertent closing on live circuit, with padlocking arrangement to lock truck in close or open position.

10.0 EQUIPMENT EARTHING

10.1	Material of earthing bus	Aluminium
10.2	Earth bus joints	All bolted joints in the bus should be made by connection of two bolts.
10.3	Rating	Sized for rated short circuit current for 3 seconds
10.4	Enclosure & non -current carrying part of the switchboard / components	Effectively bonded to the earth bus.
10.5	Hinged doors	Earthed through flexible copper braid
10.6	Circuit breaker frame /carriage	Earthed before the main circuit breaker contacts/ control circuit contacts are plugged in the associated stationary contacts
10.7	Metallic cases of relays, instruments and other LT panel mounted equipment	Connected to the earth bus by independent copper wires of size not less than 2.5 sq. mm with green colour insulation. For this purpose LT compartment should have a clear designated earth bus to which earth connections from all components are to be connected.
10.8	CT and PT neutral	Earthed at one place at the terminal blocks through links.

11.0 METERS

11.0	Mounting	Flush mounted
11.1	Ammeter	Digital type with programmable ratio

11.1.1	Size	96x96 mm
11.1.2	Panels where to be provided	All panels except bus PT
11.1.3	Ammeter selector switch	Inbuilt in meter
11.1.4	Accuracy Class	1.0
11.2	Voltmeter	Digital type with programmable ratio
11.2.1	Size	96x96 mm
11.2.2	Panels where to be provided	Incomer and bus PT panel
11.2.3	Voltmeter switch	Inbuilt in meter
11.2.4	Accuracy Class	1.0
11.3	Energy meter provision	Energy meter is not in supplier's scope. Only space and CT/PT wiring is to be provided in all panels except bus coupler and bus PT.

12.0 INDICATION, ALARMS & ANNUNCIATION

12.1	Indications	Flush mounted, High intensity, clustered LED type
12.1.1	Breaker ON	Red
12.1.2	Breaker Off	Green
12.1.3	Spring Charged	Blue
12.1.4	DC control supply fail	Amber
12.1.5	AC control supply fail	Amber
12.1.6	Auto trip	Amber
12.1.7	Test Position	White
12.1.8	Service Position	White
12.1.9	Heater circuit healthy	Yellow (Indication with integrated push button for checking)
12.1.10	Trip circuit healthy	White
12.1.11	PT supply as applicable	R,Y B
12.2	Annunciator (For 33kV Panels only)	
12.2.1	Type	Static type alongwith alarm. Annunciations shall be repetitive type and shall be capable of registering the fleeting signal. Fascia test facility should also be provided.

12.2.2	Note	LED type indications may not be provided for alarm signals provided on annunciator.
12.2.3	Mounting	Flush mounted
12.2.4	Fascia	12 window
12.2.5	Signals to provided on Fascia	Window 1 – Main Protection Operated (Distance /Differential) Window 2 – Backup O/C & E/F Protection Operated Window 3 – LBB operated Window 4 – CB Autotrip Window 5 – Trip Circuit Unhealthy Window 6 – DC Fail Window 7 – AC Fail Window 8 – VT Fuse Fail Window 9 – Protection Relay Faulty
12.2.6	Push Buttons	For test, accept and reset
12.2.7	Potential Free Contacts	To be provided for event logger
12.3	Alarm scheme with isolation switch	a. For DC fail, TC fail and CB auto trip in 11kV panels b. For all signals wired to annunciator in 33kV panels

Sequence of operation of the annunciator shall be as follows-

S No.	Alarm Condition	Fault Contact	Visual Annunciation	Audible Annunciation
a.	Normal	Open	Off	Off
b.	Abnormal	Close	Flashing	On
c.	Accept	Close	Steady on	Off
d.	Return to normal	Open	Steady On	Off
e.	Reset	Open	Off	Off
f.	Reset before return to normal	Close	Flashing	On

13.0 SELECTOR SWITCHES & PUSH BUTTONS

13.1	Selector switches	Flush mounted on LV compartment door, with shrouded terminals
13.1.1	TNC switch with pistol grip	Lockable, spring return to normal position

13.1.2	Local / SCADA selector switch	2 pole
13.1.3	Rotary ON/OFF switches	For heater / illumination circuit
13.1.4	Rating	16 A
13.2	Push Button	Flush mounted on LV compartment door, with shrouded terminals
13.2.1	Emergency trip push button	Red color with stay put
13.2.2	Accept push buttons	Black color – Trip alarm / DC fail alarm
13.2.3	Reset push buttons	Yellow color – Trip alarm / DC fail alarm
13.2.4	Rating	10 A

14.0 INTERNAL WIRING

14.0	Internal wiring	1100 V grade, PVC insulated (FRLS) stranded flexible copper wire.
14.1	Size	2.5 sq mm for CT circuit, 1.5 sq mm for PT & control circuits
14.2	Colour code	
14.2.1	CT & PT	R Ph – Red Y Ph – Yellow B Ph – Blue Neutral – Black
14.2.2	Others	DC– grey, AC-black, Earth – green
14.3	Ferrules	At both ends of wire
14.4	Ferrule type	Interlocked type (one additional red colour ferrule for all wires in trip circuit)
14.5	Lugs	Tinned copper, pre-insulated, ring type, fork type and pin type as applicable. CT circuits should use ring type lugs only.
14.6	Spare contacts	Spare contacts of relays and contactors etc. should be wired upto the terminal block.
14.7	Wiring enclosure	Plastic channels, Inter panel wiring through PVC sleeves

14.8	Interpanel wiring	Wires with ferrule to be terminated in the adjacent shipping section should be supplied with one end terminated and the other end bunched and coiled.
14.9	Auxiliary supply	Auxiliary bus wiring for AC and DC supplies, voltage transformer circuits, annunciation circuits and other common services shall be provided on the same set of terminals in all the panels with proper segregation.

15.0 TERMINAL BLOCKS

15.1	Rating and Type	1100 V grade, moulded piece, stud type screw driver operated terminals complete with insulated barriers, washers, nuts and lock nuts.
15.2	Suitability	For termination of minimum 6sqmm flexible copper conductor.
15.3	Marking and covers	White fibre markings strip with clear plastic, slip-on / clip-on terminal covers to be provided.
15.4	Disconnecting Facility	To be provided in CT and PT terminals
15.5	Shorting & Earthing Facility	To be provided in CT Terminals
15.6	Spare Terminals	20% in each TB row
15.7	TB shrouds & separators	Moulded non- inflammable plastic material
15.8	Clearance between 2 sets of TB	100 mm min
15.9	Clearance with cable gland plate	250 mm min
15.10	Clearance between AC / DC set of TB	100 mm min
15.11	Test terminal blocks	Screw driver operated stud type for metering circuit

16.0 RELAYS

16.1	Protection Relays – General Features	
16.1.1	Technology and Functionality	Numerical , microprocessor based with provision for multifunction protection, control, metering and monitoring
16.1.2	Mounting	Flush Mounting, IP5X

16.1.3	Architecture	Hardware and software architecture shall be modular and disconnectable to adapt the protection and control unit to the required level of complexity as per the application.
16.1.4	Programming configuration and	Relay shall utilize a user friendly setting and operating multi-lingual software in windows environment with menus and icons for fast access to the data required. Programming software and communication cord for offered relays should be included in scope of supply.
16.1.5	SCADA Interface port	RJ45 rear port for interfacing with SCADA on IEC61850 protocol.If relay have any other rear port, hardware/software required to achieve the above said compatibility will be in supplier's scope.
16.1.6	PC Interface port	Front port (preferably serial) for configuration/data download using PC. Cost of licensed software and communication cord, required for programming of offered protection relays shall be included in the cost of switchgear.
16.1.7	User Interface	An alphanumeric key pad and graphical LCD display with backlight indicating measurement values and operating messages. It should be possible to access and change all settings and parameters without the use of PC.
16.1.8	Relay Characteristics	Relay shall integrate all necessary protections for different applications in accordance with IS and IEC. Relay shall provide wide setting ranges and choice of all IEC, IEEE and other tripping curves through a minimum of two setting groups.
16.1.9	Event and Fault records	Relay shall have the facility of recording of various parameters during event/fault with option to set the duration of record through settable pre fault and post fault time. Relay shall store records for last 10 events

		and 10 faults (minimum). It should be possible to download records locally to PC or to remote SCADA.
16.1.10	Self diagnosis	Relay shall be able to detect internal failures. A watchdog relay with changeover contact shall provide information about the failure.
16.1.11	Time synchronization	All relays shall be capable of being synchronized with the system clock using SCADA interface and PC.
16.1.12	Operation Indicators	LEDs with push button for resetting.
16.1.13	Test Facility	Inbuilt with necessary test plugs.
16.2	Protection Relays for 11kV Incomer panel	
16.2.1	Relay 1	3-phase Overcurrent and Earthfault protection with IDMT, Definite time and instantaneous characteristics
		Undervoltage and overvoltage protection
		PT supervision (fuse failure monitoring)
16.2.2	Relay 2	High Impedance Restricted Earth fault protection.
16.2.3	User Configurable DIs and DOs	Relay-1 & 2 should have a total of 16 DIs and 10 DOs (minimum). Each relay should have atleast 2 DIs and 4 DOs
16.2.4	Note	Combining functions of Relay-1 and Relay-2 in single relay is not acceptable.
16.2.5	SLD	Refer annexure – F1
16.3	Protection Relays for 11kV Bus Section panel	
16.3.1	Relay 1	3-phase Overcurrent and Earthfault protection with IDMT, Definite time and instantaneous characteristics
		User Configurable 12 DIs and 6 DOs (minimum)
16.3.2	SLD	Refer annexure – F2
16.4	Protection Relays for 11kV Outgoing panel	
16.4.1	Relay 1	3-phase Overcurrent and Earthfault protection with IDMT, Definite time and instantaneous characteristics

		User Configurable 12 DIs and 6 DOs (minimum)
16.4.2	SLD	Refer annexure – F3
16.5	Protection Relays for 11kV Station Transformer panel	
16.5.1	Relay 1	3-phase Overcurrent and Earthfault protection with IDMT, Definite time and instantaneous characteristics
		User Configurable 12 DIs and 6 DOs (minimum)
16.5.2	SLD	Refer annexure – F4
16.6	Protection Relays for 11kV Capacitor panel	
16.6.1	Relay 1	3-phase Overcurrent and Earthfault protection with IDMT, Definite time and instantaneous characteristics
		Undervoltage and Overvoltage protection
		PT supervision (fuse failure monitoring)
		Timer for on time delay (minimum 600 seconds)
16.6.2	Relay 2	Neutral unbalance relay (current based)
16.6.3	User Configurable DIs and DOs	Relay-1 & 2 should have a total of 16 DIs and 10 DOs (minimum). Each relay should have atleast 2 DIs and 4 DOs
16.6.4	Note	Combining of functions of Relay-1 and Relay-2 in single relay is not acceptable.
16.6.5	SLD	Refer annexure – F5.
16.7	Protection Relays for 33kV Incomer	
16.7.1	Relay 1 (If Distance protection is considered as primary protection)	Distance Protection
		Sync check function
		PT supervision
		Power swing blocking
	Relay 1	Line differential protection and Distance protection
		Software based CT ratio correction
		Dedicated port for communication with remote end relay through optical fibre. This port should be in addition to PC interface and SCADA interface ports.

	Selection of Relay 1	Selection of Relay-1 (primary protection) will depend on site requirements. Hence bid shall contain prices of Incomer panel - <ul style="list-style-type: none"> a. With Distance protection as primary protection b. With Line differential protection as primary protection.
16.7.2	Relay 2	3-phase Directional Overcurrent and Earthfault protection with IDMT, Definite time and instantaneous characteristics.
		Sync check function, if not provided in relay 1.
		Circuit Breaker failure protection
		PT supervision, if not provided in relay 1
16.7.3	User Configurable DIs and DOs	Relay-1 & 2 should have a total of 16 DIs and 12 DOs (minimum). Each relay should have atleast 2 DIs and 6 DOs
16.7.4	Note	Combining functions of Relay-1 and Relay-2 in single relay is not acceptable.
16.7.5	SLD	Refer annexure – F6
16.8	Protection Relays for 33kV Transformer Feeder Panel	
16.8.1	Relay 1	Biased differential protection
		REF protection
		Software based ratio and vector correction feature (without ICT)
		H2 and H5 harmonic restraint
16.8.2	Relay 2	3-phase Overcurrent and Earthfault protection with IDMT, Definite time and instantaneous characteristics
		Circuit Breaker failure protection
16.8.3	User Configurable DIs and DOs	Relay-1 & 2 should have a total of 16 DIs and 12 DOs (minimum). Each relay should have atleast 2 DIs and 6 DOs.
16.8.4	Note	Combining functions of Relay-1 and Relay-2 in single

		relay is not acceptable.
16.8.5	SLD	Refer annexure – F7
16.9	Protection Relays for 33kV Buscoupler Panel	
16.9.1	Relay 1	3-phase Overcurrent and earthfault protection with IDMT, Definite time and instantaneous characteristics.
		Sync check function
		Circuit Breaker failure protection
		PT supervision (fuse failure monitoring) for Bus PT-1
		User Configurable 16 DIs and 8 DOs (minimum)
16.9.2	Relay 2	PT supervision (fuse failure monitoring) for Bus PT-2. May be provided as integral feature of relay-1.
16.9.3	SLD	Refer annexure – F8
16.10	Protection Relays for 33kV Outgoing Panel (For Installation at KCC Consumer Premises)	
16.10.1	Relay 1	3-phase Overcurrent and Earthfault protection with IDMT, Definite time and instantaneous characteristics
		Circuit Breaker failure protection
		User Configurable 12 DIs and 6 DOs (minimum)
16.10.2	SLD	Refer annexure – F9
16.11	Protection Relays for 33kV Incomer from 66/33kV Autotransformer	
16.11.1	Relay 1	3-phase Overcurrent and Earthfault protection with IDMT, Definite time and instantaneous characteristics
		Sync check function
		Undervoltage and overvoltage protection
		Circuit Breaker failure protection
		PT supervision (fuse failure monitoring)
16.11.2	Relay 2	High Impedance Restricted Earth fault protection
16.11.3	User Configurable DIs and DOs	Relay-1 & 2 should have a total of 16 DIs and 12 DOs (minimum). Each relay should have atleast 2 DIs and 6 DOs

16.11.4	Note	Combining functions of Relay-1 and Relay-2 in single relay is not acceptable
16.11.5	SLD	Refer annexure – F10
16.12	Protection Relays for 33kV Outgoing from 66/33kV Autotransformer	
16.12.1	Relay 1 (Distance protection is considered as primary protection)	Distance Protection
		PT supervision
		Power swing blocking
	Relay 1 (Line differential protection is considered as primary protection)	Line differential protection
		Software based CT ratio correction
		Dedicated port for communication with remote end relay through optical fibre. This port should be in addition to PC interface and SCADA interface ports.
	Selection of Relay-1	Selection of primary protection will depend on site requirements. Hence bid shall contain prices of Incomer panel – <ul style="list-style-type: none"> a. With Distance protection as primary protection b. With Line differential protection as primary protection.
16.12.2	Relay 2	3-phase Overcurrent and Earthfault protection with IDMT, Definite time and instantaneous characteristics.
		Circuit Breaker failure protection
16.12.3	User Configurable DIs and DOs	Relay-1 & 2 should have a total of 16 DIs and 12 DOs (minimum). Each relay should have atleast 2 DIs and 6 DOs
16.12.4	Note	Combining functions of Relay-1 and Relay-2 in single relay is not acceptable.
16.12.5	SLD	Refer annexure – F11
16.13	Protection Relays for 33kV Buscoupler for Switchboard of 66/33kV Autotransformer	
16.13.1	Relay 1	3-phase Overcurrent and earthfault protection with IDMT, Definite time and instantaneous characteristics.

		Sync check function
		Circuit Breaker failure protection
		PT supervision (fuse failure monitoring) for Bus PT-1
		User Configurable 16 DIs and 8 DOs (minimum)
16.13.2	Relay 2	PT supervision (fuse failure monitoring) for Bus PT-2. May be provided as integral feature of relay-1.
16.13.3	SLD	Refer annexure – F12
16.14	Protection Relays – SCADA Interfacing	
16.14.1	Configuration and wiring of DIs in Protection Relays (All panels) for routing status signals to SCADA	DI-1 – TC Unhealthy DI-2 – CB Autotrip (contact from lockout relay) DI-3 – CB Open DI-4 – CB Close DI-5 – CB in service DI-6 – CB in test DI-7 – Spring Charged DI-8 – L/R switch in local DI-9 – AC fail DI-10 – Adjacent Panel DC Fail/DC MCB Trip DI-11 – Adjacent Panel Protection Relay fail DI-12 – PT MCB trip (metering and protection, for incomer and capacitor panel only) Sequence of DIs should be strictly as mentioned above. Change in sequence of DIs will not be acceptable.
16.14.2	Configuration and wiring of DOs in Protection relays (all panels) for execution of SCADA commands through SCADA interface port (refer clause 16.1.5).	DO-1 – CB Open DO-2 – CB close Sequence of DOs should be strictly as mentioned above. Change in sequence of DOs will not be acceptable.
16.14.3	Looping of numerical relays	All relays in the switchboard have to be looped to form a common bus for interfacing with SCADA.
16.14.4	Spare DIs and DOs	Should be wired upto terminal block for future use.

16.15	Transformer Monitoring cum AVR Relay	
16.15.1	Features	As per annexure –B
16.15.2	Requirement	To be provided in 33KV Transformer panel only
16.16	Auxiliary Relays – General Features	
16.16.1	Relays for auxiliary, supervision, trip and timer relays	Static or electromechanical type.
16.16.2	Reset mechanism for auxiliary relays	Self reset contacts except for lock-out relays.
16.16.3	Reset mechanism for lockout relays	Electrical reset type for all the panels panels.
16.16.4	Operation indicators	With hand-reset operation indicators (flags) or LEDs with pushbuttons for resetting.
16.17	Auxiliary relays – Requirement	
16.17.1	Anti pumping (94), lockout (86) and trip circuit supervision (74) relays	For each breaker
16.17.2	PT selection relays	To be provided for selection between Bus PT and Line PT of respective sections.
16.17.3	Switchgear with two incomer & bus coupler	Lockout relay (86) contact of each incoming breakers to be wired in series in closing circuit of other incoming breakers & bus coupler.
16.17.4	Auxiliary Relays, contact multiplication relays etc.	To effect interlocks and to exchange signals of status & control
16.17.5	Transformer trouble relays (For 33kV Transformer feeder panel only)	Auxiliary relays with indicating flags (contactors will not be accepted) should be provided for the following trip and alarm commands – a. Buchholz trip b. OSR trip c. PRV trip d. SPR trip e. WTI Trip

		<ul style="list-style-type: none">f. OTI Tripg. Buchholz Alarmh. Low oil level alarmi. OTI Alarmj. WTI Alarm.
16.18	General Requirements for all relays/contactors	Auxiliary supply will 50/220VDC based on requirement. All relays/contactors shall be suitable for continuous operation at 15% overvoltage.

17.0 SPACE HEATERS

17.1	Type	Thermostat controlled with switch for isolation
17.2	Location	In Breaker & HV cable compartment, mounted on an insulator. Heater position in cable compartment should be easily accessible after cable termination. Heater position in breaker chamber shall be accessible with breaker racked-in.

18.0 SOCKETS, SWITCHES & ILLUMINATION LAMPS

18.1	Illumination lamp with switch	For LV & cable chamber
18.2	Universal type (5/15 A) Socket with Switch	In LV chamber

19.0 NAMEPLATES AND MARKING

19.1	Nameplates	To be provided as per the following description
19.1.1	Equipment Nameplates	<ul style="list-style-type: none">a. All equipment mounted on front side as well as equipment mounted inside the panels shall be provided with individual name plates with equipment designation engraved.b. All front mounted equipment shall be also provided at the rear with individual name plates engraved with tag numbers corresponding to the one shown in the panel internal wiring to facilitate easy tracing of the wiring.

19.1.2	Feeder Nameplates	<p>a. Large and bold name plate carrying the feeder identification/ numbers shall be provided on the top of each panel on front as well as rear side. On rear side, nameplate should be provided on frame.</p> <p>b. Rear bottom of each panel shall have a nameplate clearly indicating the following: Customer Name – BSES Delhi; PO No. & date; Drawing Reference No. etc.</p>
19.1.3	Rating Plate	<p>Following details are to be provided on Panel and CB rating plate:</p> <p>a. Customer Name – BSES Delhi</p> <p>b. PO No. & Date – As per respective PO.</p>
19.1.4	Material	Non-rusting metal or 3 ply lamicaid. Nameplates shall be black with white engraving lettering. Stickers are not allowed.
19.1.5	Fixing	All nameplates/rating plates shall be riveted to the panels at all four corners. Bolting/screwing is not acceptable.
19.2	Markings	Each switch shall bear clear inscription identifying its function. Similar inscription shall also be provided on each device whose function is not other wise identified. If any switch or device does not bear this inscription separate nameplate giving its function shall be provided for it. Switch shall also have clear inscription for each position indicating e.g. Trip-Neutral close, ON-OFF etc.

20.0 SURFACE TREATMENT & PAINTING

20.1	Surface Treatment	Sand blasting or by seven tank process.
20.2	Paint type	Powder coated. Pure polyester base grade-A structure finish.
20.3	Paint shade	RAL 7032 for external & internal surface
20.4	Paint thickness	Minimum 50 microns

21.0 APPROVED MAKES OF COMPONENTS

21.1	Numerical Relays	R series of ABB, Siprotec series of Siemens, Micom series of Schneider/Alstom. Numerical relays used in complete switchboard should be of same make. Use of two different makes of relays in a switchboard is not acceptable.
21.2	Transformer	A-eberle/Easun-MR

	monitoring cum AVR relay	
21.3	Electromechanical Relays	Alstom/Schneider/Siemens/ABB/ER
21.4	Miniature Relays	ABB/Jyoti/Omran
21.5	Contactors	ABB/Siemens/Telemecanique
21.6	Instrument transformers	ECS/ Pragati/ Gemini/Schneider/CGL/Kappa/Narayan power tech
21.7	MCBs	Siemens/Schneider/Legrand/ABB
21.8	Control switches	Switron/Kaycee
21.9	Test terminal blocks	IMP/Schneider/Alstom
21.10	Terminal blocks	Elmex/Connectwell
21.11	Indicating lamps	Siemens/ Teknic/ Binay
21.12	Surge Suppressors	Oblum/Tyco
21.13	Meters	Rishabh/Conzerv

22.0 INSPECTION AND TESTING

22.1	Type Tests	The product must be of type tested quality as per applicable Indian standards / IEC
22.1.1	Type test report validity period	Last five years from date of bid submission. Bidder with type test report more than 5 years old needs to re-conduct the tests without any commercial implication to BSES
22.1.2	Pressure relief device operation	Test certificate for panel to be submitted
22.2	Acceptance & Routine tests	As per the specification and relevant standards. Charges for these tests shall be deemed to be included in the equipment price. In addition to these tests, following tests have to be carried out as acceptance tests -
22.2.1	Primary injection test	To be carried out on panels selected for testing
22.2.1	Temperature rise test	One panel per Purchase order (PO with minimum 10 panels) without any commercial implication to BSES. In-house testing is

		acceptable.
22.2.2	Paint Thickness/ Peel off	To be carried out on panels selected for testing
22.3	Inspection	The purchaser/owner reserves the right to witness all the acceptance/routine tests during inspection.
22.4	Notice to purchaser for conducting type tests	At least three weeks in advance
22.5	Test reports before dispatch for approval	Six (6) copies of acceptance and routine test reports

23.0 DRAWINGS & DATA SUBMISSION

23.1	Submissions along with the bid	
23.1.1	Duly filled GTP and copy of specification	2 copies + 1 soft copy
23.1.2	GA drawing and Cross sectional drawings	2 copies + 1 soft copy
23.1.3	Panel wise Bill of Material	2 copies + 1 soft copy
23.1.4	Catalogues and Manuals for all major equipments	1 copy
23.1.5	Type test report for type, size and rating of equipment offered.	2 copies + 1 soft copy
23.1.6	Deviations from this specification	To be provided in writing.
23.1.7	Reference List of customers	For last five years with units of similar design and rating
23.1.8	Recommended spares and consumables	If any spares suggested (in addition to spares list in Annexure –E) for five years of operation alongwith price list
23.1.9	Manufacturer's quality assurance plan	To be provided
23.2	Submissions after award of contract	
23.2.1	Duly filled GTP	1 copy + soft copy
23.2.2	Panel wise Bill of Material	1 copy + soft copy
23.2.3	GA and Cross sectional drawings	1 copy + soft copy

23.2.4	Single line diagrams	1 copy + soft copy
23.2.5	Schematic drawings	1 copy + soft copy
23.2.6	Calculations for sizing of various equipment	1 copy + soft copy
23.2.7	Catalogues and Manuals for all equipments	1 copy + soft copy
23.2.8	Foundation Plan	1 copy + soft copy
23.2.9	Calculations for sizing of various components	1 copy + soft copy
23.2.10	Type test report for type, size and rating of equipment offered.	1 copy + soft copy
23.1.11	Manufacturer's quality assurance plan	1 copy + soft copy
23.2.12	Deviations from this specification	Approved in writing before award of contract.
23.3	Submissions prior to dispatch	
23.3.1	Inspection and test reports/ compliance report by manufacturer	1 copy + 1 soft copy
23.3.2	Test certificates for all bought out items	1 copy + 1 soft copy
23.3.3	GTP and As Built drawings consisting of GA, Cross sectional, SLD and schematic drawings	3 copies + 1 soft copy. Panels supplied without as built drawing will be treated as short supply.
23.3.4	Catalogues and Manuals for all equipments / relays	3 copies + 1 soft copy
23.3.5	Field quality plan / Installation, erection and commissioning manual for switchgear	3 copies + 1 soft copy
23.4	Drawing and document sizes	Standard size paper A3 and A4

24.0 PACKING

24.1	Packing Protection	Against corrosion, dampness, heavy rains, breakage and vibration. During transportation/ transit and storage, panels may be subjected to outdoor conditions. Hence, packing of each panel shall be
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		weatherproof ..
24.2	Packing for accessories and spares	Robust wooden non returnable packing case with all the above protection & identification Label
24.3	Packing Identification Label to be provided on each packing case with the following details	
24.3.1	Individual serial number	
24.3.2	Purchaser's name	
24.3.3	PO number (along with SAP item code, if any) & date	
24.3.4	Equipment Tag no. (if any)	
24.3.5	Destination	
24.3.6	Project Details	
24.3.7	Manufacturer / Supplier's name	
24.3.8	Address of Manufacturer / Supplier / it's agent	
24.3.9	Description and Quantity	
24.3.10	Country of origin	
24.3.11	Month & year of Manufacturing	
24.3.12	Case measurements	
24.3.13	Gross and net weights in kilograms	
24.3.14	All necessary slinging and stacking instructions	

25.0 SHIPPING

25.0	Shipping	The bidder shall ascertain at an early date and definitely before the commencement of manufacture, any transport limitations such as weights, 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.
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BSES	SP-HTSWG-01-R3
TECHNICAL SPECIFICATION FOR HT INDOOR SWITCHGEAR (33 & 11kV)	

		The seller shall be responsible for all transit damage due to improper packing.
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26.0 HANDLING AND STORAGE

26.0	Handling and Storage	Manufacturer instruction shall be followed. Detail handling & storage instruction sheet / manual needs to be furnished before commencement of supply.
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27.0 QUALITY ASSURANCE

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

28.0 PROGRESS REPORTING

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

29.0 DEVIATION

29.0	Deviation	Deviations from this Specification shall be stated in writing with the tender by reference to the Specification clause/GTP/Drawing and a description of the alternative offer. In absence of such a
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BSES	SP-HTSWG-01-R3
TECHNICAL SPECIFICATION FOR HT INDOOR SWITCHGEAR (33 & 11kV)	

		statement, it will be assumed that the bidder complies fully with this specification.
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30.0 ACCESSORIES & TOOLS

30.1	Type and Quantity	Bidder to indicate
30.2	Special tools & tackles required for erection, testing, commissioning and maintenance of the switchboard	The cost of these items shall be indicated separately in the bid as optional.
30.3	Suitable handling truck / trolley for lifting and moving the circuit breaker	To be supplied. (Two trolleys for each type/rating of breaker)

31.0 COMMISSIONING SUPPORT

Supervision of Erection and Commissioning inclusive of all testing equipments/instrument along with the Relays in Vendors Scope

32.0 TRAINING

a) Training on installation, commissioning, operation and maintenance of GIS shall be included in the proposal or quoted as optional items.

-at factory-

-at site after installation

33 Cancellation of Inspection Call:

Penalty equivalent to cost incurred in assigning the inspector shall be levied on vendor in following case:

- 1)Inspector reaches the factory and equipment is not ready for inspection
- 2)Inspection call cancelled by Vendor after making all arrangements (booking tickets&hotel) are done by buyer
- 3)Any deficiency found in equipment/material during inspection and re inspection is called for.

34 Monitoring of Material Dispatch Status

Once the material is dispatched after Final clearance, Transport Vehicle shall have GPS Tracking Device (Map My India Asset Tracking Device) and status of dispatch of material shall be sent to all the stake holders via SMS thru GPS Device. All this arrangement shall be in Bidders scope.

ANNEXURE – A - SCOPE OF SUPPLY

Scope of supply should include the following –

- 1.1 Design, manufacture, assembly, testing at manufacturer's works, properly packed for transport, supply and FOR delivery at site of following 11kV / 33kV Switchgears as per enclosed specification and single line diagram.

Sr. No.	Substation name	Name / Tag No of switchboard	Type of feeders	Qty
			Incomer	
			Bus coupler	
			Bus riser panel	
			Capacitor	
			Transformer	
			Outgoing	

- 1.2 Base channel frame of the switchgears with hardware.
- 1.3 Two trolleys for breaker of each size are to be included in offer per switchboard.
- 1.4 Programming software and communication cord for numerical relays.
- 1.5 Unit price of 33kV Incomer with Distance relay as primary protection and 33kV Incomer with Line differential relay as primary protection should be mentioned separately in the bid. Primary protection to be used in Incomer panel will be finalized based on site requirement.
- 1.6 Unit price of Bus PT should be indicated separately in the bid to enable addition/deletion based on site requirement.
- 1.7 Bidder should indicate price of one set of special tools and tackles (if any) required for maintenance of switchgear and its components.
- 1.8 Bidder should indicate price of each spare as per Annexure E.
- 1.9 All relevant drawings, data and instruction manuals

ANNEXURE – B – TRANSFORMER MONITORING CUM AVR RELAY

1	General features	
1.1	Technology and Functionality	Microprocessor based with provision for multifunction control and monitoring.
1.2	Mounting	Flush Mounting
1.3	Architecture	Hardware and software architecture shall be modular and disconnectable to adapt the control unit to the required level of complexity as per the application.
1.4	Programming and configuration	AVR shall utilize a user friendly setting and operating multi-lingual software in windows environment with menus and icons for fast access to the data required.
1.5	User Machine Interface	UMI with an alphanumeric key pad and graphical LCD display with backlight indicating measurement values and operating messages. Capability to access and change all settings and parameters.
1.6	PC Interface port	Front port (preferably serial) for configuration using PC. Cost of licensed software and communication cord, required for programming of offered protection relays using PC, shall be mentioned separately in the bid.
1.7	SCADA Interface port	RJ45 rear port for interfacing with SCADA on IEC 61850 protocol.If relays have any other rear port, hardware/software required to achieve the above said compatibility will be in supplier's scope.
1.8	Self diagnosis	Shall be able to detect internal failures. A watchdog relay with changeover contact shall provide information about the failure.
1.9	Auxiliary supply	220VDC or 48VDC
2	Inputs and Outputs	
2.1	CT Input	1/5A selectable through programming
2.2	PT Input	110VAC
2.3	Binary Inputs	Sixteen programmable binary inputs should be

		provided
2.4	Analog Inputs (4-20mA)	One input to be provided
2.5	PT-100 direct input	Two inputs to be provided
2.6	Direct Resistance Input	For tap position indication (18 steps)
2.7	Binary Outputs	Ten programmable binary outputs should be provided
3	Control	
3.1	Control Tasks	Ability to implement control functions through programmable logics
3.2	Voltage setting	Programmable Voltage set point
3.3	Voltage Regulation	Raise/Lower tap position to maintain the preset value of voltage.
3.4	Voltage Regulation modes	Automatic and Manual
3.5	Operation Modes	Local and Remote
3.6	Fan and Pump control	To be provided
3.7	Transformer Paralleling	Capability to parallel transformers whose AVR's are interconnected via a communication network.
4	SCADA Interfacing	
4.1	Configuration of DIs for routing alarm/trip signals to SCADA.	DI-1 – Buchholz trip DI-2 – OSR Trip DI-3 – PRV trip DI-4 – SPR trip DI-5 – OTI trip DI-6 – WTI trip DI-7 – Buchholz alarm DI-8 – Oil Level low alarm (MOG alarm) DI-9 – WTI alarm DI-10 – OTI alarm DI-11 – Tap changer trouble/stuck/out of step DI-12 – Tap changer motor supply fail DI-13 – Tap changer in local control All signals from DI-1 to DI-10 are to be wired up from transformer trouble auxiliary relays.
4.2	Configuration of DOs for	DO-1 – Tap raise

	executing commands from SCADA through interface port/CRP	DO-2 – Tap lower DO-3 – Fan group 1 control DO-4 – Fan group 2 control
4.3	Spare DIs and DOs	To be wired upto the terminal block.
5	Measurement, Event Recording and Monitoring	
5.1	Measured Quantities (optional)	Voltage, Current, Active Power, Reactive Power, Apparent Power, Power factor, frequency
5.2	Event Recording	Facility for recording parameters during various events such as tap change, change in binary input status etc.
5.3	Monitoring	Capability to monitor important transformer parameters such as Oil temperature, Winding Temperature etc and give indication/alarm when the value of a particular parameter exceeds the preset value.

ANNEXURE – C - TECHNICAL PARTICULARS (DATA BY PURCHASER)

1.0	SWITCHGEAR		
1.1	Type	Metal clad, air insulated with VCB type circuit breaker	
1.2	Service	Indoor	
1.3	Mounting	Free standing, floor mounted	
1.4	System Voltage	11 KV	33kV
1.5	Voltage variation	+/- 10%	
1.6	Frequency	50 Hz +/- 5%	
1.7	Phase	3	
1.8	Rated voltage	12 KV	36 kV
1.9	Rated current	As per SLDs given in Annexure-F	
1.10	Short time rating for 3 sec.	26.3kA	26.3kA
1.11	Internal arc classification and rating		
1.11.1	Classification	IAC – A - FLR	IAC – A - FLR
1.11.2	Rating	25kA for 0.1 sec without any deflectors/gas ducts	25kA for 1 second.
1.12	Insulation level (PF rms / Impulse peak)	28 kV / 75 kV	70 kV/ 170 kV
1.13	System ground	Effectively earthed	Effectively earthed
1.14	Enclosure degree of protection	IP – 4X for high voltage compartment and IP – 5X for metering and protection compartment	
1.15	Bus bar - Main	Rating as per SLDs given in annexure - F, Short time rating as per clause 1.10.	
1.15.1	Material	Tinned Electrolytic copper	
1.15.2	Bus bar sleeve	Sleeved with shrouds on joints. Tape on joints is not acceptable.	
1.15.3	Bus identification	Colour coded	
1.15.4	Temperature rise	40 deg. C for conventional joints. 55 deg. C for silver plated joints	

1.16	Auxiliary bus bar	Electrolytic grade tinned copper	
1.17	Auxiliary DC Supply	220 V DC / 48 V DC	
1.18	Auxiliary AC supply	240 V AC 50 Hz	
1.19	Hardware	Stainless steel.	
1.20	Earth bus	Aluminium	
1.21	Bus duct entry	From top (where ever applicable)	
1.22	Power cable entry	From bottom and rear	
1.23	Control cable entry	From bottom and front (i.e breaker compartment)	
2.0	CIRCUIT BREAKER		
2.1	Voltage class, insulation level, short time rating	As specified for switchgear	
2.2	Rated current	As per SLDs given in annexure - F. Use of two breakers in parallel to meet the required current rating shall not be acceptable.	
2.3	Duty cycle	O – 0.3 sec – CO - 3min - CO	
2.4	Short circuit rating		
2.4.1	A.C sym. breaking current	25kA	25kA
2.4.2	Short circuit making current	62.5kA	62.5kA
2.5	Operation time		
2.5.1	Break time	Not more than 4 cycles	
2.5.2	Make time	Not more than 5 cycles	
2.6	Range of Auxiliary Voltage		
2.6.1	Closing	85% - 110%	
2.6.2	Tripping	70% - 110%	
2.6.3	Spring Charging	85% - 110%	
2.7	No. of spare aux. Contacts of Breaker, for Owner's use.	Minimum 6 NO + 6 NC	
2.8	No. of spare contacts of Service and Test position limit switch	2 NO	

3.0	CURRENT TRANSFORMERS		
3.1	Voltage class, insulation level and short time rating	As specified for switchgear	
3.2	Type	Cast resin, window / bar primary type	
3.3	Class of insulation	Class E or better	
3.4	Ratio	As per SLDs given in annexure - F	
3.5	Number of secondaries	As per SLDs given in annexure - F	
3.6	Accuracy class		
3.6.1	Protection core	5P20	
3.6.2	Protection (Diff. / REF)	PS	
3.6.3	Metering	0.2s	
3.6.4	Core balance CT	PS	
3.7	Burden (VA)	Adequate for the protection & instruments offered	
3.8	Excitation current of PS Class CTs	30 mA at $V_k/4$	
3.9	Primary operating current sensitivity of CBCTs	5A	
4.0	VOLTAGE TRANSFORMERS		
4.1	Type	Cast resin, draw out type, single phase units	
4.2	Rated Voltage		
4.2.1	Primary	11000/sq.rt.3	33000/sq.rt.3
4.2.2	Secondary	110V/sq.rt.3	
4.3	No. of phases	3	
4.4	No. of secondary windings	2	
4.5	Method of connection	Star/Star	
4.6	Rated voltage factor	1.2 continuous, 1.9 for 30 seconds	
4.7	Class of insulation	Class E or better	
4.8	Accuracy class		
4.8.1	Protection	3P	
4.8.2	Metering	0.2	

4.9	Primary and secondary fuses	HRC current limiting type, Primary fuse replacement shall be possible with VT in withdrawn position	
5.0	HV FUSES		
5.1	Voltage class	12kV	36kV
5.2	Rupturing capacity	50kA	
5.3	Rated current	As per application	
6.0	SURGE ARRESTORS	For 11kV switchgear	For 33kV switchgear
6.1	Rated Voltage	9kV	30kV
6.2	Maximum continuous operating voltage (MCOV)	7.65kV	25kV
6.3	Discharge current	10kA	10kA
6.4	Discharge class	3	3

Note - The auxiliary DC voltage shall be checked on a case to case basis by Purchaser

ANNEXURE – D - GUARANTEED TECHNICAL PARTICULARS (DATA BY BIDDER)

Sr. No.	Description	Feeder Panel Type				
		Incomer	Bus Coupler	Outgoing/ Station Trafo	Capacitor	Transformer
1.0	SWITCHGEAR ASSEMBLY					
1.1	Make					
1.2	Type					
1.3	Reference Standard					
1.4	Voltage (Normal/Max.) kV					
1.6	Frequency (Hz)					
1.7	Short Circuit Rating					
1.7.1	Short time current and duration.					
1.8	Internal Arc Classification and rating (Refer Annexure –C)					
1.8.1	Classification					
1.8.2	Rating with gas ducts/deflectors					
1.8.3	Rating without gas ducts/deflectors					
1.9	Insulation Level					
1.9.1	Impulse Withstand (kV peak)					
1.9.2	1 minute 50 Hz. Voltage Withstand (kV rms)					
2.0	CONSTRUCTION					
2.1	Metal Clad Construction Yes/No					
2.2	Degree of protection :					
2.3	Minimum thickness of sheet metal used (mm)					
2.4	Draw out feature provide for					
2.4.1	Breaker with Service, Test & Isolated position -Yes/No					
2.4.1	Voltage Transformer :					

Sr. No.	Description	Feeder Panel Type				
		Incomer	Bus Coupler	Outgoing/ Station Trafo	Capacitor	Transformer
	Yes/ No					
2.4.3	Protective relays : Yes/ No					
2.5	Breaker Cubicle					
2.5.1	Cubicle door can be closed with breaker in Test and isolated position : Yes/ No					
2.5.1	Working zone units from floor level (mm)					
2.6	All meters, switches & relays flush mounted type: Yes/No					
2.7	Minimum clear space required					
2.7.1	Front for breaker withdrawal (mm)					
2.7.2	Rear (mm)					
2.8	Typical Vertical Section					
2.8.1	Overall Dimensions					
a.	Length (mm)					
b.	Breadth (mm)					
c.	Height (mm)					
2.8.2	Weight (kg)					
3.0	BUS BAR					
3.1	Make					
3.2	Material & Grade					
3.3	Reference Standard					
3.4	Cross Sectional area (mm ²)					
3.5	Bus connection (Joints)					
3.5.1	Silver Plated Yes/No					
3.5.2	Conventional made with anti oxide grease Yes/No					

Sr. No.	Description	Feeder Panel Type				
		Incomer	Bus Coupler	Outgoing/ Station Trafo	Capacitor	Transformer
3.6	Rated Continuous Current Amps					
3.7	Maximum temperature rise at rated continuous current °C					
3.8	Short time current and duration (KA and secs)					
3.9	D.C. Resistance at 85°C ($\Omega/m/\varnothing$)					
3.10	Minimum clearance of bus bar and connection					
3.10.1	Phase to phase (mm)					
3.10.2	Phase to earth (mm)					
3.11	Bus Bar provided with					
3.11.1	Insulation Sleeve					
3.11.2	Phase barriers					
3.11.3	Cast Resin shrouds for joints					
3.12	Bus bar support spacing (mm)					
3.13	Bus support insulators					
3.13.1	Make					
3.13.2	Type					
3.13.3	Reference Standard					
3.13.4	Voltage Class (kV)					
3.13.5	Min. creepage distance (mm)					
3.13.6	Cantilever strength Kg/mm ²					
3.13.7	Net Weight (kg)					
4.0	CIRCUIT BREAKER					
4.1	Make					
4.2	Type					
4.3	Reference Standard					
4.4	Rated Voltage					

Sr. No.	Description	Feeder Panel Type				
		Incomer	Bus Coupler	Outgoing/ Station Trafo	Capacitor	Transformer
4.5	Rated Frequency					
4.6	Rated Current					
4.6.1	Rated Current and its reference ambient temperature.					
4.6.2	Continuous current to limit the maximum temperature rise to 55 Deg C for silver plated connections and 40 Deg C for conventional connections.					
4.7	Rated operating Duty					
4.8	Symmetrical Breaking capacity at rated voltage & operating duty KA rms					
4.9	Rated making Current (KAp)					
4.10	Short time current and duration (KA and secs)					
4.11	Insulation Level					
4.11.1	Impulse voltage withstand on 1/50 full wave					
4.11.2	1 minute 50 Hz. Voltage withstand					
4.12	Maximum over voltage factor when switching off					
4.12.1	Un loaded transformer					
4.12.2	Loaded transformer					
4.12.3	Un loaded cables					
4.12.4	Capacitors					
4.12.5	Motors					
4.13	Opening time maximum No load					

Sr. No.	Description	Feeder Panel Type				
		Incomer	Bus Coupler	Outgoing/ Station Trafo	Capacitor	Transformer
	condition (ms)					
4.14	Number of permissible breaker operations under vacuum loss					
4.15	At 100% Breaking capacity					
4.15.1	Opening time-Max. (ms)					
4.15.2	Arcing time-Max (ms)					
4.15.3	Total break time (ms)					
a.	Make time (Max) (ms)					
b.	Total closing time (ms)					
4.17	Total length of contact travel (mm)					
4.18	No. of breaker operations permissible without requiring inspection, replacement of contacts and other main parts.					
4.18.1	At 100% rated current					
4.18.2	At 100% rated breaking current					
4.19	Type of contacts					
4.20	Material of contact					
4.21	Minimum clearance in air (mm) from live part					
4.21.1	Between phases					
4.21.2	Between live parts and ground					
4.22	Type of arc control device provided					
4.23	Operating mechanism-closing					
4.23.1	Type					
4.23.2	No. of breaker operations stored					
4.23.3	Trip free or fixed trip					
4.23.4	Anti pumping features provided					

Sr. No.	Description	Feeder Panel Type				
		Incomer	Bus Coupler	Outgoing/ Station Trafo	Capacitor	Transformer
4.24	Operating mechanism-tripping					
4.24.1	Type					
4.24.2	No. of breaker operations stored					
4.24.3	Trip free or fixed trip (V)					
4.24.4	Anti pumping features provided (%)					
4.25	Spring Charging motor					
4.25.1	Rating (kW)					
4.25.2	Make					
4.25.3	Voltage and permissible variation (%)					
4.26	Closing coil					
4.26.1	Voltage (V)					
4.26.2	Permissible voltage variation (%)					
4.26.3	Closing current at rated voltage (A)					
4.26.4	Power at rated voltage (W)					
4.27	Tripping Coil					
4.27.1	Voltage					
4.27.2	Permissible voltage variation (%)					
4.27.3	Tripping Current at rated Voltage (A)					
4.27.4	Power at rated voltage (W)					
4.28	Breaker/Accessories Accessories such as control switch indication lamps etc. furnished as specified: (Please attach separate sheet giving details of all accessories,					

Sr. No.	Description	Feeder Panel Type				
		Incomer	Bus Coupler	Outgoing/ Station Trafo	Capacitor	Transformer
	inter locks and safety shutters)					
4.28.1	Mechanical Safety Interlock					
4.28.2	Automatic Safety Interlock					
4.28.3	Operational Interlock					
4.28.4	Emergency manual trip					
4.28.5	Operation counter					
4.28.6	Change/discharge indicator					
4.28.7	Manual spring charging facility					
4.28.8	Auxiliary switch with 6NO+ 6 NC for Owner's use.					
4.28.9	Contacts wear indicator					
4.29	Auxiliary Switch					
4.29.1	Switch contacts type					
4.29.2	Contacts rating at					
a.	Make & Continuous (Amps)					
b.	Break (Inductive) (Amps)					
4.30	Net weight of the breaker (Kg)					
4.31	Impact load foundation design (to include dead load plus impact value on opening at maximum interrupting rating) (kG)					
4.32	On Vacuum loss (Amps)					
4.32.1	Possible load current breaking (Amps)					
4.32.2	Possible fault current breaking (Amps)					
4.33	Overall Dimensions					
4.33.1	Length (mm)					

Sr. No.	Description	Feeder Panel Type				
		Incomer	Bus Coupler	Outgoing/ Station Trafo	Capacitor	Transformer
4.33.2	Breadth (mm)					
4.33.3	Height (mm)					
4.34	Type test report on identical breaker furnished					
5.0	CONTROL & INDICATIONS					
5.1	Push Buttons Make					
5.1.1	Type & Catalog No.					
5.1.2	Contact rating at 110V / 220V D,C,					
5.1.3	Make & continuous (Amps)					
5.2	LED lamps: Make :					
5.2.1	Type & Catalog No.					
5.2.2	Watts/Voltage					
5.2.3	Lamps & Lens replaceable from front with glass cover					
5.3	Selector switch: Make					
5.3.1	Type & Catalog No.					
5.3.2	Contact rating.					
5.3.3	Make & continuous (Amps)					
5.3.4	Break (inductive) (Amps)					
6.0	CURRENT TRANSFORMER					
6.1	Make					
6.2	Type & voltage level					
6.3	Reference standard					
6.4	C.T. ratio as specified					

Sr. No.	Description	Feeder Panel Type				
		Incomer	Bus Coupler	Outgoing/ Station Trafo	Capacitor	Transformer
6.5	Short circuit withstand Short time current for 1 Sec. - kA rms Dynamic current - kA peak					
6.6	Class of insulation					
6.7	Temperature rise					
6.8	Basic insulation level					
6.9	For metering & protection					
6.9.1	CT Ratio					
6.9.2	Class of accuracy					
6.9.3	Rated burden VA					
6.9.4	Knee point voltage V					
6.9.5	Excitation current at $V_k/4$					
6.9.6	Rated saturating current Amp					
6.10	For differential protection					
6.10.1	CT Ratio					
6.10.2	Class of accuracy					
6.10.3	Rated burden VA					
6.10.4	Knee point voltage V					
6.10.5	Excitation current at $V_k/4$ Amps					
6.10.6	Rated saturating current Amp					
6.10.7	Secondary resistance (Ω)					
6.11	For restricted earth fault protection					
6.11.1	CT Ratio					
6.11.2	Class of accuracy					
6.11.3	Rated burden VA					

Sr. No.	Description	Feeder Panel Type				
		Incomer	Bus Coupler	Outgoing/ Station Trafo	Capacitor	Transformer
6.11.4	Knee point voltage V					
6.11.5	Excitation current at $V_k/4$					
6.11.6	Amps					
6.11.7	Rated saturating current Amp					
6.11.8	Secondary resistance (Ω)					
6.12	For stand by earth fault protection					
6.12.1	CT Ratio					
6.12.2	Class of accuracy					
6.12.3	Rated burden VA					
6.12.4	Knee point voltage V					
6.12.5	Excitation current at $V_k/4$ Amps					
6.12.6	Rated saturating current Amp					
6.12.7	Over current rating Continuous % over load (%)					
6.13	For sensitive earth fault protection (CBCT) CT Ratio					
6.13.1	Class of accuracy					
6.13.2	Rated burden VA					
6.13.3	Knee point voltage V					
6.13.4	Excitation current at $V_k/4$ Amps					
6.13.5	Rated saturating current Amp					
6.13.6	Over current rating Continuous % over load (%)					

Sr. No.	Description	Feeder Panel Type				
		Incomer	Bus Coupler	Outgoing/ Station Trafo	Capacitor	Transformer
7.0	POTENTIAL TRANSFORMER					
7.1	Make					
7.2	Type and voltage level					
7.3	Reference Standard					
7.4	Voltage Ratio					
7.5	Accuracy					
7.5.1	Winding-1					
7.5.2	Winding-2					
7.6	Rated Burden (VA)					
7.6.1	Winding-1					
7.6.2	Winding-2					
7.7	Over voltage factor					
7.7.1	Continuous					
7.7.2	30 seconds					
7.8	Class of Insulation					
7.9	Temperature rise over ambient (°C)					
7.10	Basic Impulse level (kV peak)					
7.11	Winding connection					
7.11.1	Primary					
7.11.2	Secondary					
7.12	Fuses					
7.12.1	Continuous rating HV/LV (Amp)					
7.12.2	Symmetrical fault rating HV/LV kA rms					

Sr. No.	Description	Feeder Panel Type				
		Incomer	Bus Coupler	Outgoing/ Station Trafo	Capacitor	Transformer
7.12.3	Make					
7.13	Maximum ratio error at					
7.13.1	90% to 100% of rated voltage and 25% to 100% of rated secondary burden at Unity Power factor.					
7.13.2	90% to 106% of rated voltage and 10% to 50% of rated secondary burden at 0.2 p.f.					
7.14	Maximum phase difference at					
7.14.1	90% to 100% of rated voltage and 25% to 100% of rated secondary burden at unity p.f.					
7.14.2	90% to 106 of rated voltage and 10% to 50% of rated secondary burden at 0.2 p.f.					
7.15	Weight (kg)					
8.0	RELAYS					
8.1	Manufacturer					
8.2	Model Type					
8.3	Draw out type with built in test facilities. Yes/No					
8.4	Built in test facility . Yes/No					
8.5	Type of mounting					
8.6	Reference standard					
8.7	All relays furnished as per drawing					

Sr. No.	Description	Feeder Panel Type				
		Incomer	Bus Coupler	Outgoing/ Station Trafo	Capacitor	Transformer
	and specification					
8.8	All relevant relay leaflets and catalogue furnished					
8.9	Communication port type					
8.10	Auxiliary supply					
8.11	Measurement and data acquisition feature.					
8.12	Control and supervision					
a	IEC protocol					
b	Open protocol feature					
c	Programming facility					
d	Separate output for individual element					
e	Event recording facility Number of events					
f	Required softwares offered					
8.13	C.T. secondary current					
8.14	Self diagnostic feature					
8.15	Modular design					
8.16	Relay details:-					
8.16.1	Overcurrent					
a	Make					
b	Type					
c	Characteristics available					
d	Range of settings a) Current b) Time					

Sr. No.	Description	Feeder Panel Type				
		Incomer	Bus Coupler	Outgoing/ Station Trafo	Capacitor	Transformer
e	Range of settings a) Current b) Time					
f	Rated burden					
8.16.2	Synchronizing check relay (if applicable) :					
a	Make					
b	Type					
c	Setting range					
8.16.3	Earth fault					
a	Make					
b	Type					
c	Characteristics available					
d	Range of settings a) Current b) Time					
e	Rated burden					
8.16.4	Over current (Directional) if applicable					
a	Make					
b	Type					
c	Characteristics available					
d	Range of settings a) Current b) Time					
e	Rated burden					
8.16.5	Earth fault (Directional) If applicable					
a	Make					

Sr. No.	Description	Feeder Panel Type				
		Incomer	Bus Coupler	Outgoing/ Station Trafo	Capacitor	Transformer
b	Type					
c	Characteristics available					
d	Range of settings a) Current b)Time					
e	Rated burden					
8.16.6	Neutral unbalance relay					
a	Make					
b	Type					
c	Characteristics available					
d	Range of settings Current Time					
e	Rated burden					
8.16.7	Under Voltage Relay					
a	Make					
b	Type					
c	Range of setting					
d	Rated burden					
8.16.8	Over Voltage Relay					
A	Make					
b	Type					
c	Range of setting					
d	Rated burden					
8.16.9	Busbar Differential Relay					
a	Make					
b	Type					
c	High impedance /Low impedance					

Sr. No.	Description	Feeder Panel Type				
		Incomer	Bus Coupler	Outgoing/ Station Trafo	Capacitor	Transformer
d	Facility for CT ratio adjustment possible through software. Yes/No					
e	CT supervision facility available. Yes/No					
8.16.10	Transformer Differential Relay					
a	Make					
b	Type					
c	High impedance /Low impedance					
d	Facility for CT ratio adjustment possible through software. Yes/No					
e	Facility of transformer vector group adjustment through software. Yes/No					
f	Setting range.					
g	Rated burden.					
8.16.11	Restricted earth fault relay					
a	Make					
b	Type					
c	Combined with differential relay. Yes/No					
d	Setting range					
e	Rated burden.					
8.16.12	Standby earth fault relay					
a	Make					
b	Type					
c	Characteristics					

Sr. No.	Description	Feeder Panel Type				
		Incomer	Bus Coupler	Outgoing/ Station Trafo	Capacitor	Transformer
d	Setting range					
e	Rated burden					
8.17	Terminal block for relay testing provided (Yes / No)					
9.0	METERS					
9.1	Ammeter					
a	Make					
b	Type					
c	Reference standard					
d	Size					
e	Accuracy class					
9.2	Voltmeter					
a	Make					
b	Type					
c	Reference standard					
d	Size					
e	Accuracy class					
10.0	SECONDARY WIRING					
10.1	Type and insulation					
10.2	Voltage grade					
10.3	Conductor material					
10.4	Conductor size (minimum) and insulation wiring					
10.4.1	Potential circuit					
10.4.2	Control & current circuit					
11.0	TERMINAL BLOCK					
11.1	Make					

Sr. No.	Description	Feeder Panel Type				
		Incomer	Bus Coupler	Outgoing/ Station Trafo	Capacitor	Transformer
11.2	Type					
11.3	Catalog No.					
11.4	20% Spare terminals furnished					
12.0	CABLE TERMINATIONS					
12.1	Clearance for power cable termination					
12.2	Removable gland plate					
12.2.1	Material for multi core cable					
12.2.2	Material for single core cable					
12.2.3	Thickness of the plate					
13.0	NAME PLATE					
13.1	Material					
13.2	Thickness					
13.3	Size for					
13.3.1	Breaker cubicle					
13.3.2	Instruments/devices					
14.0	Space Heater/Plug Socket					
14.1	Cubicle Heater					
14.1.1	Thermostat controlled					
14.1.2	Wattage					
14.1.3	Voltage					
14.1.4	Resistance (ohms)					
14.1.5	Thermostat range					
14.2	Plug Socket					
14.2.1	Type					
14.2.2	Rating					
14.3.	Cubicle heater & plug socket circuit provided with MCBs					

Sr. No.	Description	Feeder Panel Type				
		Incomer	Bus Coupler	Outgoing/ Station Trafo	Capacitor	Transformer
15.0	A.C/D.C Supply					
15.1	Isolating Switches for incoming supply					
15.1.1	A. C. Type & rating					
15.1.2	D.C. Type & rating					
15.2	Isolating Switch at each cubicle					
15.2.1	A. C. Supply-type & rating					
15.2.2	D.C. Supply-type & rating					
16.0	Tropical Protection					
16.1	Any special treatment for tropical protection					
17.0	Painting					
17.1	Finish of Switchgear					
17.1.1	Inside					
17.1.2	Outside					
18.0	No. of Accessories Furnished					
18.1	Breaker lifting & handling trolley					
18.2	Any other					
19.0	TESTS					
19.1	Reference Standard					
19.2	Routine tests to be performed on Switchgear					
19.3	Type Tests certificates submitted					
20.0	Drawing/Data					
20.1	General arrangement for Panel Board					
20.2	Foundation plan					

BSES	SP-HTSWG-01-R3
TECHNICAL SPECIFICATION FOR HT INDOOR SWITCHGEAR (33 & 11kV)	

Sr. No.	Description	Feeder Panel Type				
		Incomer	Bus Coupler	Outgoing/ Station Trafo	Capacitor	Transformer
20.3	Bill of material					
20.4	Cross Sectional drawing for every type of switchgear (Add sheets if necessary)					

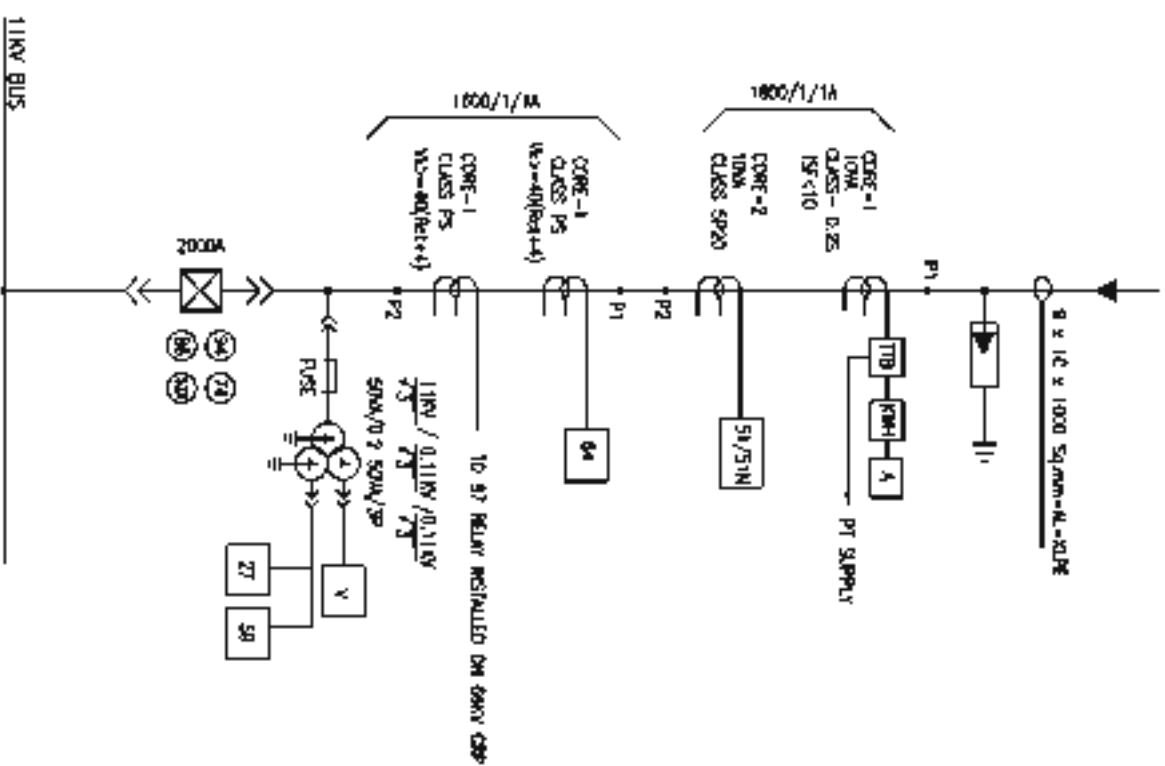
Place : Signature :
 Printed Name : Designation :
 Business Address : (Including Telex, Telephone & Telefax No.)
 Name & Address of the Principal Officer :

ANNEXURE – E – SPARES REQUIREMENT

S No.	Description	Qty
1	Line voltage transformer	3 (1 set)
2	Bus voltage transformer	3 (1 set)
3	Current transformer of each ratio	3 (1 set)
4	Trip Coil	4
5	Closing Coil	4
6	CB Spring charging motor	2
7	Auxiliary switch	2 sets (2 Nos. each type)
8	Bursting disc / pressure relief plate complete	2
9	Numerical relay of each type	1 nos. (each type)
10	Vaccum Interrupter Bottle	1 set (3 nos.) of each rating
11	Breaker contacts for busbar	1 set (3 nos.) of each rating

ANNEXURE-F1

LEGEND




SYMBOL	DESCRIPTION
	11kV SF ₆ /VACUUM C.T. BRK. DRAWOUT TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE ARRESTOR
	FUSE
	BREAKER AUX CONTACT MULTIPLIER
	TRIP CIRCUIT SUPERVISION RELAY
	AMV PUMPING RELAY
	HIGH SPEED TRIP RELAY
	VOLTMETER
	AMPMETER

NOTE:-

1. KWH METER NOT IN SUPPLIER'S SCOPE
2. REFER CLAUSE 16 OF SPECIFICATION FOR DETAILED FUNCTIONAL REQUIREMENTS OF PROTECTION RELAYS

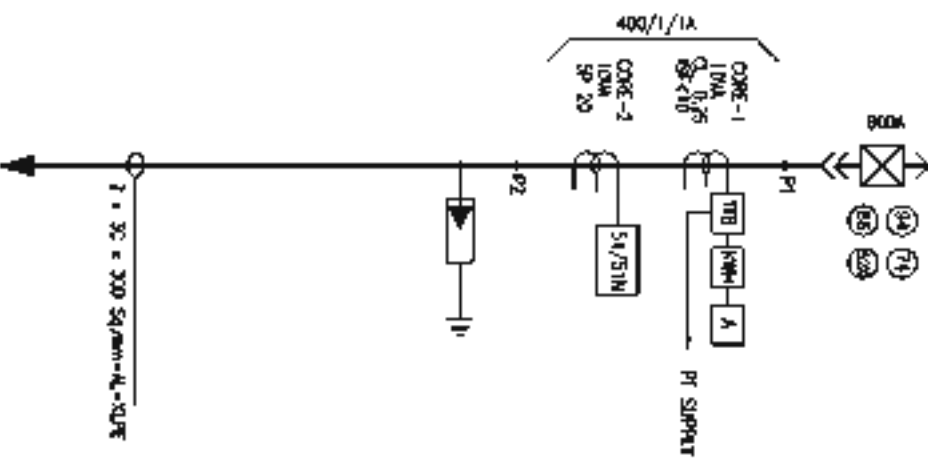
for 3 sets, 2000A at 50 degree Celsius

GRADE	FRESH	TITLE - STANDARD 320 PPG THIRY INCHES	
CHECKED	0.5		
APPRO.	0.5		
BUILT	11/1/11		
SCALE	MIS		
SPECIFICATION NO. PP-111111-01-11 320-320-1111-01			












ANNEXURE-F3

11KV BUS	26.3KA	for 3 sec, 200A of 50 degree celcius
----------	--------	--------------------------------------

for 3 sec, 2000A at 50 degree celcius



LEGEND

SYMBOL	DESCRIPTION
	11kV SF6/VACUUM CXT. BRK. DRAUGHT TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE ARRESTOR
	FUSE
	BREAKER AUX CONTACT MULTIPLIER
	TRIP CIRCUIT SUPERVISION RELAY
	ANTI PUMPING RELAY
	HIGH SPEED TRIP RELAY
	VOLTMETER
	AMMETER

NOTE:-

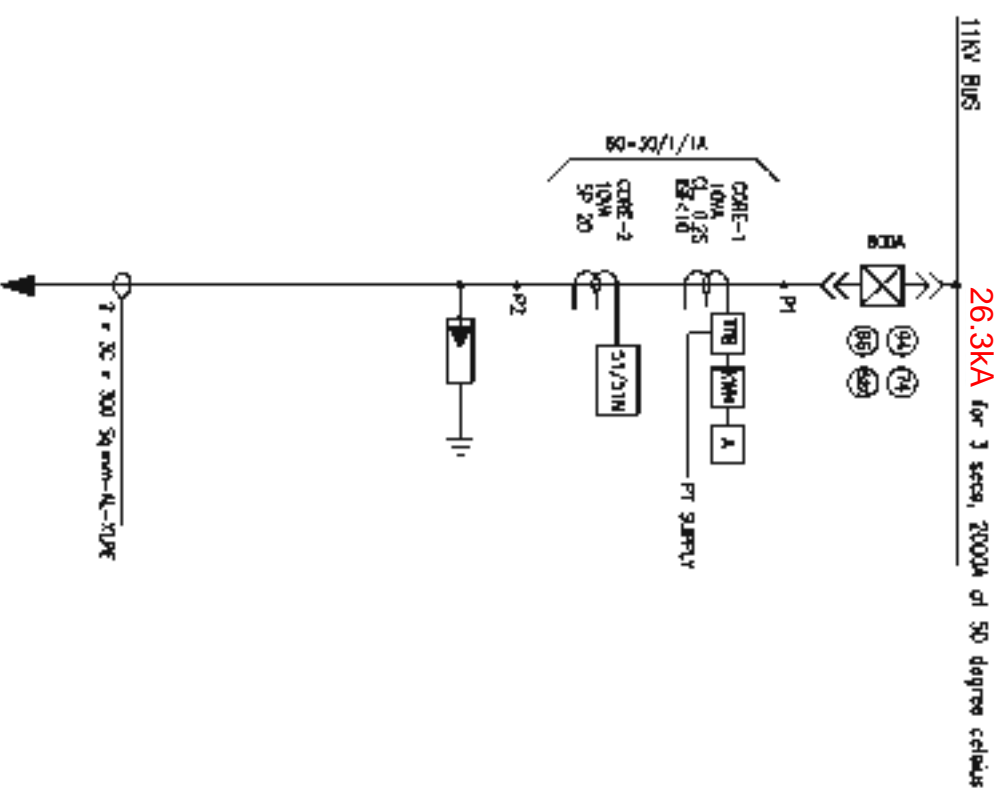
1. KMH METER NOT IN SUPPLIER'S SCOPE
2. REFER CLAUSE 16 OF SPECIFICATION FOR DETAILED FUNCTIONAL REQUIREMENTS OF PROTECTION RELAYS












DRIVER	BUSCH	RTA--
CALIBER	A-1	
APPR.	0.5	STANDARD S&W FROM 110V
TORR	1.68E-11	CARTRIDGE FEEDER
SCALE	WTG	

SPECIFICATION NO.: SP-HTSMC-01-R1
S&W=SPC-110V-03

ANNEXURE-F4

LEGEND



SYMBOL	DESCRIPTION
	11KV SF ₆ /VACUUM CXT. BRK. DRAWOUT TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE ARRESTOR
	FUSE
	BREAKER AUX CONTACT MULTIPLIER
	TRIP CIRCUIT SUPERVISION RELAY
	ANTI PUMPING RELAY
	HIGH SPEED TRIP RELAY
	VOLTMETER
	AMMETER

SYMBOL	DESCRIPTION
KMH	ENERGY METER
45	NEGATIVE PHASE SEQUENCE PROTECTION
25	SYNC CHECK
D1/31H	O/C & E/F RELAY
27	UNDER VOLTAGE RELAY
37	DIFFERENTIAL RELAY
21	DISTANCE RELAY
59	OVER VOLTAGE RELAY
6+	REF RELAY
57/57H	DIRECTIONAL O/C & E/F RELAY
7B	TEST TERMINAL BLOCK

NOTE:—

1. KWH METER NOT IN SUPPLIER'S SCOPE
2. REFER CLAUSE 16 OF SPECIFICATION FOR DETAILED FUNCTIONAL REQUIREMENTS OF PROTECTION RELAYS

TITLE =	
BRAND	BAUGHN
CO-ORD	0.5
APP	0.5
WRT	14412
TOTAL	MTS

STANDARD SLD FOR 110V
driftless Market demand reduction

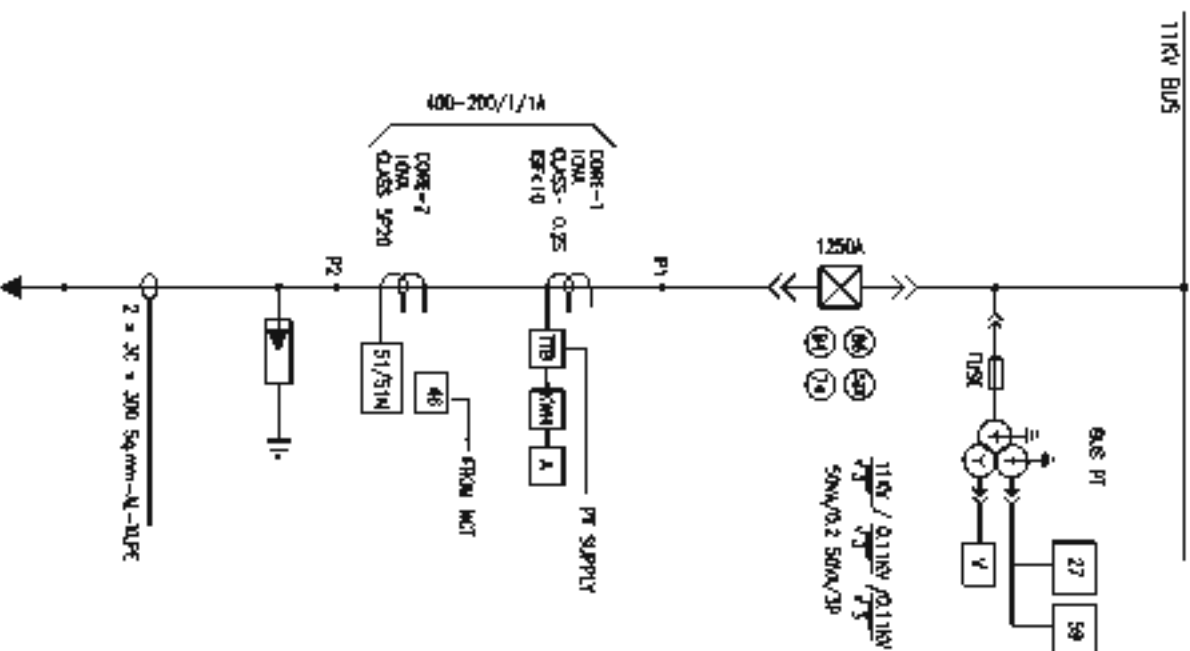
BSES

SPECIFICATION NO. 00-444444-01-11
SLD-SW-110V-04

ANNEXURE-F5

for 3 sec., 2000A at 50 degree celcius

LEGEND



SYMBOL	DESCRIPTION
	11KV 556/VACUUM C.T. AND DRAWOUT TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE ARRESTOR
	FUSE
	BREAKER AUX CONTACT MULTIPLIER
	TRIP CIRCUIT SUPERVISION RELAY
	ANTI PUMPING RELAY
	HIGH SPEED TRIP RELAY
	VOLTMETER
	AMMETER

SYMBOL	DESCRIPTION
KWH	ENERGY METER
46	NEGATIVE PHASE SEQUENCE PROTECTION
25	SYNC CHECK
51/31N	O/C & E/F RELAY
27	UNDER VOLTAGE RELAY
87	DIFFERENTIAL RELAY
21	DISTANCE RELAY
58	OVER VOLTAGE RELAY
64	REF RELAY
67/67N	DIRECTIONAL O/C & E/F RELAY
TTB	TEST TERMINAL BLOCK

NOTE:-

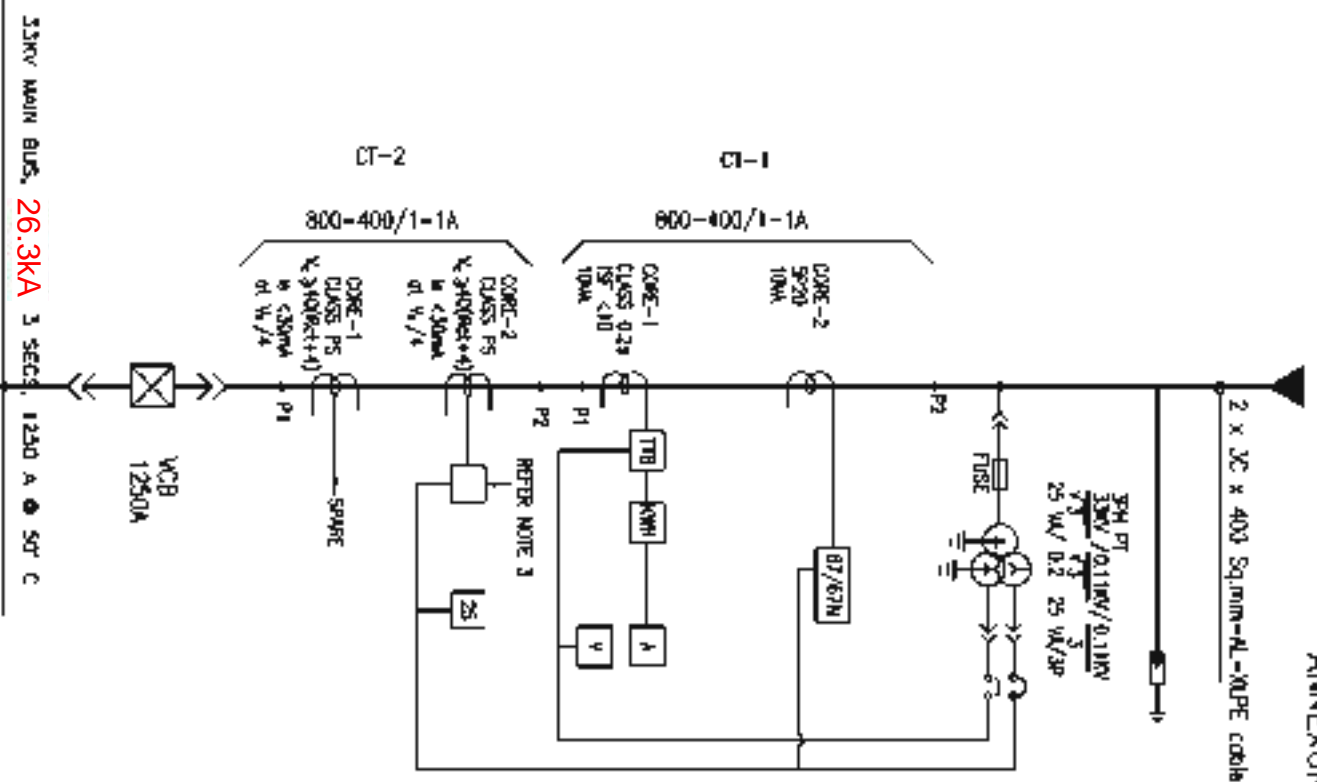
1. KWH METER NOT IN SUPPLIER'S SCOPE
2. REFER CLAUSE 16 OF SPECIFICATION FOR DETAILED FUNCTIONAL REQUIREMENTS OF PROTECTION RELAYS
3. ONE BPT TO BE CONSIDERED FOR EACH CAPACITOR PANEL

ITEM NO.	QUANTITY	UNIT	DESCRIPTION
000000	1.0	EA	STANDARD RLD FOR 11KV
000000	0.0	EA	CONNECTION PLENDER
000000	1.0	EA	11KV
000000	1.0	EA	11KV

540-3000-11KV-05

540-3000-11KV-05

ANNEXURE-F6

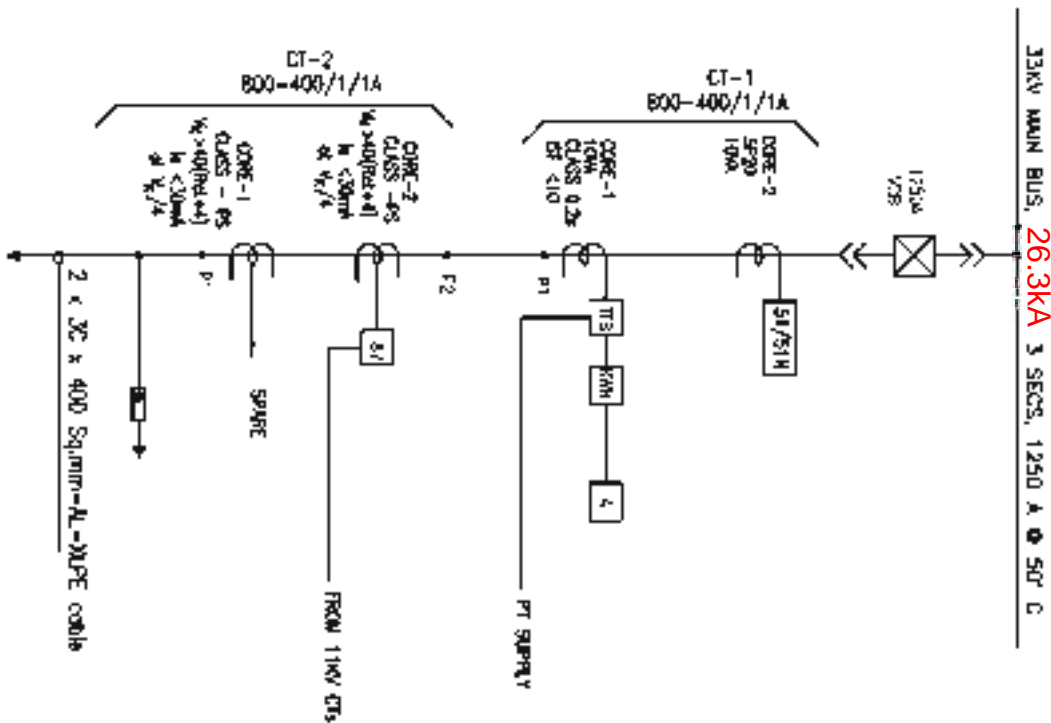


LEGEND

SYMBOL	DESCRIPTION
	12V RELAY/12V EXT. BATT. (optional 12V)
	COMMON TRANSISTOR
	POTENTIAL TRANSFORMER
	SWITCH RELAY/SPRM
	FUSE
	BREAKER WITH CONTACT MULTIPLY
	TEMP. CONTROL SUPERVISION RELAY
	40V PLATING RELAY
	12V 300V 12V RELAY
	VOLTAGING
	ADAPTER

NOTE:

1. KVAH METER NOT IN SUPPLIER'S SCOPE
2. REFER CLAUSE 16 OF SPECIFICATION FOR DETAILED FUNCTIONAL REQUIREMENTS OF PROTECTION RELAYS
3. LINE CIRCUMFERENTIAL OR DISTANCE RELAY. REFER CLAUSE 16.7.1 OF SPECIFICATION

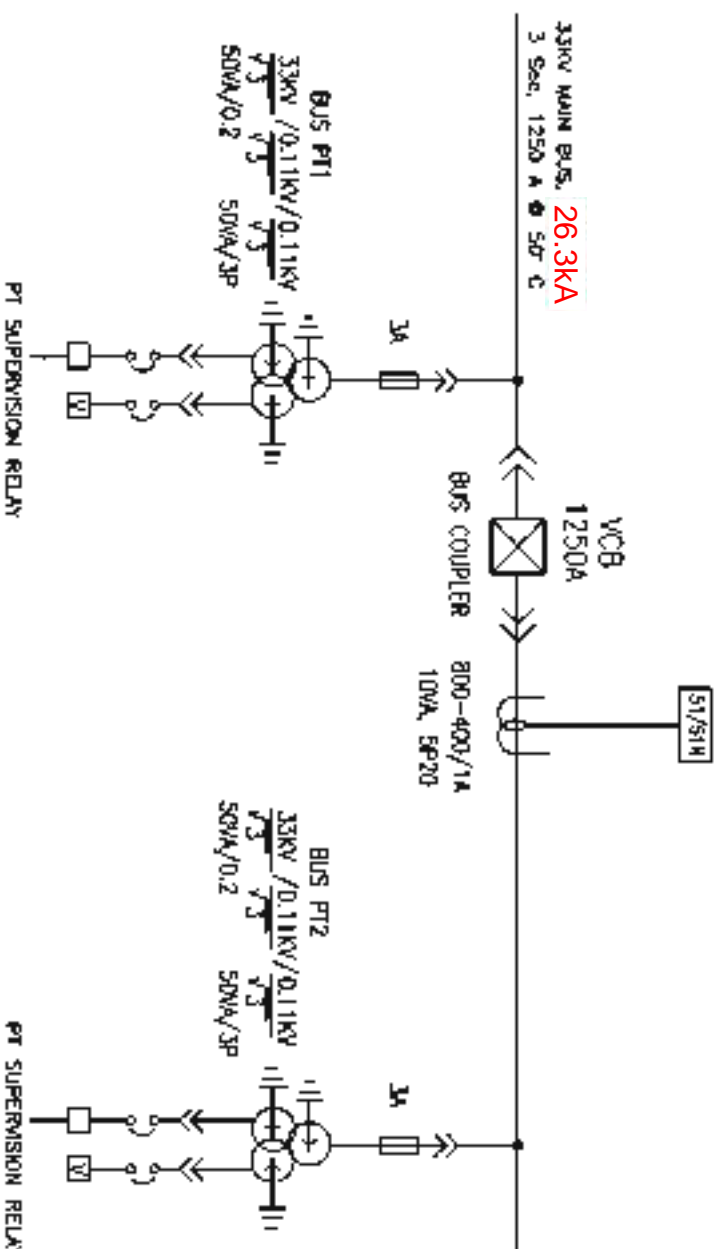


LEGEND

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	CT ratio/primary CT ratio, secondary CT ratio, secondary CT ratio		OVER CURRENT RELAY
	CURRENT TRANSFORMER		RECLOSE RELAY
	POTENTIAL TRANSFORMER		RECLOSE PROTECTION
	SURGE ARRESTER		SYNC CHECK
	RELAY		O/C & E/F RELAY
	RELAY WITH CONTACT		UNDER VOLTAGE RELAY
	RELAY WITH CONTACT AND INTERLOCKING		DIFFERENTIAL RELAY
	TRIP CIRCUIT SWITCHER RELAY		DISTANCE RELAY
	AIR PREHEATING RELAY		OVER VOLTAGE RELAY
	HIGH SPEED TRIP RELAY		POP RELAY
	VOLTMETER		DIRECTIONAL O/C & E/F RELAY
	AMMETER		TEST TERMINAL BLOCK

NOTE: 1. KWH METER NOT IN SUPPLIER'S SCOPE
2. REFER CLAUSE 16 OF SPECIFICATION
FOR DETAILED FUNCTIONAL REQUIREMENTS OF
PROTECTION RELAYS

ANNEXURE – F8



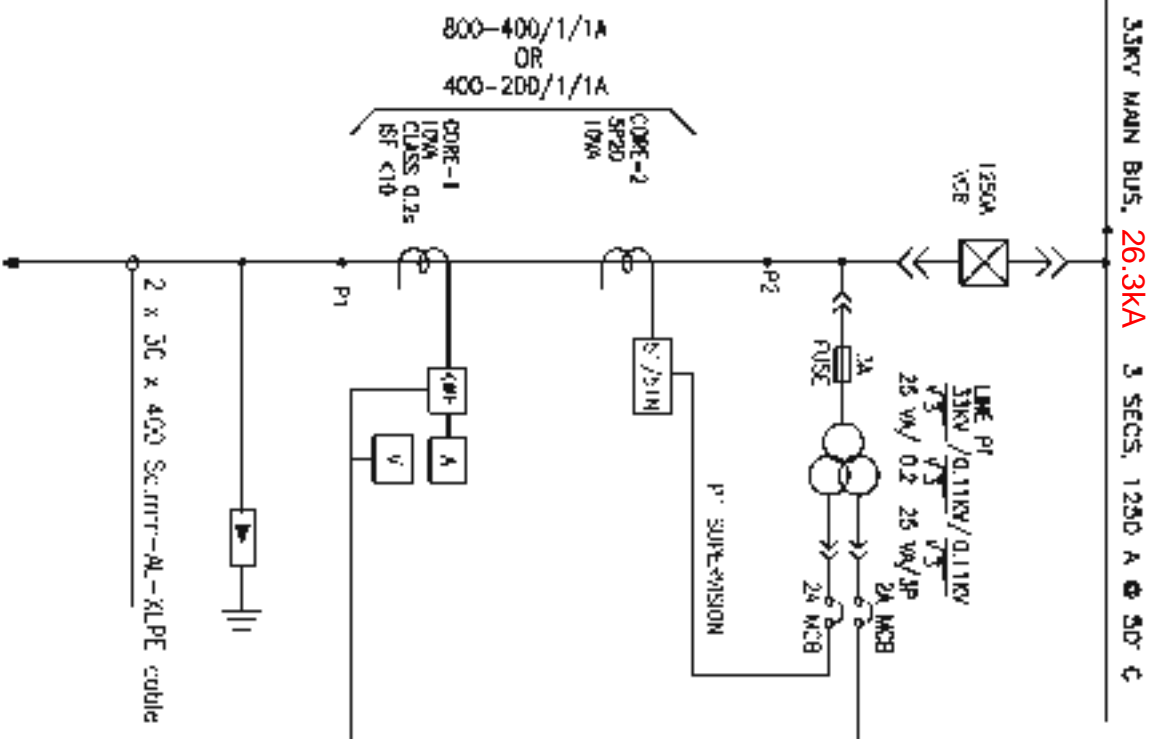
LEGEND

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	11kV BTR/1250A C.B. with breakout type		ENERGY METER
	CIRCUIT BREAKER		NEGATIVE PHASE SEQUENCE PROTECTION
	POTENTIAL TRANSFORMER		PHASE CHECKER
	SURGE ARRESTER		O/C & E/F RELAY
	FUSE		UNDER VOLTAGE RELAY
	800-400/1A CONTACT with 10VA, SP20		DIFFERENTIAL RELAY
	TRIP CIRCUIT SUPERVISION RELAY		DISTANCE RELAY
	ANTI PUMPING RELAY		OVER VOLTAGE RELAY
	HIGH SPEED TRIP RELAY		R/F RELAY
	VOLTMETER		DIRECTIONAL O/C & E/F RELAY
	AMMETER		R/F TERMINAL BLOCK

NOTE:-

1. REFER CLAUSE 15 OF SPECIFICATION FOR DETAILED FUNCTIONAL REQUIREMENTS OF PROTECTION RELAYS

DRG/WN	RAJESH	TITLE	
CHECKED	CALTRAY		
APPRO	D.SHAHNA		
DATE	14/09/2012	33kV BUS COUPLER CUM BUS PT	
SCALE	NTS		



LEGEND


Symbol	Description
	12V 30A ANCHOR CRT. FUEL DELIVERY TRIC
	CLAMPED TRANSDUCER
	POTENTIAL TRANSFORMER
	START INJECTION
	FUSE
	ENGINE MAX. DIFFERENTIAL SW. 12V 30A
	TRIP CIRCUIT SWITCH-ON RELAY
	ANTI PLUNGER RELAY
	WATER SPEED TRIP RELAY
	VALVE TRIP
	ANCHOR

NOTE 1. KWH METER NOT IN SUPPLIER'S SCOPE

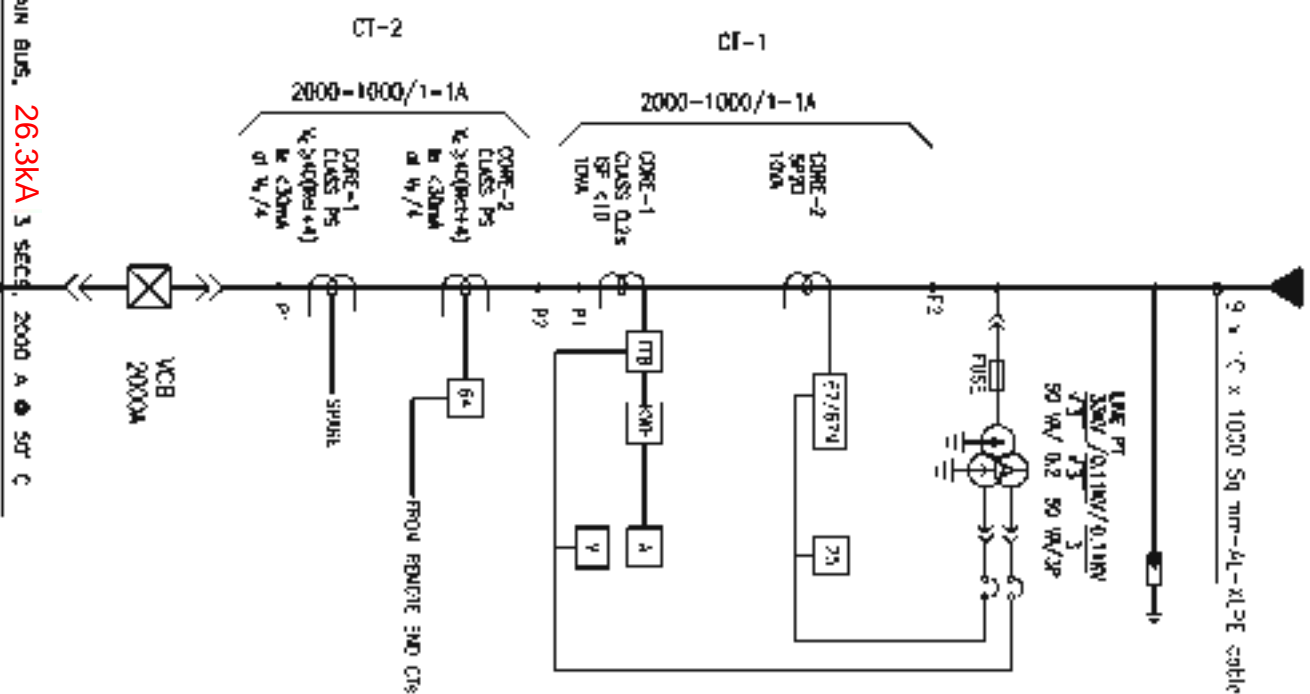
2. REFER CLAUSE 15 OF SPECIFICATION

FOR DETAILED FUNCTIONAL REQUIREMENTS OF PROTECTION RELAYS

3. TBA NOT REQUIRED IN THIS PANEL

DRAWING	POURUSH	
CHECKED	U. SILLARAY	
APPRO.	D. SILLARAYA	
DATE	14-09-2012	
SCALE	MTS	
TITLE		APPROPRIATION NO. SP.HTN.WG. (D-R) INSTALLATION AT REC COUNCILMEMBERS PREMISES
TYPICAL SLID FOR 23 KV OUTGOING FEEDER FOR INSTALLATION AT REC		
COUNCILMEMBERS PREMISES		SLD-57KV-0.53KV-044

ANNEXURE-F10

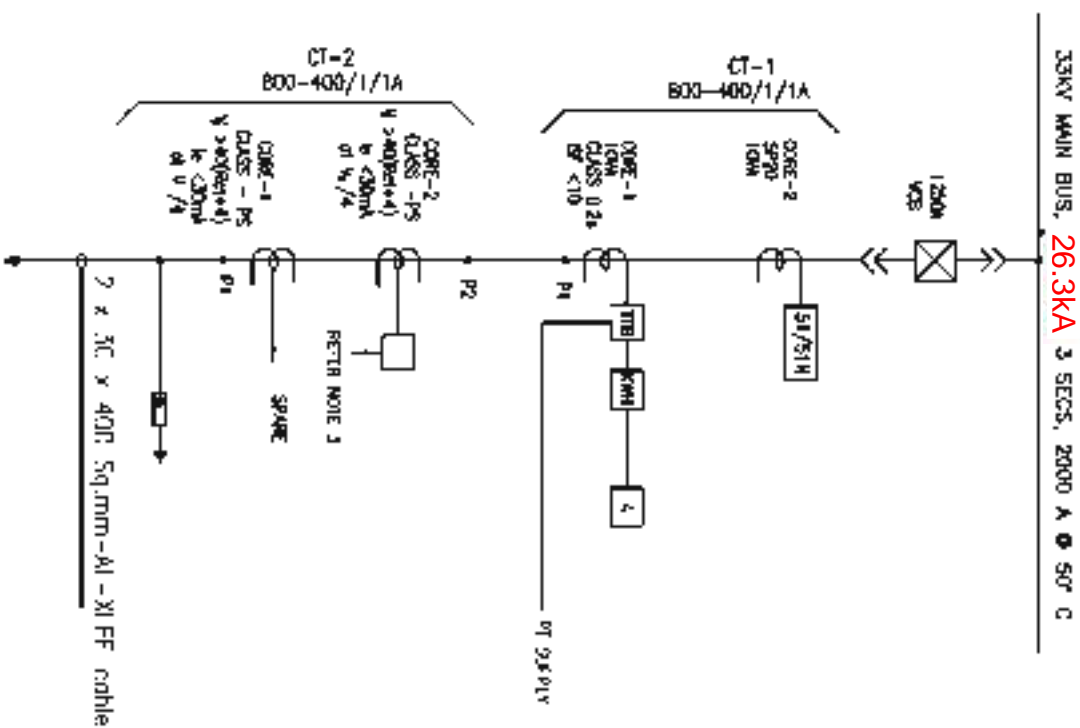


LEGEND

Symbol	Description
	12V 27V/30VDC CRT. PRO. CHARACTER TYPE
	CUMULAT. TRANSFORMER
	POSITIVE TRANSFORMER
	SENSE AMPLIFIER
	PURE
	FREQUENCY WAVE CONTACT MULTIPLE
	TYP. CIRCUIT SUPERVISION RELAY
	ANTI PLASMA RELAY
	HIGH SPEED TYP. RELAY
	VOLTMETER
	ANALOG

NOTE: 1. KW/H METER NOT IN SUPPLIER'S SCOPE
2. REEER CLAUSE 16 OF SPECIFICATION
FOR DETAILED FUNCTIONAL REQUIREMENTS OF
PROTECTION RELAYS

ANNEXURE-F11



LEGEND

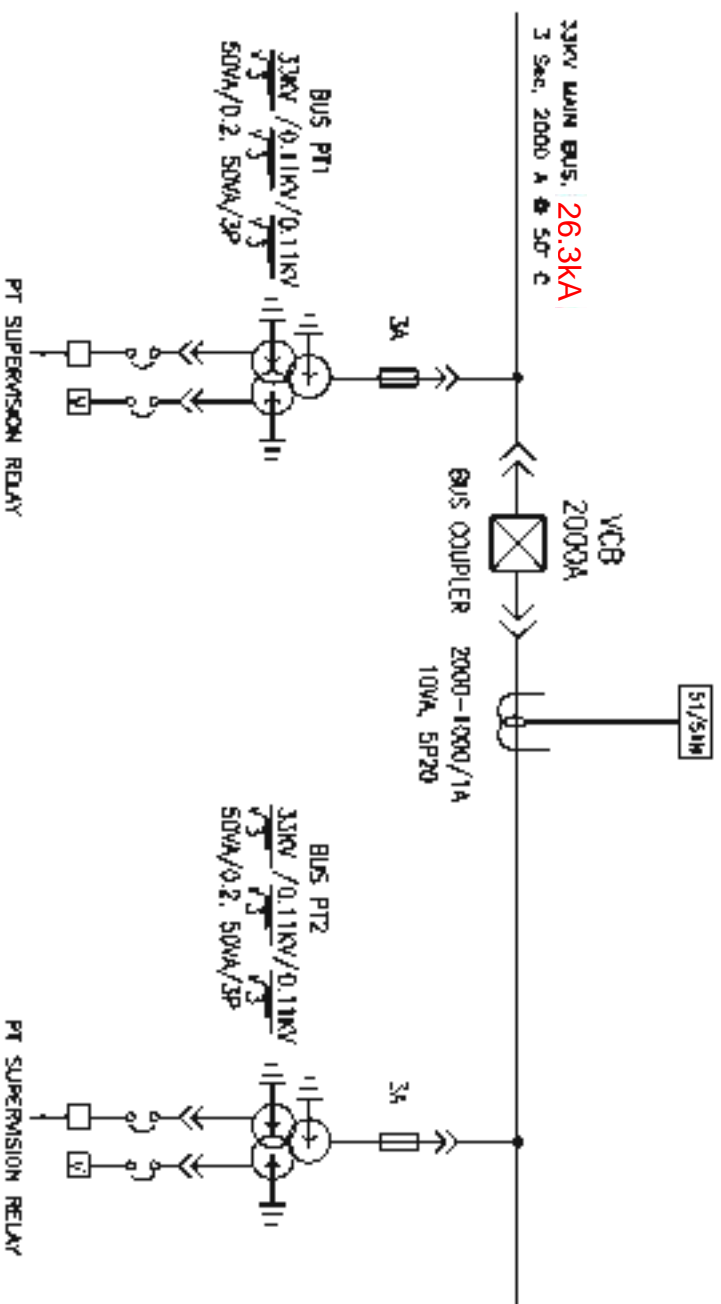
SYMBOL	DESCRIPTION
	14V SW/CONTROL EXT. AND SIGNALIT TYPE
	DIAGNOSTIC TRANSDUCER
	POTENTIAL TRANSFORMER
	SHOCK DETECTION
	FUSE
	DETERMINES ALAR CONTACT MULTIFUNCTION
	THE CIRCUIT'S SUPERVISION RELAY
	DATA TRANSMIT RELAY
	HIGH SPEED TIME RELAY
	VOL METER
	ALARM

NOTE: 1. WITH METER NOT IN SUPPLIER'S SCOPE

2. REFER CLAUSE 16 OF SPECIFICATION FOR DETAILED FUNCTIONAL REQUIREMENTS OF PROTECTION RELAYS

3. LINE DIFFERENTIAL OR DISTANCE RELAY. REFER CLAUSE 10.12.1 OF SPECIFICATION

ANNEXURE-F12



LECHENID

SYMBOL	DESCRIPTION
	TIME DELAY/ON-Delay, OFF-Delay, TIME TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE PROTECTION
	RSC
	BREAKER A/C CONTACT
	BREAKER D/C CONTACT
	TIME DELAY/ON-Delay, OFF-Delay, TIME TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE PROTECTION
	RSC
	BREAKER A/C CONTACT
	BREAKER D/C CONTACT
	TIME DELAY/ON-Delay, OFF-Delay, TIME TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE PROTECTION
	RSC
	BREAKER A/C CONTACT
	BREAKER D/C CONTACT
	TIME DELAY/ON-Delay, OFF-Delay, TIME TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE PROTECTION
	RSC
	BREAKER A/C CONTACT
	BREAKER D/C CONTACT
	TIME DELAY/ON-Delay, OFF-Delay, TIME TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE PROTECTION
	RSC
	BREAKER A/C CONTACT
	BREAKER D/C CONTACT
	TIME DELAY/ON-Delay, OFF-Delay, TIME TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE PROTECTION
	RSC
	BREAKER A/C CONTACT
	BREAKER D/C CONTACT
	TIME DELAY/ON-Delay, OFF-Delay, TIME TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE PROTECTION
	RSC
	BREAKER A/C CONTACT
	BREAKER D/C CONTACT
	TIME DELAY/ON-Delay, OFF-Delay, TIME TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE PROTECTION
	RSC
	BREAKER A/C CONTACT
	BREAKER D/C CONTACT
	TIME DELAY/ON-Delay, OFF-Delay, TIME TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE PROTECTION
	RSC
	BREAKER A/C CONTACT
	BREAKER D/C CONTACT
	TIME DELAY/ON-Delay, OFF-Delay, TIME TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE PROTECTION
	RSC
	BREAKER A/C CONTACT
	BREAKER D/C CONTACT
	TIME DELAY/ON-Delay, OFF-Delay, TIME TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE PROTECTION
	RSC
	BREAKER A/C CONTACT
	BREAKER D/C CONTACT
	TIME DELAY/ON-Delay, OFF-Delay, TIME TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE PROTECTION
	RSC
	BREAKER A/C CONTACT
	BREAKER D/C CONTACT
	TIME DELAY/ON-Delay, OFF-Delay, TIME TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE PROTECTION
	RSC
	BREAKER A/C CONTACT
	BREAKER D/C CONTACT
	TIME DELAY/ON-Delay, OFF-Delay, TIME TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE PROTECTION
	RSC
	BREAKER A/C CONTACT
	BREAKER D/C CONTACT
	TIME DELAY/ON-Delay, OFF-Delay, TIME TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE PROTECTION
	RSC
	BREAKER A/C CONTACT
	BREAKER D/C CONTACT
	TIME DELAY/ON-Delay, OFF-Delay, TIME TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE PROTECTION
	RSC
	BREAKER A/C CONTACT
	BREAKER D/C CONTACT
	TIME DELAY/ON-Delay, OFF-Delay, TIME TYPE
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	SURGE PROTECTION
	RSC
	BREAKER A/C CONTACT
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	POTENTIAL TRANSFORMER
	SURGE PROTECTION
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	BREAKER D/C CONTACT
	TIME DELAY/ON-Delay, OFF-Delay, TIME TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE PROTECTION
	RSC
	BREAKER A/C CONTACT
	BREAKER D/C CONTACT
	TIME DELAY/ON-Delay, OFF-Delay, TIME TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE PROTECTION
	RSC
	BREAKER A/C CONTACT
	BREAKER D/C CONTACT
	TIME DELAY/ON-Delay, OFF-Delay, TIME TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE PROTECTION
	RSC
	BREAKER A/C CONTACT
	BREAKER D/C CONTACT
	TIME DELAY/ON-Delay, OFF-Delay, TIME TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE PROTECTION
	RSC
	BREAKER A/C CONTACT
	BREAKER D/C CONTACT
	TIME DELAY/ON-Delay, OFF-Delay, TIME TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE PROTECTION
	RSC
	BREAKER A/C CONTACT
	BREAKER D/C CONTACT
	TIME DELAY/ON-Delay, OFF-Delay, TIME TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE PROTECTION
	RSC
	BREAKER A/C CONTACT
	BREAKER D/C CONTACT
	TIME DELAY/ON-Delay, OFF-Delay, TIME TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE PROTECTION
	RSC
	BREAKER A/C CONTACT
	BREAKER D/C CONTACT
	TIME DELAY/ON-Delay, OFF-Delay, TIME TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE PROTECTION
	RSC
	BREAKER A/C CONTACT
	BREAKER D/C CONTACT
	TIME DELAY/ON-Delay, OFF-Delay, TIME TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE PROTECTION
	RSC
	BREAKER A/C CONTACT
	BREAKER D/C CONTACT
	TIME DELAY/ON-Delay, OFF-Delay, TIME TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE PROTECTION
	RSC
	BREAKER A/C CONTACT
	BREAKER D/C CONTACT
	TIME DELAY/ON-Delay, OFF-Delay, TIME TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE PROTECTION
	RSC
	BREAKER A/C CONTACT
	BREAKER D/C CONTACT
	TIME DELAY/ON-Delay, OFF-Delay, TIME TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE PROTECTION
	RSC
	BREAKER A/C CONTACT
	BREAKER D/C CONTACT
	TIME DELAY/ON-Delay, OFF-Delay, TIME TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE PROTECTION
	RSC
	BREAKER A/C CONTACT
	BREAKER D/C CONTACT
	TIME DELAY/ON-Delay, OFF-Delay, TIME TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE PROTECTION
	RSC
	BREAKER A/C CONTACT
	BREAKER D/C CONTACT
	TIME DELAY/ON-Delay, OFF-Delay, TIME TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE PROTECTION
	RSC
	BREAKER A/C CONTACT
	BREAKER D/C CONTACT
	TIME DELAY/ON-Delay, OFF-Delay, TIME TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE PROTECTION
	RSC
	BREAKER A/C CONTACT
	BREAKER D/C CONTACT
	TIME DELAY/ON-Delay, OFF-Delay, TIME TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE PROTECTION
	RSC
	BREAKER A/C CONTACT
	BREAKER D/C CONTACT
	TIME DELAY/ON-Delay, OFF-Delay, TIME TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE PROTECTION
	RSC
	BREAKER A/C CONTACT
	BREAKER D/C CONTACT
	TIME DELAY/ON-Delay, OFF-Delay, TIME TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE PROTECTION
	RSC
	BREAKER A/C CONTACT
	BREAKER D/C CONTACT
	TIME DELAY/ON-Delay, OFF-Delay, TIME TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE PROTECTION
	RSC
	BREAKER A/C CONTACT
	BREAKER D/C CONTACT
	TIME DELAY/ON-Delay, OFF-Delay, TIME TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE PROTECTION
	RSC
	BREAKER A/C CONTACT
	BREAKER D/C CONTACT
	TIME DELAY/ON-Delay, OFF-Delay, TIME TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE PROTECTION
	RSC
	BREAKER A/C CONTACT
	BREAKER D/C CONTACT
	TIME DELAY/ON-Delay, OFF-Delay, TIME TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE PROTECTION

NOTE:-

1. REFER CLAUSE 15 OF SPECIFICATION
FOR DETAILED FUNCTIONAL REQUIREMENTS OF
PROTECTION RELAYS

DATA QTN	RAJESH	TITLE
CHECKED	GATEWAY	TYPICAL SILD FOR
APPRO	D.SHAHANA	PLUS COXOPLER CUM BUS PT
DATE	14-04-2012	PANJAL SUR 33KV SWITCH
SCALE	MTS	BOARD OF 667KV AUTO
		TRANSFORMER
		BSES
		SPECIFICATION NO. SP-4175WGL-01-R1
		SILD-33KV-33KV-07

ANNEXURE-G----11kV Signals

Signals - 11KV Out Going Feeders	Digital Input/AI soft through N.Relay/BCU	Digital Out Put soft through N.Relay/BCU	Digital Input Hard Wire to RTU	Additional signals Hard wire to RTU for backup	Signal Type	N.Relay Protocol
Breaker ON/OFF	√			√	DPI	IEC-61850
Trip Ckt Healthy	√				SPI	
Spring Charge	√				SPI	
Breaker in service/Test	√				DPI	
Auto Trip(86) Operated	√			√	SPI	
Panel DC Fail			√		SPI	
L/R Switch in Local/Remote	√			√	DPI	
Relay Int Fault.			√		SPI	
Over Current Operated	√				SPI	
Earth Fault Operated	√				SPI	
BKR CLS/OPN COMMAND		√		√	DCO	
AutoTrip(86) relay reset from Remote		√			SCO	
3Phase R,Y,B - Current & Voltage,Active Power,Reactive Power,Power Factor,Max.Demand,Neu.Current	√				AI/MV	
Fault Current Levels/Disturbance Record/ If Any Fault Graphs for Remote diagnosis purpose*	√				AI	

Signals - 11KV Incomers	Digital Input/AI soft through N.Relay/BCU	Digital Out Put soft through N.Relay/BCU	Digital Input/Output Hard Wire to RTU	Additional signals Hard wire to RTU for backup	Signal Type	N.Relay Protocol
Breaker ON/OFF	√			√	DPI	IEC-61850
Trip Ckt Healthy	√				SPI	
Spring Charge	√				SPI	
Breaker in service/Test	√				DPI	
Auto Trip(86) Operated	√			√	SPI	
VT fuse Blown - Metering.	√				SPI	
VT fuse Blown - Protection	√				SPI	
Panel DC Fail			√		SPI	
L/R Switch in Local/Remote	√			√	DPI	
Relay Int Fault.			√		SPI	
Over Current Operated	√				SPI	
Earth Fault Operated	√				SPI	
Under Voltage Prot.Operated	√				SPI	
Over Voltage Prot.Operated	√				SPI	
REF Operated	√				SPI	
BKR CLS/OPN COMMAND	√	√		√	DCO	
AutoTrip(86) relay reset from Remote		√			SCO	
3Phase R,Y,B - Current & Voltage,Active Power,Reactive Power,Power Factor,Max.Demand,Neu.Current	√				AI/MV	
Fault Current Levels/Disturbance Record/ If Any Fault Graphs for Remote diagnosis purpose*	√				AI	

Signals - 11KV Bus Coupler	Digital Input/AI soft through N.Relay/BCU	Digital Out Put soft through N.Relay/BCU	Digital Input/Output Hard Wire to RTU	Additional signals Hard wire to RTU for backup	Signal Type	N.Relay Protocol
Breaker ON/OFF	√			√	DPI	IEC-61850
Trip Ckt Healthy	√				SPI	
Spring Charge	√				SPI	
Breaker in service/Test	√				DPI	
Auto Trip(86) Operated	√			√	SPI	
Panel DC Fail			√		SPI	
L/R Switch in Local/Remote	√			√	DPI	
Relay Int Fault.			√		SPI	
PT MCB - Met&protection operated	√					
Over Current Operated	√				SPI	
Earth Fault Operated	√				SPI	
BKR CLS/OPN		√		√	DCO	
Fault Current Levels/Disturbance Record/ If Any Fault Graphs for Remote diagnosis purpose*	√				AI	

Signals - 11KV Capacitors	Digital Input/AI soft through N.Relay/BCU	Digital Out Put soft through N.Relay/BCU	Digital Input/Output Hard Wire to RTU	Additional signals Hard wire to RTU for backup	Signal Type	N.Relay Protocol
Breaker ON/OFF	√			√	DPI	IEC-61850
Bank ISO ON/OFF	√				DPI	
Trip Ckt Healthy	√				SPI	
Spring Charge	√				SPI	
Breaker in service/Test	√				DPI	
Auto Trip(86) Operated	√			√	SPI	
Bus PT fuse Blown - Metering.	√				SPI	
Bus PT fuse Blown - Protection	√				SPI	
Panel DC Fail			√		SPI	
L/R Switch in Local/Remote	√			√	DPI	
Over Current Operated	√				SPI	
Earth Fault Operated	√				SPI	
Under Voltage Prot.Operated	√				SPI	
Over Voltage Prot.Operated	√				SPI	
Neg.Phase.sequence Operated	√				SPI	
Timer Relay operated/Normal	√				DPI	
Relay Int Fault.			√		SPI	
BKR CLS/OPN		√		√	DCO	
BANK ISO CLS/OPN		√			DCO	
A.Trip reset from remote		√			SCO	
3Phase R,Y,B - Current&Voltage,Reactive Power,Neu.Current	√				AI/MV	
Fault Current Levels/Disturbance Record/ If Any Fault Graphs for Remote diagnosis purpose*	√				AI	

Note: Analog signals (Fault Current levels/Disturbance records/If any Fault graphs for remote diagnosis, etc,) from Numerical relays marked with “*” needs to be confirmed by vendor before finalize the tender documents.

Signals - 33 & 66KV Incomers/Out Going	Digital Input/AI soft through N.Relay/BCU	Digital Out Put soft through N.Relay/BCU	Digital Input/Output Hard Wire to RTU	Additional signals Hard wire to RTU for backup	Signal Type	Protocol
Breaker ON/OFF	√			√	DPI	IEC-61850
Front Bus (89A) ISO ON/OFF (In-Case of O/D)	√			√	DPI	
Rear Bus (89B) ISO ON/OFF (In-Case of O/D)	√			√	DPI	
LINE ISO (89L) ON/OFF (In-Case of O/D)	√			√	DPI	
Earth Switch (89LE) -1&2 On/OFF (In-Case of O/D)	√				DPI	
Breaker in service/Test (In-case of I/D BKR)	√				DPI	
Trip Ckt Healthy	√				SPI	
Spring Charge	√				SPI	
Auto Trip(86) Operated	√			√	SPI	
SF6 Pressure Low/Lock Out	√				SPI	
VT fuse Fail	√				SPI	
Panel DC Fail			√		SPI	
L/R Switch in Local/Remote	√			√	DPI	
LBB Operated	√				SPI	
Relay Int Fault.			√		SPI	
Over Current Operated	√				SPI	
Earth Fault Operated	√				SPI	
DIFF.Prot Operated	√				SPI	
DIST.Ptot Operated	√				SPI	
BKR CLS/OPN COMMAND		√		√	DCO	
Front Bus (89A) ISO OPN/CLS COMMAND (In-Case of O/D)		√			DCO	
Rear Bus (89B) ISO OPN/CLS COMMAND (In-Case of O/D)		√			DCO	
LINE ISO (89L) OPN/CLS COMMAND (In-Case of O/D)		√			DCO	
AutoTrip(86) relay reset from Remote		√			SCO	
3Phase R,Y,B -Current&Voltage,Active&Reactive Power,PowerFactor,Max.Demand,Neu.Current	√				AI/MV	
Fault Current Levels/Disturbance Record/ If Any Fault Graphs for Remote diagnosis purpose*	√				AI	

Signals - 33 & 66KV Transformer	Digital Input/AI soft through N.Relay/BCU	Digital Out Put soft through N.Relay/BCU	Digital Input/Output Hard Wire to RTU	Additional signals Hard wire to RTU for backup	Signal Type	Protocol
Breaker ON/OFF	√			√	DPI	IEC-61850
Front Bus (89A) ISO ON/OFF (In-Case of O/D)	√			√	DPI	
Rear Bus (89B) ISO ON/OFF (In-Case of O/D)	√			√	DPI	
Trf ISO (89T) ON/OFF (In-Case of O/D)	√			√	DPI	
Earth Switch (89LE) -1&2 On/OFF (In-Case of O/D)	√				DPI	
Breaker in service/Test (In-case of I/D BKR)	√				DPI	
Trip Ckt Healthy	√				SPI	
Spring Charge	√				SPI	
Auto Trip(86) Operated	√			√	SPI	
Differential Operated	√				SPI	
LBB Operated	√				SPI	
REF/SEF Prot Operated	√				SPI	
SF6 Pressure Low/Lock Out	√				SPI	
Panel DC Fail			√		SPI	
L/R Switch in Local/Remote	√			√	DPI	
Relay Int Fault.			√		SPI	
Over Current Operated	√				SPI	
Earth Fault Operated	√				SPI	
BKR CLS/OPN COMMAND		√		√	DCO	
Front Bus (89A) ISO OPN/CLS COMMAND (In-Case of O/D)		√			DCO	
Rear Bus (89B) ISO OPN/CLS COMMAND (In-Case of O/D)		√			DCO	
Trf ISO (89LT) OPN/CLS COMMAND (In-Case of O/D)		√			DCO	
AutoTrip(86) relay reset from Remote		√			SCO	
3Phase R,Y,B -Current&Voltage,Active&Reactive Power,PowerFactor,Max.Demand,Neu.Current	√				AI/MV	

Fault Current Levels/Disturbance Record/ If Any Fault Graphs for Remote diagnosis purpose*	√				AI
Transformer - RTCC/A-Eberle Signals					
A-Eberle Unit Faulty/DC Fail			√		SPI
Oil Temp Alarm	√				SPI
Oil Temp trip	√				SPI
Winding Temp Alarm	√				SPI
Winding Temp Trip	√				SPI
Buchlotz Alarm	√				SPI
Buchlotz Trip	√				SPI
PRD TRIP	√				SPI
OLTC OSR	√				SPI
MOG/LOW Oil level Alarm	√				SPI
SPR Trip	√				SPI
OSR Main Tank	√				SPI
L/R Switch in Local/Remote	√				DPI
Auto/Manual Mode	√				DPI
Fan Fail	√				SPI
Tap Changer Fail	√				SPI
OLTC Out of Step/Stuck Up/Motor trip	√				SPI
Tap Rise/Tap Low Command	√				DCO/RCC
Oil Temp	√				AI
Winding Temp	√				AI
Tap Position	√				AI

Signals - 33 & 66KV BusCoupler	Digital Input/AI soft through N.Relay/BCU	Digital Out Put soft through N.Relay/BCU	Digital Input/Output Hard Wire to RTU	Additional signals Hard wire to RTU for backup	Signal Type	Protocol
Breaker ON/OFF	√			√	DPI	IEC-61850
Front Bus (89A) ISO ON/OFF (In-Case of O/D)	√			√	DPI	
Rear Bus (89B) ISO ON/OFF (In-Case of O/D)	√			√	DPI	
Earth Switch (89AE-1&2) - On/OFF (In-Case of O/D)	√				DPI	
Earth Switch(89BE-3&4) - On/OFF (In-Case of O/D)	√				DPI	
Breaker in service/Test (In-case of I/D BKR)	√				DPI	
Trip Ckt Healthy	√				SPI	
Spring Charge	√				SPI	
Auto Trip(86) Operated	√			√	SPI	
SF6 Pressure Low/Lock Out	√				SPI	
VT fuse-1 Blown	√				SPI	
VT fuse-2 Blown	√				SPI	
Panel DC Fail			√		SPI	
L/R Switch in Local/Remote	√			√	DPI	
LBB Operated	√				SPI	
Relay Int Fault.			√		SPI	
Over Current Operated	√				SPI	
Earth Fault Operated	√				SPI	
BKR CLS/OPN COMMAND		√		√	DCO	
Front Bus (89A) ISO OPN/CLS COMMAND (In-Case of O/D)		√			DCO	
Rear Bus (89B) ISO OPN/CLS COMMAND (In-Case of O/D)		√			DCO	
AutoTrip(86) relay reset from Remote		√			SCO	
3Phase R,Y,B - Current ,BUS PT-01 & BUS PT02 3Phase votages.	√				AI/MV	
Fault Current Levels/Disturbance Record/ If Any Fault Graphs for Remote diagnosis purpose*	√				AI	
Signals - 33 & 66KV CAP Bank	Digital Input/AI soft through N.Relay/BCU	Digital Out Put soft through N.Relay/BCU	Digital Input/Output Hard Wire to RTU	Additional signals Hard wire to RTU for backup	Signal Type	Protocol
Breaker ON/OFF	√			√	DPI	
Front Bus (89A) ISO ON/OFF (In-Case of O/D)	√			√	DPI	
Rear Bus (89B) ISO ON/OFF (In-Case of O/D)	√			√	DPI	
CAP Bank ISO ON/OFF (In-Case of O/D)	√			√	DPI	
Earth Switch On/OFF (In-Case of O/D)	√				DPI	
Trip Ckt Healthy	√				SPI	
Spring Charge	√				SPI	
Auto Trip(86) Operated	√			√	SPI	

SF6 Pressure Low/Lock Out	√				SPI
VT fuse Blown	√				SPI
Cap Discharge Time	√				SPI
Netural Displacement	√				SPI
Panel DC Fail			√		SPI
L/R Switch in Local/Remote	√			√	DPI
LBB Operated	√				SPI
Relay Int Fault.			√		SPI
Over Current Operated	√				SPI
Earth Fault Operated	√				SPI
Under Voltage Prot.Operated	√				SPI
Over Voltage Prot.Operated	√				SPI
BKR CLS/OPN COMMAND		√		√	DCO
Front Bus (89A) ISO OPN/CLS COMMAND (In-Case of O/D)		√			DCO
Rear Bus (89B) ISO OPN/CLS COMMAND (In-Case of O/D)		√			DCO
CAP Bank ISO OPN/CLS COMMAND (In-case of O/D)		√			DCO
3Phase R,Y,B - Current&Voltage,Reactive	√				AI/MV
Fault Current Levels/Disturbance Record/ If Any Fault Graphs for Remote diagnosis purpose*	√				AI

IEC-61850

Signals - BUS PT-1&2	Digital Input/AI soft through N.Relay/BCU	Digital Out Put soft through N.Relay/BCU	Digital Input/Output Hard Wire to RTU		Signal Type
BUS A (89A) ON/OFF			√		DPI
BUS B (89B) ON/OFF			√		DPI
Earth Switch (89LE) - 1 On/OFF			√		DPI
Earth Switch (89LE) - 2 On/OFF			√		DPI
BUS-A ISO OPN/CLS COMMAND			√		DCO
BUS-B ISO OPN/CLS COMMAND			√		DCO

Note: Analog signals (Fault Current levels/Disturbance records/If any Fault graphs for remote diagnosis, etc,) from Numerical relays marked with “*” needs to be confirmed by vendor before finalize the tender documents.

ANNEXURE-G----Battery charger LT and fire fighting Signals

List of Abbreviations
AI - Analog Input/Analog Values
MV - Measured Value
MFM - Multi Function Meter
DCO - Double Command Output
DPI - Double Point Indication
SCO - Single Command Output
SPI - Single Point Indication

MFM - Signals	Data Type	Protocol
R-Phase Current	MV/MFI	Modbus
Y-Phase Current	MV/MFI	
B-Phase Current	MV/MFI	
Neutral Current	MV/MFI	
R-Y Phase Voltage	MV/MFI	
Y-B Phase Voltage	MV/MFI	
B-R Phase Voltage	MV/MFI	
Active Power	MV/MFI	
Reactive Power	MV/MFI	
Power Factor	MV/MFI	
Maximum Demand	MV/MFI	
THD	MV/MFI	

Signals - Fire Fighting	Digital Input Hard Wire to RTU	Signal Type
System ON	√	SPI
FIRE Fighting in Progress	√	SPI
FIRE Alarm/Common Alarm Operated	√	SPI
Cylinder Pr.Low	√	SPI
DC Fail	√	SPI
System Out Of Service	√	SPI
TCIV Closed	√	SPI
FIRE System Tripping	√	SPI

Signals - LT Board	Digital Input Hard Wire to RTU	MFM data through	Signal Type
LT AC Fail	√		SPI
R,Y,B Phase Current		√	AI

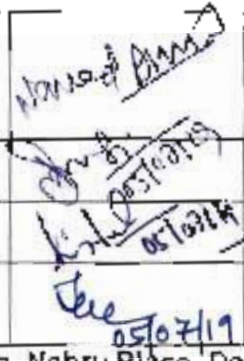
Signals - Battery Charger	Digital Input/AI soft through RTU	Digital Input Hard Wire	Signal Type	Protocol
Battery CHG Mains AC Fail	√		SPI	Modbus
DC Mains Fail	√		SPI	
DC System Under Voltage	√		SPI	
Battery on Boost/Float	√		SPI	
DC System Earth Fault/Insulation Fail	√		SPI	
Charger Current		√	AI	
Charger Voltage		√	AI	
Battery Current		√	AI	
Battery Voltage		√	AI	
Load Current		√	AI	
Load Voltage		√	AI	

BSES

TECHNICAL SPECIFICATION FOR 11 KV INDOOR METERING CUBICAL

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

BSES RAJDHANI POWER LTD

Prepared by	Naved Ahmed Pronab Bairagi		Rev : 0
Reviewed by	Amit Tomar		Date : 05.07.2019
Approved by	K. Sheshadri		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	AC

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 DRPL 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 2599-1986	Bushings for alternating voltages above 1000 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 control gear
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 DRPL. In case the Bidders 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 DRPL 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
- DRPL Requirement

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

The Metering Cubicle 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-L.

5.0 Construction

5.1 11 kV Indoor metering cubicle shall house Three (03) nos 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 door 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 door 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 Nos 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 Cubicle

5.5 Cable termination compartments (for incoming and outgoing) should have bottom cable entry provision along with gland plate (30mm thick) suitable for 11kV, 30X150 sqmm to 30X400sqmm 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 at least two sealing arrangements. Clearance of cable box gland plate from ground shall be sufficient (300mm 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 Joshi make 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 beRAL 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 C.T's/P.T'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 11kV, 50Hz (highest 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. CT's 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	50 / 5 A		
4	100 / 5 A		
5	150 / 5 A		
6	300 / 5 A		
7	400 / 5 A		40 x 6 sqmm

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 $11kV/\sqrt{3}$ / $110/\sqrt{3}$ 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	N/A
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 non parts shall be hot tin galvanized and all points shall be alright. 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 G 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 parts 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 BRPI.

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. Meter compartment
- b. Incoming cable compartment
- c. Outgoing cable compartment

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 Cubicle

- a. BHPL 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 connect and 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 name plate, 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 2090& 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 (21KV/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> <ol style="list-style-type: none"> Individual serial no Purchaser's name PO no along with date and SAP code Equipment Tag no if any Destination Manufacturer name/Supplier name Address of manufacturer/Supplier/Its agent Country of Origin Month of year of manufacturer Gross and Net weight in kilogram All necessary cringing and slacking instruction All necessary storage instructions 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 instructions 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 bid 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>
------	---

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

Technical Specification for 11 kV Indoor Metering Cubical

Make List of Accessories

Sl.No.	Descriptions	Make
4	Boot	Firplex
		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