BSES RAJDHANI POWER LIMITED

# NOTICE INVITING TENDER (NIT)

# SUPPLY, LAYING, TESTING, COMMISSIONING & HANDING OVER OF 33kV 3Cx400 SQMM/66kV 3Cx300 SQMM XLPE CABLES WITH REQUIRED ACCESSORIES FOR PROVIDING 33kV/66kV POWER SOURCES FROM 220kV SUBSTATIONS AT NARAINA, DEV NAGAR & NAJAFGARH TO GRID SUBSTATIONS AT MAYAPURI, METAL FORGING, DLF MALL, PASCHIM VIHAR & G-1 DWARKA ON SINGLE POINT RESPONSIBILITY BASIS.

## NIT NO: CMC/BR/26-27/FK/PR/KG/1355

## Due Date for Submission: 12/05/2026 150Hrs


**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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BSES RAJDHANI POWER LIMITED

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# VOLUME – I: INFORMATION TO BIDDER (ITB)

BSES

# SECTION – I: REQUEST FOR QUOTATION

## 1.00 EVENT INFORMATION

1.01 BSES Rajdhani Power Ltd (hereinafter referred to as **"BRPL"**) invites sealed tenders in 2 envelopes for following scope of work:

### Table 1: Scheme Details

| PACKAGE-B1 | | | | | |
|---|---|---|---|---|---|
| **S. No.** | **Description** | **Scheme No** | **Scheme Name** | **Estimated Cost (₹ Crore)** | **EMD Amount (₹ Lakh)** |
| 1 | Supply, Laying, Testing & Commissioning of 66KV 3CX300 SQMM Cables with required accessories on single point responsibility basis | Scheme No- 1 | 220kV Najafgarh to G-1 Dwarka grid | 16.6 | 16.6 |
| **Total Amount - Package B1 (₹)** | | | | **16.6** | **16.6** |

| PACKAGE-B2 | | | | | |
|---|---|---|---|---|---|
| **S. No.** | **Description** | **Scheme No** | **Scheme Name** | **Estimated Cost (₹ Crore)** | **EMD Amount (₹ Lakh)** |
| 1 | Supply, Laying, Testing & Commissioning Of 33 KV 3CX400 SQMM Cables With Required Accessories on single point responsibility basis | Scheme no 2 | Naraina to Mayapuri & A-43 Mayapuri to Metal Forging | 10 | 10 |
| 2 | | Scheme no 3 | 220/33KV DTL Dev Nagar substation to DLF mall & A-4 Paschim Vihar | 19.7 | 19.7 |
| **Total Amount - Package B2 (₹)** | | | | **29.7** | **29.7** |
| **Consolidated Total Amount -Package B1 + B2 (₹)** | | | | **46.3** | **46.3** |

**The bidder may quote either Package B1 or Package B2, or both Packages. The bidder shall submit EMD based on the Packages quoted, considering the EMD Value provided in Table 1. The bidder must meet the Qualification Criteria detailed in clause 2.0 below, in accordance with the quoted packages.**

1.02 The tender document can be downloaded from our website www.bsesdelhi.com **by navigating to → BSES RAJDHANI POWER LTD → Tender → Open Tenders** to view and participate in the tender.

1.03 **Tender Fee**: The bidder must compulsorily submit the non-refundable tender fee of ₹ 1,180/- either as a demand draft or via online transfer through IMPS, NEFT, or RTGS to cover the cost of bid documents. Bids submitted without the Tender fee will be rejected.

1.04 **Earnest Money Deposit (EMD)** as specified in Table 1, must be valid for 180 days from the bid submission due date. It should be submitted in the form of BG, FD, or online transfer of the

required amount through IMPS, NEFT, or RTGS. Bids submitted without the EMD will be rejected.

1.05 **Time Schedule**

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

| S. No. | Events | Due date & Time |
|---|---|---|
| 1 | Date of availability of tender documents from BRPL Website | 30.04.2026, 15:00 Hours |
| 2 | Date & Time of Pre-Bid Meeting | 05.05.2026, 14:00 Hours |
| 3 | Last Date of receipt of pre-bid queries, if any (Queries to be submitted via e-mail) | 06.05.2026 up to 18:00 Hours |
| 4 | Last Date of replies to all the pre-bid queries as received | 08.05.2026 up to 17:00 Hours |
| 5 | Last date and time of receipt of Complete Bids (Tender Fees, EMD, Part A & Part B) | 12.05.2026, 15:00 Hours |
| 6 | Date & Time of Opening of PART A – EMD and Technical Bid | 12.05.2026, 15:45 Hours |

**Note:** In the event of the last date specified for submission of bids and the date of opening of bids is declared as a closed holiday for the BSES office, the last date of submission of bids and date of opening of bids will be the following working day at the appointed times.

1.06 The Bid shall be submitted in two (02) parts as detailed below:

- **Part A - Techno Commercial Bid**
- **Part B - Financial (Price) Bid**

Bids will be received up to 12-05-2026 1500 HRS at the address given below. Part A of the Bid shall be opened on 12-05-2026 1545 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.

**Head of Department**
**Contracts & Materials Deptt.**
**BSES Rajdhani Power Ltd**
**Nehru Place**
**New Delhi 110019**

It shall be the sole responsibility of the bidder to ensure that the bid documents reach the above office on or before the last date and time specified.

All envelopes shall be duly super scribed "SUPPLY, LAYING, TESTING, COMMISSIONING & HANDING OVER OF 33kV 3Cx400 SQMM/66kV 3Cx300 SQMM XLPE CABLES WITH REQUIRED ACCESSORIES FOR PROVIDING 33kV/66kV POWER SOURCES FROM 220kV SUBSTATIONS AT NARAINA, DEV NAGAR & NAJAFGARH TO GRID SUBSTATIONS AT MAYAPURI, METAL FORGING, DLF MALL, PASCHIM VIHAR & G-1 DWARKA ON SINGLE POINT RESPONSIBILITY BASIS" **against NIT NO: CMC/BR/26-27/FK/PR/KG/1355**

1.07 BSES Rajdhani Power Ltd reserves the right to accept or reject any or all tenders without assigning any reason thereof in the event of the following:

a) Tender is received after the due date and time.

b) Tender fee of requisite value is not submitted.
c) **Earnest Money Deposit (EMD)** as per Table no.1 is not deposited in shape of FD/Bank Guarantee drawn in favor of BSES Rajdhani Power Ltd, payable at Delhi.
d) Financial Bid, as per the prescribed Price Schedule, is not submitted.
e) The bid is incomplete in any respect.
f) The required documents in support of the Qualification Requirements mentioned in Section 1, Clause 2.0 of this Tender Document are not furnished.
g) Complete documents and details as per the Bid Index for Part-A (Technical Bid) at Appendix I – Annexure 1.01 & Appendix II – Annexure 2.05 are not enclosed.
h) Filled in Schedule of Deviations as per Annexure is not submitted.

**QUALIFICATION CRITERIA**

**For Package-B, Bidder shall quote for Package- B1 (66 KV Cable Infeed works) or Package B2 (33KV Cable Infeed works) or both packages.**

For the above scope of work prospective bidder must qualify the criteria as mentioned below to participate in the bidding process

**Qualification Criteria QR -01**

**Technical Criteria:**

| Sl No. | Clause | Criteria | Documents to be submitted by Bidder |
|---|---|---|---|
| 1 | OEM / EPC | The bidder shall be a legally constituted entity operating in India, being any one of the following:<br>a) A proprietorship firm registered and operating in India<br>b) A partnership firm registered under the Indian Partnership Act, 1932<br>c) A company incorporated under the Companies Act, 2013 (or erstwhile Companies Act, 1956)<br>d) A Limited Liability Partnership (LLP) registered under the Limited Liability Partnership Act, 2008<br>e) Any other entity duly registered under applicable Indian laws<br>The bidder must fulfill one of the following categories: | |
| | | a. The bidder should have its own manufacturing facility in India for the last three (03) years for 33KV or higher voltage grade Power Cables through Dry Cure CCV or VCV line.<br>Cable OEM can enter into Consortium /JV with the contractors who can jointly fulfil the Qualification Criteria. | Cable manufacturing and factory incorporation certificate |
| | | b. Bidder should be an EPC company engaged in turnkey execution of 33KV or higher voltage grade cable laying work from the last three (03) years. EPC Bidder shall supply all the Cables required for the Cable In-feed works from the manufacturer meeting the Qualification Criteria mentioned in QR-02 | i. Company Incorporation certificate<br>ii. Undertaking<br>iii. Documents of Cable OEM as per QR-02 |
| 2 | Experience | Bidder along with consortium, should have experience in turnkey projects including design, supply, laying, testing & commissioning of offered or higher voltage grade Power Cables in any utilities/ SEB's/ PSU's/ reputed company wherein the end-user shall be utilities/ SEB's/ PSU's/ Government Organizations having minimum cumulative 25 KM cable quantity in last Seven (07) years from the date of bid opening. | i. Turnkey Purchase order/Work order copy<br>ii. Work completion certificate copy<br>iii. Consortium Agreement |

| | | | |
|---|---|---|---|
| | | Cable manufacturer (OEM) along with Consortium Partner can jointly fulfil the Qualification Criteria. | |
| 3 | Performance Certificate | The Bidder along with consortium, shall submit two (2) years of satisfactory performance of at least two (2) executed Turnkey Projects of 33KV or higher voltage grade power cables SITC work execution, out of which one certificate should be of more than 10KM cable quantity in the last 7 years from the date of bid opening from any utilities/ SEB's/ PSU's/ Government Organizations.<br><br>In case of bidder has a previous association with BRPL/BYPL for similar project, product and service, the performance feedback for that bidder by BRPL/BYPL shall only be considered irrespective of the performance certificate issued by any third organization | Performance certificate |
| 4 | Backup support by OEMs | Bidder shall procure equipment from the approved Bidder list of BRPL for individual items (mentioned in Scope/Specifications). The bidder is supposed to have an agreement with the manufacturer/services provider in India to provide support to BRPL for any supply, services & spares related issues for the time stipulated in the specification or service life of the equipment. | Undertaking by bidder for Backup support by OEMs |
| 5 | ISO | The bidder must possess valid ISO 9001:2015 certification or above. | Valid copy of Certification |
| 6 | Electrical License | The bidder should possess valid Electrical Contractor License issued by competent statutory agency to undertake work in NCT Delhi. In case bidder is not having this license, suitable sub-contractor having the valid license shall be engaged for works at site where copy of valid license shall be submitted to BRPL before the start of the work OR Bidder to give the undertaking that it will be obtained by them before the start of the work at site. | i. Electrical Contractor License Copy<br>ii. Undertaking if not available |

**Commercial Criteria:**

| Sl No. | Clause | Criteria | Documents to be submitted by Bidder |
|---|---|---|---|
| 7 | Turnover | Bidder should have an Average Annual Sales Turnover of Rs 250 Crores or more in the last three (3) Financial Years. | Balance Sheet / Copy of audited P&L Account / Duly certified CA certificate having UDIN to be submitted |
| 8 | Litigation | The Bidder shall submit an undertaking that "No Litigation" is pending with the BRPL or its Group/Associates Companies as on date of bid opening. | Self-Undertaking |
| 9 | Blacklisting | An undertaking (self-certificate) that the bidder has not been blacklisted/debarred by any central/state government institution/Electricity utilities as on date of bid opening. | Self-Undertaking |
| 10 | Statutory Documents | The bidder must have valid PAN No., and GST Registration Number, in addition to other statutory compliances. The bidder must submit copy of registrations and submit an undertaking that the bidder shall comply with all the statuary compliances as per the laws/rules etc. before the start of the supply/work. | Relevant Statutory Documents Copy/ Self Undertaking |

## Qualification Criteria QR -02 for the selection of Cable Supplier

**Technical Criteria:**

| Sl No. | Clause | Criteria | Documents to be submitted by Bidder |
|---|---|---|---|
| 1 | OEM (Manufacturing base in India) | The Bidder should have its own manufacturing facility in India for the last three (03) years for the offered or higher voltage grade Power Cables. | i. OEM Manufacturing and factory incorporation certificate / Undertaking<br>ii. The details of manufacturing units, locations and works from where supply against this tender shall be proposed to be furnished by OEM. |
| 2 | CCV/VCV line | The bidder must have a Dry cure and Dry cooling CCV/VCV line for manufacturing of the offered or higher voltage grade cables. | Undertaking |
| 3 | Supply Quantity | The bidder should have supplied at least 25 KMS of the offered or higher voltage grade Power Cables in the last Seven (07) years from the date of bid opening from to any utilities/ SEB's/ PSU's/ reputed companies wherein the end-user shall be utilities/ SEB's/ PSU's. | i. Summary list of executed Purchase orders<br>ii. Purchase order copies<br>iii Material delivery clearance certificate copy or Invoice Copies or Delivery completion/ Performance certificate |
| 4 | Performance Certificate | Performance certificate for minimum two (2) years of satisfactory performance for the offered or higher voltage grade Power Cables supplied in last seven (7) years from the date of bid opening from utilities/ SEB's/ PSU's/ Government Organizations.<br><br>In case of bidder has a previous association with BRPL/BYPL for similar project, product and service, the performance feedback for that bidder by BRPL/BRPL shall only be considered irrespective of the performance certificate issued by any third organization. | Performance certificates |
| 5 | Manufacturing Capacity | The bidder should have a manufacturing capacity of a minimum 20 km per month for the offered or higher voltage grade Power Cables. | Installed Manufacturing Capacity (duly certified by the CE/CA/DIC/Self-Undertaking/ Government Organization/others) |
| 6 | ISO | The bidder must possess valid ISO 9001:2015 certification or above. | Valid copy of Certification |
| 7 | BIS License | The bidder must possess valid BIS License. | Valid copy of License |
| 8 | New Bidder | In case of Bidder is not registered with BRPL, factory inspection, and evaluation shall be carried out to ascertain the 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. | Undertaking |

**Commercial Criteria:**

| Sl No. | Clause | Criteria | Documents to be submitted by Bidder |
|---|---|---|---|
| 9 | Turnover | Bidder should have an Average Annual Sales Turnover of Rs 100 Crores or more in the last three (3) Financial Years. | Balance Sheet / Copy of audited P&L Account / Duly certified CA certificate having UDIN to be submitted |
| 10 | Litigation | The Bidder shall submit an undertaking that "No Litigation" is pending with the BRPL or its Group/Associates Companies as on date of bid opening. | Self-Undertaking |
| 11 | Blacklisting | An undertaking (self-certificate) that the bidder has not been blacklisted/debarred by any central/state government institution/Electricity utilities as on date of bid opening. | Self-Undertaking |
| 12 | Statutory Documents | The bidder must have valid PAN No., and GST Registration Number, in addition to other statutory compliances. The bidder must submit copy of registrations and submit an undertaking that the bidder shall comply with all the statuary compliances as per the laws/rules etc. before the start of the supply/work. | Relevant Statutory Documents Copy/ Self Undertaking |

**TERMS & CONDITIONS TO APPLY AS CONSORTIUM:**

i. The Cable OEM (manufacturer of the offered cable in the NIT or higher voltage grade power cables) may collaborate with BRPL enlisted contractor to form a consortium and submit Bid for this tender, provided they jointly qualify as per qualification criteria of the tender.

ii. The Cable OEM shall act as the Lead Partner and Bidder within the consortium and must be supported by a power of attorney, duly signed by the legally authorized signatories of all partners. Refer to Annexure-I for the sample format.

iii. Bidder will be authorized to incur liabilities and receive instructions on behalf of all partners in the Consortium. The entire execution of the contract, including payment, will be conducted exclusively with the Bidder. This authorization will be evidenced by submitting a Power of Attorney signed by the legally authorized signatories of all partners.

iv. Bidder will be solely responsible for executing the contract in accordance with the NIT. A copy of the agreement between the consortium partners, which includes this provision, must be submitted with the Bid.

v. In the event of any default by 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. The Extra Expenditure so incurred shall be debited to the Bidder.

vi. Responsibilities in respect of execution of tendered work by the Bidder as well as of each Consortium member shall be clearly indicated in the agreement.

vii. The Consortium agreement shall not be cancelled or amended unilaterally without consent of the purchaser and a statement to this effect should appear in the consortium agreement.

viii. A firm can submit only one bid in the same bidding process, either individually as a bidder or as a partner of a Consortium. A bidder who submits or participates in more than one bid will cause all the bids in which the bidder has participated to be disqualified.

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

**Note:**

- **In case of non-furnishing the requisite documents along with the bid, the bid will be considered as non-responsive and bid may be summarily rejected.**
- **Orders shall be issued in favor of the Bidder only.**

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

**As an exception to the foregoing Clause 2.00 above:**

a. Sanctions: Firms, which includes any of the Consortium members in case of bidding Consortium Partner as per Clause 2.00 above, blacklisted by the Purchaser/ CPSEs or any of their subsidiaries / Government of India/ any Regulatory Authority, as on the date of submission of Bid, are not eligible to bid.

b. Suspension: Firms, which includes any of the Consortium members in case of bidding Consortium Partner as per Clause 2.00 above, under suspension by the Purchaser as the result of the operation of a Bid–Securing Declaration or Proposal-Securing Declaration, shall not be eligible to bid.

c. Prohibitions: Firms, which includes any of the Consortium members in case of bidding Consortium Partner as per Clause 2.00 above, and individuals of a country or goods/ works/services manufactured/ produced in a country shall be ineligible, if as a matter of law or official regulations, the Government of India prohibits commercial relations with that country.

d. Restrictions under Rule 144 (xi) of GFR 2017: Restrictions on procurement from a bidder of a country which shares a land border with India.

## 3.00 BIDDING AND AWARD PROCESS

Bidders are requested to submit their offer strictly in line with this tender document. Normally, the deviations to tender terms are not admissible and the bids with deviations are liable for rejection. Hence, the bidders are advised to refrain from taking any deviations on this Tender. Still, in case of any deviations, all such deviations shall be set out by the Bidders, clause by clause in the "Annexure - Schedule of Deviations" and the same shall be submitted as a part of the Technical Bid.

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 the following, do not contain any cost information whatsoever and shall be submitted within the due date:

| S. No. | Descriptions | Type of Documents/Format |
|---|---|---|
| **A.1** | **Bid Details** | |
| 1 | **Bid Index for Part-A (Technical Bid)** | In the prescribed format enclosed at APPENDIX I ANNEXURE – 1.01 |
| 2 | **Cover Letter, if any** | Standard Format |
| 3 | **Bid Form (Unpriced) Duly Signed** | Duly Signed Bid Form as per enclosed format at APPENDIX I ANNEXURE – 1.02 |
| 4 | **Tender Fee** | Non-refundable demand draft or online transfer of the requisite amount through IMPS/NEFT/RTGS for Rs 1,180/-, Duly filled and signed as per enclosed format at APPENDIX I ANNEXURE – 1.03 |
| 5 | **EMD** | Online transfer of the requisite amount through IMPS/NEFT/RTGS or FD or BG in the prescribed stamp paper & format enclosed at APPENDIX I ANNEXURE – 1.05, EMD Details Duly filled and signed as per enclosed format at APPENDIX I ANNEXURE – 1.04 |
| 6 | **Power-of-Attorney/ Authorization Letter** | In the standard stamp paper/letter |
| **A.2** | **Technical Bid** | |
| 7 | **Communication Details of the Bidder** | Duly filled and signed as per enclosed format at APPENDIX I ANNEXURE – 1.06 |
| 8 | **Manufacturer Authorization Form (as applicable)** | Duly filled and signed as per enclosed format at APPENDIX I ANNEXURE – 1.07 |
| 9 | **Technical Qualifying Criteria Compliance Index & Documents** | Documentary evidence in support of qualifying criteria mentioned in Section 1 Clause 2.00. Duly filled and signed as per enclosed format at APPENDIX I ANNEXURE – 1.08, ANNEXURE – 1.09 & ANNEXURE – 1.10 |
| 10 | **Schedule of Deviations - Technical** | Duly filled and signed as per enclosed format at APPENDIX I ANNEXURE – 1.11 |
| 11 | **Technical Details/ Filled in Guaranteed Technical particulars (GTP) as per specification** | Bidder shall submit duly filled GTP with all Technical documents |
| 12 | **Technical Drawings as per specification** | Bidder shall submit all Drawings as per the specification |
| 13 | **Type Test Reports** | Bidders shall submit a copy of type test reports in their technical bids in support of technical specifications. Duly filled and signed as per enclosed format at APPENDIX I ANNEXURE – 1.12 |
| 14 | **Sample Submission Details (if applicable as per specification)** | Duly filled and signed as per enclosed format at APPENDIX I ANNEXURE – 1.13 |
| 15 | **Product Catalogue (If applicable)** | Bidders shall submit a copy of the product catalogue in their technical bids in support of technical specifications |
| 16 | **Manufacturer's Quality Assurance Plan** | Bidders shall submit a copy of MQP in their technical bids in support of technical specifications |
| 17 | **Other drawings/ documents mentioned in technical specification** | Bidders shall submit a copy of documents in their technical bids in support of technical specifications |
| 18 | **Testing Facilities** | Bidder shall submit the details of testing facilities available at their works/factory. |
| **A.3** | **Commercial Bid** | |

| | | |
|---|---|---|
| 19 | **Company Profile, Organization Chart & Manpower Details.** | Bidder shall submit the details of Organization & Manpower with qualification and experience. |
| 20 | **Commercial Qualifying Criteria Compliance Index & Documents** | Documentary evidence in support of qualifying criteria mentioned in Section 1 Clause 2.00. Duly filled and signed as per enclosed format at APPENDIX I ANNEXURE – 1.14 |
| 21 | **Undertakings** | Duly signed self-undertakings as per enclosed format at APPENDIX I ANNEXURE – 1.15 |
| 22 | **Schedule of Deviations - Commercial** | Duly filled and signed as per enclosed format at APPENDIX I ANNEXURE – 1.16 |
| 23 | **Acceptance Form for Participation in Reverse Auction Event** | Duly signed Acceptance Form for Participation In Reverse Auction Event as per enclosed format at APPENDIX I ANNEXURE – 1.17 |
| 24 | **Commercial Terms and Conditions** | Acceptance of Commercial Terms and Conditions viz. Delivery Schedule/Period, Payment terms, PBG etc. Duly filled and signed as per enclosed format at APPENDIX II ANNEXURE – 2.05 |
| 25 | **Un price Bid Duly Signed** | Item wise marked as "Quoted" & Duly Signed Un price Bid as per enclosed format at VOLUME – II - FINANCIAL BID (PRICE FORMAT) |
| 26 | **Signed Tender document** | Original Tender documents duly stamped & signed on each page as a token of acceptance |

**PART B: FINANCIAL BID** comprising of

- Price strictly in the Format enclosed at VOLUME – II - FINANCIAL BID (PRICE FORMAT) indicating Break up of basic price, taxes & duties, etc.
- The Bidder has to submit the item-wise price bifurcation in the bid. An unpriced copy must be attached with the Part A (Technical Bid).

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

**REVERSE AUCTION CLAUSE**: Purchaser reserves the right to use the reverse auction as an optional tool through SAP-SRM as an integral part of the entire tendering process. All techno-commercially qualified bidders shall participate in the reverse auction. **Reverse Auction may be conducted at the buyer's discretion on Lump-sum basis, for the Total Landed Cost (including supply and services).**
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

Notwithstanding anything stated above, the Purchaser reserves the right to assess the bidder's capability to perform the contract, should the circumstances warrant such assessment in the overall interest of the purchaser. In this regard the decision of the purchaser is final. Bidder is to submit their acceptance as per the format APPENDIX I ANNEXURE – 1.17.

**BIDS RECEIVED AFTER THE DUE DATE AND TIME MAY BE LIABLE FOR REJECTION**

## 4.00 AWARD DECISION

4.01 Purchaser intends to award the business on the lowest bid basis, so suppliers are encouraged to submit the bid competitively. The decision to place a LOI/Purchase Order solely depends on the purchaser on the cost competitiveness across multiple lots, quality, delivery and bidder's capacity, in addition to other factors that Purchaser may deem relevant.

4.02 In the event of your bid being selected by the purchaser (and/or its affiliates) and you subsequent DEFAULT on your bid; you will be required to pay the purchaser (and/or its

affiliates) an amount equal to the difference in your bid and the next lowest bid on the quantity declared in NIT/RFQ.

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

4.04 Contract Price/Rate shall remain "FIRM" till the validity of the Contract.

4.05 Quantity Variation: The purchaser reserves the right to vary the quantity based on the actual requirements.

4.06 **Incase execution target timelines is coinciding, BRPL reserves the right to limit the award of schemes to single party depending on the contractor's turnover, execution capabilities & past performance. The decision shall be as per BRPL discretion and Vendor has to abide by the same.** The purchaser reserves all the rights to award the contract to one or more bidders to meet the Project execution requirement or nullify the award decision without citing any reason.

## 5.00 MARKET INTEGRITY

We have a fair and competitive marketplace. The rules for bidders are outlined in the Terms & Conditions. Bidders must agree to these rules before participating. In addition to other remedies available, we reserve 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 & Conditions. Bidders who violate the marketplace rules or engage in behaviour that disrupts the fair execution of the marketplace restrict a bidder to the length of time, depending upon the seriousness of the violation. Examples of violations include, but are not limited to:

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

## 6.00 SUPPLIER CONFIDENTIALITY

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

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

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

## 7.00 CONTACT INFORMATION

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

| Address | Name/ Designation | E-mail Address |
|---|---|---|
| **Technical** | | |
| CES Dept. 1st Floor, A-Block, BSES Bhawan, Nehru Place | Pronab Bairagi GM (CES) | Pronab.bairagi@reliancegroupindia.com |
| | Anupam Kumar AsVP (CES) | Anupam.o.kumar@reliancegroupindia.com |
| **Commercial** | | |
| CES Dept. 1st Floor, C & D-Block, BSES Bhawan, Nehru Place | Kumar Gaurav GM (C&M) | Kumar.ga.gaurav@reliancegroupindia.com |
| | Pankaj Goyal AsVP (Head-Procurement) | pankaj.goyal@reliancegroupindia.com |

# SECTION – II: INSTRUCTION TO BIDDERS

## A. GENERAL

1.00 BSES Rajdhani Power Ltd, hereinafter referred to as "The Purchaser" is desirous of awarding work for " SUPPLY, LAYING, TESTING, COMMISSIONING & HANDING OVER OF 33kV 3Cx400 SQMM/66kV 3Cx300 SQMM XLPE CABLES WITH REQUIRED ACCESSORIES FOR PROVIDING 33kV/66kV POWER SOURCES FROM 220kV SUBSTATIONS AT NARAINA, DEV NAGAR & NAJAFGARH TO GRID SUBSTATIONS AT MAYAPURI, METAL FORGING, DLF MALL, PASCHIM VIHAR & G-1 DWARKA ON SINGLE POINT RESPONSIBILITY BASIS" to single/multiple contractors.

### 2.00 SCOPE OF WORK

2.01 The scope of work under this contract shall include the turnkey execution on End to End Basis, including but not limited to Design, Engineering, Manufacture, Shop Testing, Inspection, Packing, Dispatch, Supply, Loading, Unloading, Storage At Site, Assembly, Erection, Complete Pre-Commissioning Checks, Testing & Commissioning at Site, Obtaining Statutory Clearance & Certification From Electrical Inspector And Handing Over Of Complete Projects Covered Under Scope Of this tender To BSES Rajdhani Power Ltd. (BRPL) including comprehensive Marine cum Storage cum Erection Insurance Policy (MSE) "on Single Point responsibility Basis".

Single purchase order will be placed for Supply & Services (ETC/Civil) which inter-alia includes the Scope of Work as mentioned/required.

### 3.00 DISCLAIMER

3.01 This Document includes statements, which reflect various assumptions, which may or may not be correct. Each Bidder/Bidding Consortium should conduct its 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 interest.

3.02 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 a rising in any way from the selection process for the Supply.

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

3.04 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 COST OF BIDDING

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

## B. BIDDING DOCUMENTS

### 5.00 BIDDING DOCUMENTS

5.01 The Scope of Work, Bidding Procedures and Contract Terms are described in the Bidding Documents.

5.02 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 may result in the rejection of the Bid.

### 6.00 AMENDMENT OF BIDDING DOCUMENTS

6.01 At any time before the deadline for submission of Bids, the Purchaser may for any reason, whether at its initiative or in response to a clarification requested by a prospective Bidder, modify the Bidding Documents by Amendment.

6.02 The Amendment shall be part of the Bidding Documents, pursuant to Clause 5.01, and it will be notified on the website **www.bsesdelhi.com** and the same will be binding on them.

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

6.04 Purchaser shall reserve the rights to the following:
a) Extend the due date of submission,
b) Modify the tender document in part/whole,
c) Cancel the entire tender

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

## C. PREPARATION OF BIDS

### 7.00 LANGUAGE OF BID

7.01 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 an English translation, in which case, for purposes of interpretation of the Bid, the English translation shall govern.

### 8.00 DOCUMENTS COMPRISING THE BID

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

(a) All the Bids must be accompanied by the required Tender Fees and EMD as mentioned in the tender.

(b) PART A - Technical Bid and

(c) PART B - Financial Bid

**9.00 BID FORM**

9.01 The Bidder shall submit the Bid Form with the Bidding Documents.

**10.00 EMD**

10.01 Pursuant to Clause 8.0(a) above, the bidder shall furnish, as part of its bid, an EMD amounting to as specified in Section I. The EMD is required to protect the Purchaser against the risk of Bidder's conduct which will warrant forfeiture.

The EMD shall be denominated in any of the following forms**:**

(a) Bank Guarantee drawn in favour of BSES Rajdhani Power Ltd, payable at Delhi or
(b) Fixed Deposit (lien marked in favour of BSES Rajdhani Power Limited) payable at Delhi.
(c) Online transfer of requisite amount through IMPS/NEFT/RTGS to BRPL account mentioned herein in **Appendix II - BRPL BANK DETAILS WITH IFSC CODE**.

EMD shall be valid for One Hundred Eighty (180) days after the due date of submission drawn in favour of BSES Rajdhani Power Ltd.

The EMD may be forfeited in the 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/Work Order, or

(ii) Furnish the required performance security BG.

**11.00 BID PRICES**

11.01 Bidders shall quote for the entire Scope of Supply/Work with a break-up of prices for individual items. 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, and Transportation to the site, all in accordance with the requirement of the Bidding Documents. The Bidder shall complete the appropriate Price Schedules included herein, stating the Unit Price for each item & total Price.

11.02 The prices offered shall be inclusive of all costs as well as Duties, Taxes or Levies paid or payable during the execution of the supply work, a breakup of price constituents, should be there.

11.03 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.**

**12.00 BID CURRENCIES**

12.01 Prices shall be quoted in Indian Rupees Only.

**13.00 PERIOD OF VALIDITY OF BIDS**

13.01 Bids shall remain valid for 180 days from the due date of submission of the Bid.

13.02 Notwithstanding Clause 13.01 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.

**14.00 ALTERNATIVE BIDS**

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

**15.00 FORMAT AND SIGNING OF BID**

15.01 The original Bid Form and accompanying documents, must be received by the Purchaser at the date, time and place specified pursuant to Clauses 15.0 and 16.0.

15.02 The original Bid shall be typed or written in indelible ink and shall be signed by the Bidder or a person or persons duly authorized to sign on behalf of the Bidder. Such authorization shall be indicated by written Power-of-Attorney accompanying the Bid. The Bid submitted on behalf of companies registered with the Indian Companies Act, for the time being in force, shall be signed by persons duly authorized to submit the Bid on behalf of the Company and shall be accompanied by certified true copies of the resolutions, extracts of Articles of Association, special or general Power of Attorney etc. to show clearly the title, authority and designation of persons signing the Bid on behalf of the Company. Satisfactory evidence of the authority of the person signing on behalf of the Bidder shall be furnished with the bid. A bid by a person who affixes to his signature the words 'President', 'Managing Director', 'Secretary', 'Agent' or other designations without disclosing his principal will be rejected.

The Bidder's name stated on the Proposal shall be the exact legal name of the firm.

15.03 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 initiated by the person or persons signing the Bid.

## D. SUBMISSION OF BIDS

**16.00 SEALING AND MARKING OF BIDS**

16.01 Bid submission: Bids have to be mandatorily submitted offline only at address mentioned in Section I. Bids submitted through any other form/ route shall not be admissible.

16.02 However, documents that necessarily have to be submitted in originals like EMD or Tender Fee (in the form of BG/ DD /FD as applicable) and any other documents mentioned in the tender documents have to be submitted at the BRPL office before the due date & time of submission. The Technical Documents and the EMD shall be enclosed in a sealed envelope and the said envelope shall be superscribed with — "Technical Bid & EMD". All the envelopes should bear the Name and Address of the Bidder and mark for the Original. The envelopes should be superscribed with — "Tender No. & Due date of opening".

16.03 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.

**17.00 DEADLINE FOR SUBMISSION OF BIDS**

17.01 The Bid must be received by the Purchaser on or before the due date & time of submission.

17.02 The Purchaser may, at its discretion, extend the deadline for the submission of Bids by amending the Bidding Documents in accordance with Clause 6.0, 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.

**18.00 ONE BID PER BIDDER**

18.01 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.

**19.00 LATE BIDS**

19.01 No Bid will be received by the Purchaser after the deadline for submission of Bids prescribed by the Purchaser, pursuant to Clause 17.0.

**20.00 MODIFICATIONS AND WITHDRAWAL OF BIDS**

20.01 The Bidder is not allowed to modify or withdraw its Bid after the Bid's due date & time of submission subject to any corrigendum/addendum/modifications in the tender documents uploaded to the website.

## E. EVALUATION OF BID

**21.00 PROCESS TO BE CONFIDENTIAL**

21.01 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.

**22.00 CLARIFICATION OF BIDS**

22.01 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.

**23.00 PRELIMINARY EXAMINATION OF BIDS / RESPONSIVENESS**

23.01 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 to verify the documents submitted in support of qualification criteria.

23.02 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.

23.03 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.

23.04 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.

**24.00 EVALUATION AND COMPARISON OF BIDS**

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

24.02 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 will be subjected to a responsiveness check. The Technical & qualifying Proposals and the Conditional ties of the Bidders will be evaluated.

Subsequently, the Financial Proposals along with Supplementary Financial Proposals, if any, of Bidders with Techno-commercially Acceptable Bids shall be considered for final evaluation.

24.03 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:

(a) Delivery Schedule

(b) Conformance to Qualifying Criteria

(c) 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 the Bidding Documents shall be evaluated. **The Purchaser may make its own assessment of the cost of any deviation to ensure a fair comparison of Bids.**

24.04 Any price adjustments that result from the above procedures shall be added for comparative evaluation only to arrive at an "Evaluated Bid Price". Bid Prices quoted by Bidders shall remain unaltered.

## F. AWARD OF CONTRACT

**25.00 CONTACTING THE PURCHASER**

25.01 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.

25.02 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.

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

26.01 Submission of bids shall not automatically construe qualification for evaluation. 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 the award of the 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.

**27.00 AWARD OF CONTRACT**

27.01 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 the order to other bidders in the tender, provided it is required for the timely execution of the project & provided he agrees to come to the lowest rate. Purchaser reserves the right to distribute the entire tender quantity at its own discretion without citing any reasons thereof.

27.02 The Purchaser intends to issue Composite Order which will includes the Scope of Work as mentioned/required in the NIT viz.
a) Supply
b) Installation/Erection, Testing & Commissioning
c) Civil (If applicable)

**28.00 THE PURCHASER'S RIGHT TO VARY QUANTITIES**

28.01 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.

**29.00 LETTER OF INTENT/ NOTIFICATION OF AWARD**

29.01 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 the issue of the letter of intent /Notification of Award by Purchaser.

**30.00 CONTRACT PERFORMANCE BANK GUARANTEE (CPBG)**

30.01 Within 28 days of the receipt of Letter of Intent/Notification of Award 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 Total Contract Price (including GST). The Performance Bond shall be valid up to contract completion plus 3 months claim period. Upon submission of the performance security, the EMD shall be released.

**31.00 CORRUPT OR FRAUDULENT PRACTICES**

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

(a) Defines, for this provision, the terms set forth below as follows:
(i) "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 contract execution; and
(ii) "Fraudulent practice" means a misrepresentation of facts to influence a procurement process or the execution of a contract to the detriment of the Purchaser, and includes collusive practice among Bidders (before or after Bid submission) designed to establish Bid prices at artificial non -competitive levels and to deprive the Purchaser 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, 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.

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

## 32.00 STATUTORY GUIDELINES & REGULATIONS

32.01 The bidder shall make himself fully aware & familiarize himself with all applicable laws/guidelines/regulations.

## 33.00 SAFETY

33.01 Safety related requirements as mentioned in our safety Manual put on the Company's website which can be accessed at http://www.bsesdelhi.com. All bidders shall strictly abide by the guidelines provided in the safety manual at all relevant stages during the contract period.

## 34.00 PRIORITY OF CONTRACT DOCUMENTS

34.01 The several documents forming the Agreement 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 company, who shall, accordingly, issue suitable instructions thereon to the Contractor. In such event, unless otherwise provided in the agreement or explained by way of instructions by the company, as mentioned above, the priority of the documents forming the Agreement shall be as follows:

i) Contract Agreement/Purchase Order.
(a)Special Conditions of Contract
(b)General Conditions of Contract
(ii)The Letter of Acceptance/ Intent
(iii)Agreed Minutes of the Tender Negotiation Meetings
(iv) Agreed Minutes of the Tender Technical Meetings
(v) The Priced Bill of Quantities
(vi)The Technical Specifications / Scope of work
(vii)The Tender document, including all Appendices and/or Addenda, Corrigendum the latest taking precedence.

In the event of any conflict between the above-mentioned documents, the more stringent requirement or conditions which shall be favourable to the company shall govern and the decision of the company/BRPL shall be final and binding upon the parties.

BSES RAJDHANI POWER LIMITED

**APPENDIX I** ANNEXURE – 1.01

## BID INDEX FOR PART-A (TECHNICAL BID)

***(To be filled & submitted on Bidder Letter Head, Bidders document submission should have following main categories as outlined below and should have page numbers printed at the bottom of each page with this page as page number 1. The page number should be in "Page X of Y" format. Separator with document description shall be provided before each document)***

**NIT No.:**

**Bidder's Name:**

**Bidder's Bid Reference No. & Date:**

| S. No. | Particulars | Bid Pdf Page No. | |
|---|---|---|---|
| | | From | To |
| **A.1** | **Bid Details** | | |
| 1. | Bid Index for Part-A (Technical Bid) as per APPENDIX I ANNEXURE - 1.01 | 1 | |
| 2. | Cover Letter, If any | | |
| 3. | Bid Form (Unpriced) Duly Signed as per APPENDIX I ANNEXURE - 1.02 | | |
| 4. | Tender Fee Details as per APPENDIX I ANNEXURE - 1.03 | | |
| 5. | EMD Details as per APPENDIX I ANNEXURE - 1.04 & 1.05 | | |
| 6. | Power-of-Attorney / Authorization Letter | | |
| **A.2** | **Technical Bid** | | |
| 7. | Communication Details of the Bidder as per APPENDIX I ANNEXURE - 1.06 | | |
| 8. | Manufacturer Authorization Form (as applicable) as per APPENDIX I ANNEXURE - 1.07 | | |
| 9. | Technical Qualifying Criteria Compliance Index & Documents as per APPENDIX I ANNEXURE - 1.08, 1.09, 1.10 | | |
| 10. | Schedule of Technical Deviations (along with soft editable Excel copy) as per APPENDIX I ANNEXURE - 1.11 | | |
| 11. | Guaranteed Technical particulars (GTP) as per specification | | |
| 12. | All Drawings as per specification | | |
| 13. | Type Test Reports (Sequence of Tests shall be strictly in accordance with relevant IS/IEC) as per APPENDIX I ANNEXURE - 1.12 | | |
| 14. | Sample Submission Details (If applicable as per Specification) as per APPENDIX I ANNEXURE - 1.13 | | |
| 15. | Product Catalogue (If applicable) | | |
| 16. | Manufacturer's quality assurance plan (as applicable) | | |
| 17. | Other drawings/ documents mentioned in technical specification | | |
| 18. | Testing Facilities | | |
| **A.3** | **Commercial Bid** | | |
| 19. | Company Profile/Organogram/Organization Chart & Manpower Details | | |
| 20. | Commercial Qualifying Criteria Compliance Index & Documents as per APPENDIX I ANNEXURE - 1.14 | | |
| 21. | Undertakings as per APPENDIX I ANNEXURE - 1.15 | | |
| 22. | Schedule of Commercial Deviations (along with soft editable Excel copy) as per APPENDIX I ANNEXURE - 1.16 | | |
| 21. | Acceptance form for participation in reverse auction event as per APPENDIX I ANNEXURE - 1.17 | | |
| 24. | Acceptance of Commercial Terms and Conditions as per APPENDIX II ANNEXURE - 2.05 | | |
| 25. | Un Price Bid Duly Signed (Volume - II Financial Bid (Price Format)) | | |
| 26. | NIT Document complete Signed & Stamped | | |

BSES RAJDHANI POWER LIMITED

ANNEXURE – 1.02

**BID FORM**

To

Head of Department
Contracts & Material Deptt.
BSES Rajdhani Power Ltd
BSES Bhawan, Nehru Place,
Delhi 110019

Sir,

1. We understand that BRPL is desirous of procuring…… for its licensed distribution network area in Delhi.
2. Having examined the Bidding Documents for the above-named works, we the undersigned, offer to deliver the goods in full conformity with the Terms and Conditions and technical specifications for the sum indicated in the Financial Bid or such other sums as may be determined in accordance with the terms and conditions of the contract. The amounts are in accordance with the Price Schedules attached herewith and are made part of this bid.
3. If our Bid is accepted, we undertake to deliver the entire goods as per the delivery schedule mentioned in Section IV from the date of award of the purchase order/letter of intent.
4. If our Bid is accepted, we will furnish a performance bank guarantee for due performance of the Contract in accordance with the Terms and Conditions.
5. We agree to abide by this Bid for 180 days from the due date of bid submission and it shall remain binding upon us and may be accepted at any time before the expiration of that period.
6. We declare that we have studied the provision of Indian Laws for the supply/services of equipment/materials and the prices have been quoted accordingly.
7. Unless and until Letter of Intent is issued, this Bid, together with your written acceptance thereof, 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, by the Laws and Jurisdiction of Contract.

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

Signature..... In the capacity of ……

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

(IN BLOCK CAPITALS) .....

ANNEXURE – 1.03

**TENDER FEE DETAILS**

a. Amount (Rs.) : **1,180/- (One Thousand One Hundred Eighty Only)**

b. Mode of Payment : DD or online transfer through IMPS/NEFT/RTGS (select any one)

c. DD /UTR No. (As applicable) : .....

d. Dated : .....

e. Bidders Bank Account No. : .....

f. Name of the Bank : .....

g. Address of the Bank : .....

h. IFSC Code of the Bank : .....

BSES

ANNEXURE – 1.04

**EMD DETAILS**

a. EMD Amount (Rs.) : .....

b. Mode of Payment : BG/FD/online transfer through IMPS/NEFT/RTGS (select any one)

c. BG/FD/UTR No. (As applicable): .....

d. Dated : .....

e. BG valid up to : .....

f. BG Claim period up to : .....

g. Bidders Bank Account No. : .....

h. Name of the Bank : .....

i. Address of the Bank : .....

j. IFSC Code of the Bank : .....

BSES

ANNEXURE – 1.05

## (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*] (hereinafter called the "Bidder") has submitted its bid dated [*date of submission of bid*] for the supply of [*name and/or description of the goods*] (hereafter 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*] (hereinafter called the "Bank"), are bound unto BSES Rajdhani Power Ltd., with its Corporate Office at BSES Bhawan, Nehru Place, New Delhi -110019, (hereinafter 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 performance security, In accordance with the Instructions to Bidders/Terms and Conditions;

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

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

(Stamp & signature of the bank)

Signature of the witness

ANNEXURE – 1.06

## COMMUNICATION DETAILS OF THE BIDDER

| S. No. | Designation | Name | Mobile No. | E-mail id |
|---|---|---|---|---|
| 1 | CEO / MD | | | |
| 2 | Sales / Marketing Head | | | |
| 3 | Sales Representative / Key Account Manager (KAM) | | | |
| 4 | Technical Head | | | |
| 5 | Manufacturer Plant / Operations Head | | | |
| 6 | Post Order Execution In Charge | | | |
| 7 | Authorized contact person (Primary responsibility for the Bid) | | | |
| 8 | Authorized contact person (Secondary responsibility for the Bid) | | | |

BSES

ANNEXURE – 1.07

**MANUFACTURER AUTHORIZATION FORM**
***(To be submitted on OEM's Letter Head)***

Date: …….
Tender No.: ……..

To

Head of Department
Contracts & Material Deptt.
BSES Rajdhani Power Ltd
BSES Bhawan, Nehru Place,
Delhi 110019

Sir,

WHEREAS M/s. *[name of OEM]*, who are official manufacturers of …… having factories at *[address of OEM]* do hereby authorize M/s *[name of bidder]* to submit a Bid in relation to the Invitation for Bids indicated above, the purpose of which is to provide the following Goods, manufactured by us ……and to subsequently negotiate and sign the Contract.

We hereby extend our full guarantee and warranty by the Conditions of the Contract or as mentioned elsewhere in the Tender Document, concerning the Goods offered by the above firm in reply to this Invitation for Bids.

We hereby confirm that in case, the channel partner fails to provide the necessary services as per the Tender Document referred above, M/s *[name of OEM]* shall provide standard warranty on the materials supplied against the contract. The warranty period and inclusion/exclusion of parts in the warranty shall remain the same as defined in the contract issued to our channel partner against this tender.

Yours Sincerely,
For ……..

Authorized Signatory

ANNEXURE – 1.08

| QUALIFYING CRITERIA COMPLIANCE INDEX - TECHNICAL CRITERIA | | | | |
|---|---|---|---|---|
| **S No** | **Qualifying Criteria Description as per section 1 clause 2.00** | **Documentary Proof Description** | **Documentary Proof Enclosed on Bid Page No.** | |
| | | | **From** | **To** |
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |
| 4 | | | | |
| 5 | | | | |

BSES

ANNEXURE – 1.09

| LIST OF PURCHASE ORDERS EXECUTED & DELIVERY DETAILS IN SUPPORT OF QUALIFYING REQUIREMENTS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S No | Item Details | | | | PO & Execution Details | | | | | Customer Name | End User (shall be Utility/ SEB's/ PSU's) name and details | PO copy, MDCC /Delivery completion certificates/ Invoice Copies enclosed on Bid Page no. | |
| | Item | Model | Voltage Rating (kV) | Current Rating (A) | PO No | PO Date | PO Qty | Executed Qty | Execution Year | | | From | To |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| **Total** | | | | | | | ∑ | ∑ | | | | | |

**Note – Only items relevant as per qualifying requirements should be included in the list.**

BSES

ANNEXURE – 1.10

| LIST OF PERFORMANCE CERTIFICATES IN SUPPORT OF QUALIFYING REQUIREMENT | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S No | Item Details | | | | PO No | Supplied/ Commissioning | | Performance Certificate Issue Date | Performance Certificate Issued By End User (Utility/SEB/Govt Org.) | Contact Details of Issuing Person | | | Enclosed on Bid Page No. | |
| | Item | Model | Voltage Rating (kV) | Current Rating (A) | | Qty. | Date | | | Name | Email | Mobile | From | To |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| **Total** | | | | | | ∑ | | | | | | | | |

**Note –**

1. **Only items relevant as per qualifying requirement should be included in the list.**
2. **Only Performance certificates issued by End User (utilities/ SEB's/PSU's only) will be accepted as per qualifying requirement.**

BSES

ANNEXURE – 1.11

## SCHEDULE OF DEVIATIONS - TECHNICAL

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

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

**Technical Deviations:-**

| S. No. | NIT Pdf Page No. | NIT Clause No. | NIT Clause Descriptions | Details of Clarification/deviation with justifications |
|---|---|---|---|---|
| | | | | |

**Note – Please enclose detailed GTP and drawings as per specification after the technical deviation sheet**

**Seal of the Bidder:**

**Signature:**

**Name:**

BSES

ANNEXURE – 1.12

| TYPE TEST REPORTS (SEQUENCE OF TESTS SHALL BE STRICTLY IN ACCORDANCE WITH RELEVANT IS/IEC) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| S No | Test Description | Reference Standard | Reference Standard Clause No. | Name of Testing Lab | Test Report Reference Number | Date of Issue of Report | Report Enclosed on Bid Page No | |
| | | | | | | | From | To |
| 1 | | | | | | | | |
| 2 | | | | | | | | |
| 3 | | | | | | | | |
| 4 | | | | | | | | |
| 5 | | | | | | | | |
| 6 | | | | | | | | |
| 7 | | | | | | | | |

BSES

ANNEXURE – 1.13

| SAMPLE SUBMISSION DETAILS (IF APPLICABLE AS PER SPECIFICATION) | | |
|---|---|---|
| **S No** | **Description** | **Bidder's Response** |
| 1 | Samples submitted with the bid | Yes/No |
| 1 | Sample Type -1 | |
| 1.1 | Model Number | |
| 1.2 | Number of samples | |
| 2 | Sample Type -2 | |
| 2.1 | Model Number | |
| 2.2 | Number of samples | |

BSES

ANNEXURE – 1.14

| QUALIFYING CRITERIA COMPLIANCE INDEX - COMMERCIAL CRITERIA | | | | |
|---|---|---|---|---|
| **S No** | **Qualifying Criteria Description as per section 1 clause 2.00** | **Documentary Proof Description** | **Documentary Proof Enclosed on Bid Page No.** | |
| | | | **From** | **To** |
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |
| 4 | | | | |
| 5 | | | | |

BSES

ANNEXURE – 1.15

**UNDERTAKINGS**
***(To be submitted on Bidders Letter Head)***

Date: …….

Tender No.: ……..

To

Head of Department
Contracts & Material Deptt.
BSES Rajdhani Power Ltd
BSES Bhawan, Nehru Place,
Delhi 110019

Sir,

We *[name of bidder]*, …… , hereby undertake and confirm the following:

- *[name of bidder]* has "No Litigation" pending with the BRPL or its Group/Associates Companies as on the date of bid opening.
- *[name of bidder] has* not been blacklisted/debarred by any central/state government institution/Electricity utilities as on the date of bid opening.
- *[name of bidder]* shall comply with all the statuary compliances as per the laws/rules etc. before the start of the supply/work.
- All documents, certificates, and information submitted by us against this tender are genuine, true, and correct. Copies provided have been made from the original documents. In the event that any document, certificate, or information is found to be false, forged, or misleading, BRPL shall have the right, at its sole discretion, to take appropriate legal action, including forfeiture of EMD and disqualification from participation in future tenders of BRPL and its group companies, for an indefinite period or as decided by BRPL.

Yours Sincerely,
For ……..

Authorized Signatory
Name : _____

Designation : _____

Seal : _____

ANNEXURE – 1.16

## SCHEDULE OF DEVIATIONS - COMMERCIAL

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

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

**Commercial Deviations:-**

| S. No. | NIT Pdf Page No. | NIT Clause No. | NIT Clause Descriptions | Details of Clarification/deviation with justifications |
|---|---|---|---|---|
| | | | | |

By signing this document we hereby withdraw all the deviations whatsoever taken anywhere in this bid document and comply with all the terms and conditions, technical specifications, scope of work etc. as mentioned in the standard document except those mentioned above.

**Seal of the Bidder:**

**Signature:**

**Name:**

BSES

ANNEXURE – 1.17

## ACCEPTANCE FORM FOR PARTICIPATION IN REVERSE AUCTION EVENT

(To be signed and stamped by the bidder)

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

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

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

Signature & seal of the Bidder

ANNEXURE – 1.18

# CODE OF CONDUCT FOR SUPPLIERS

BSES expects suppliers including their personnel (employees or sub-contractors) to support, embrace and enact the following Code of Conduct (CoC), apart from complying with all national and international regulations and laws that are applicable at any given time. BSES encourages its suppliers to go beyond compliance and embrace the principles of sustainability. BSES will support training and capacity-building programmes undertaken by suppliers, which promote awareness on sustainability and responsible business practices. BSES shall incorporate regulatory compliance and ESG performance as key criteria based on requirements as stated in the Code during evaluation of the suppliers.

## A. Promote Environmental Sustainability

All suppliers support a precautionary approach to environmental issues and undertake initiatives to promote better environmental responsibility. To this end, suppliers will

1. Reduce resource consumption and conserve natural resources:
   - 1.1. Conduct all operations, sourcing, manufacture, distribution of products and the supply of services with the aim of protecting and preserving the environment.
   - 1.2. Use natural resources rationally and work towards reducing resource consumption (water, energy, fuel, electricity, other materials etc.) and GHG emissions.
   - 1.3. Identify environmental risks and set up appropriate prevention measures.
2. Prevent pollution and reduce waste generation
   - 2.1. Maintain all required official permits, licenses and registrations.
   - 2.2. Prevent contamination, limit waste generation, and avoid or minimise adverse impact on the environment and biodiversity by facilitating reusing and recycling material.
   - 2.3. Clearly monitor the precautions to be taken during operations & maintenance in case of emission of heat, vibrations, radioactive rays, noise or similar.
   - 2.4. Use only those chemicals and aerosols with very low or zero ODP (Ozone Depletion Potential), which are allowed as per the regulatory provisions.
   - 2.5. Ensure that all the chemical and hazardous substances are accompanied by the manufacturer MSDS (Material Safety Data Sheet) during transport, storage, use and disposal, and that instructions mandated be strictly followed. No chemical and hazardous substance shall be received without a MSDS document. All the applicable regulatory guidelines shall be adhered strictly for the procurement, transport, storage, use and disposal of such harmful and hazardous chemicals.
   - 2.6. Provide written instructions about handling and/or disposal of equipment and product during the life cycle if special handling is required.

## B. Commitment to Human Rights, Labour and the Society

Suppliers shall support, respect and protect human and labour rights and make sure their organisation/entity is not complicit in any kind of abuses and/or violations. In this regard, the suppliers must:

1. Fair working conditions
   - 1.1. Provide and maintain healthy and safe working conditions and welfare facilities for the employees in its establishment.
   - 1.2. Ensure that that wages and benefits of their employees and subcontractors are fair and comply with applicable national and local laws as well as with contractual agreements.
   - 1.3. Provide all workers, both permanent and non-permanent, with employment documents that are freely agreed to and which respect their legal and contractual rights.

2. Health & Safety

Ensure that the activities of suppliers do not harm the health and safety of their own employees, suppliers and subcontractors, local communities/population, and finally the users of its products and services, which is in accordance with the BSES's Mission Zero Harm in Health and Safety.

3. Child Labour

3.1. No person below 18 years shall be employed or permitted to work in any occupation or process.

3.2. Zero tolerance for any kind of child labour in their establishments and supply chain.

4. Forced Labour

4.1. Under no circumstance shall suppliers use forced labour[1], whether in form of compulsory or trafficked labour, indentured labour, bonded labour or other forms, through direct or indirect use of force and/or intimidation.

4.2. Any kind of slavery, mental and physical coercion, human trafficking and debt bondage in the supply chain shall not be tolerated.

5. Wages and Working hours

5.1. Ensure that all applicable regulations related to wages, overtime compensation and other legally mandated benefits of their employees and subcontractors are fair and comply with applicable national and local laws as well as with contractual agreements. Minimum wages are applicable as per applicable in central Act and State rules.

5.2. Ensure that maximum working hours laid down and are adhered to.

6. Freedom of Association and Collective Bargaining

6.1. Recognise and respect the rights of workers to freedom of association and collective bargaining. Workers are not intimidated or harassed in the exercise of their right to join or refrain from joining any organisation.

6.2. Ensure that all employees can communicate with the management regarding working conditions.

7. Non-Discrimination and Equal opportunity

7.1. Commit, within the scope of prevailing laws and statutes, to oppose all forms of discrimination[2].

7.2. Maintain a work environment free from any form of discrimination and harassment.

7.3. Refrain from discrimination in hiring and employment practices on grounds of skin colour, age, caste, gender, race, ethnicity, nationality, socio-economic background, physical or mental disability, religion, sexual orientation, marital status, pregnancy, dependants, political or religious opinion, ideology, union membership and personal or social circumstances. Special attention must be paid to the rights of workers most vulnerable to discrimination.

8. Zero Tolerance towards Harassment

8.1. Treat all employees with respect and dignity and furthermore ensure that their own suppliers treat their employees in the same manner.

8.2. No tolerance towards unacceptable treatment of employees, such as physical punishment or torture, sexual harassment[3], or abuse, mental or physical coercion or verbal abuse, or the threat of any such treatment.

8.3. No worker should be subjected to any physical, sexual, psychological, or verbal harassment, abuse or other form of intimidation.

**C. Ethical Integrity and Legality**

Suppliers shall demonstrate the highest standard of integrity, ethics, and business conduct.

1. Compliance with Applicable laws and regulations:

1.1. All activities must be carried out in compliance with the legislation that is applicable in the countries in which the suppliers operate.

1.2. All other applicable international laws and regulations must be complied with, including those relating to international trade (such as those relating to sanctions, export controls and reporting obligations), data protection and antitrust/ competition laws.

1.3. Avoid any conduct that could tarnish or damage the reputation of BSES.

2. Anti-Corruption & Anti Bribery

2.1. All forms of bribery and corruption are prohibited

2.2. Adequate measures and procedures should be in place to prevent bribery in all commercial dealings.

2.3. Maintain a policy of 'Zero Tolerance' of any practice that may be deemed to be corruption, either active or passive.

2.4. No tolerance for unacceptable conduct, which includes, but not limited to, non-compliance with anti- corruption laws and, directly or indirectly offering, promising, hiring or authorising payments in cash or in kind to any BSES employee, public official or any other person or entity, with intention of a) obtaining or retaining business b) Influencing business decisions; and/or c) securing an unfair advantage.

3. Conflict of Interest

3.1. All and any conflict of interest in any business dealings with BSES, of which the suppliers are aware, should be declared to BSES so that appropriate action can be taken.

3.2. Avoid a situation where there is a real or potential conflict of interest with BSES employees, or with their family or closely associated persons, that could affect the independence or objectivity of their professional actions or decisions. If avoidance is not possible, the suppliers should inform BSES of the situation so that appropriate action can be taken.

4. Insider Trading and Other Economic Crimes

4.1. Ensure that all business and commercial dealings are transparently performed and accurately recorded in the books and records.

4.2. Comply with applicable anti-money laundering laws, conduct business only with ethically responsible partners and receive funds only from legitimate sources.

4.3. Avoid actual or attempted participation in economic offences, such as (but not limited to) money laundering, criminal breach of trust, counterfeiting, criminal misappropriation of properties, forgery, cheating, extortion, embezzlement and fraud.

4.4. Refrain from insider trading. No confidential information regarding BSES is used to either engage, facilitate or support insider trading in BSES's shares.

4.5. Take necessary measures to detect and prevent any illicit or suspicious forms of payment and inform and/or report through established channels if it has any suspicion or concern in this regard.

5. Gifts & Hospitality

5.1. Any business entertaining/hospitality with BSES should be modest in value, appropriate, and compliant with the law and company policies, entirely for the purpose of maintaining good business relations and not intended to influence in any way BSES's decisions on future business relationship.

5.2. Only gifts/honorarium of nominal value accepted or offered on festivals, at conferences, etc. will be permitted. Such gifts should comply with local laws and customs (including cultural and religious festivals) and should not be prohibited under applicable law and should not

include cash or cash equivalents, gold or other precious metals, gems or stones.

5.3. Neither receive nor offer or make, directly or indirectly, any illegal payments, remunerations, gifts, donations or comparable benefits that are intended, or perceived, to obtain uncompetitive favours for the conduct of its business with BSES.

5.4. Neither directly or indirectly offer any gift, entertainment, trip, discount, service, or other benefit to any official of BSES or his/her close relations which would or be capable of compromising, influencing, liable to corrupt the integrity and objectivity of that person.

6. Competition, Confidentiality and Data Privacy

6.1. All market survey/other entities information must be obtained and used legitimately and in compliance with all applicable laws and regulations.

6.2. No attempt should be made to divulge to BSES any information about any other entity in violation of any law or agreement.

6.3. Likewise, BSES's confidential information must not be shared with any Supplier unless expressly permitted by BSES in writing by authorised signatory under the respective purchase order or agreement, as the case may be.

7. Transparency and Ethics

7.1 Fair competition

Avoid any action that may constitute an illegal practice of unfair competition and ensure compliance with applicable competition laws.

7.2 Corporate image and reputation

Suppliers must NOT:

- Make false statements or provide any misleading information regarding its products/services.
- Give the impression of representing or being the spokesperson of BSES while getting associated with any religious/political party or for activities in their personal capacity.

8. Protection of Intellectual Property and No Misuse or Improper use of BSES's assets/ property

8.1. Respect and protect all confidential information and intellectual property of BSES.

8.2. Do not misuse and share assets of BSES and employ them only for the purpose of conducting the business for which they are duly authorised by BSES. These include tangible assets such as equipment and machinery, systems, facilities, materials, and resources and intangible assets such as intellectual property rights, processes, know how & technology, proprietary information, etc.

8.3. Safeguard, secure, and protect BSES's assets and information technology from theft, destruction, misappropriation, wastage, and abuse.

8.4. Promptly report loss, theft or destruction of any intellectual property and data of the Company or that of any Supplier.

9. Financial Records and Accuracy in Books

9.1. Have accounting practices in place to ensure accuracy of its financial books and records.

9.2. Ensure accurate accounting and proper reporting of information pertaining to the business and financial results in accordance with applicable Accounting Standards [Generally Accepted Accounting Principles (GAAP)].

9.3. Ensure compliance to applicable laws and regulations with respect to accounting and taxation and timely discharge of tax liability.

10. Sanction Laws

10.1 Do not engage in any dealings or transactions with any person, or in any country or territory that are subject to global / regional sanctions as mentioned herein below in clause 10.2. BSES is vigilant of its suppliers who may be on a sanctions list or have a related company in a country subject to global/regional sanctions. In case of any concerns, the supplier

should immediately report to BSES.

10.2 Do not be subject to or the target of any economic or financial sanctions or trade embargoes imposed, administered or enforced by the U.S. Government including without limitation by the World Bank or by the United Nations Security Council, the European Union, the United Kingdom including by Her Majesty's Treasury or the Department of Business, Innovation and Skills, a relevant regulatory authority or the Minister of Foreign Affairs of Canada under the Special Economic Measures Act or the United Nations Act or legislation or regulations with similar purpose or effect or any other relevant sanctions authority of any other country (collectively, 'Sanctions Laws') nor is the Company or any of its subsidiaries / affiliates located, organised or resident in a country or territory that is the subject of the target of Sanctions Laws

10.3 Do not take any action which places or is likely to place BSES in violation of Sanctions Laws and/ or breaches affecting the reputation and/ or business interests of BSES

11. Responsible Sourcing

Ensure that goods and materials are not sourced in a suspicious or illegal way and implement measures for sustainable procurement practices[3] to ensure compliance with laws and regulations.

12. Quality of Product and Services

Products and services should meet the specifications, quality, safety and environmental criteria specified in the relevant contract documents and required by applicable laws

13. Corporate Citizenship

Suppliers shall be committed to be good corporate citizens, not only in compliance with all relevant laws and regulations, but also by assisting and supporting initiatives to improve the quality of life of local communities/regions in which it operates. The activities may be, but not limited to, community health and family welfare, vocational training, education and literacy and employment.

---

[1] 'Forced Labour' or 'Involuntary Labour' refers to all work or service that is extracted under the menace of penalty. It also includes terms such as, bonded labour and modern slavery. It also includes any labour for which the worker receives less than the government stipulated minimum wage.

[2] 'Discrimination' refers to unjust or prejudicial treatment of people, especially on the grounds of, but not limited to, caste, creed, gender, race, ethnicity, age, color, religion, disability, socio-economic status or sexual orientation.

[3] Sustainability shall mean to device a practice & procedure proactively to sustain resources of organization and society at present levels with reasonable degradation. Sustainable procurement or sourcing is the process of making purchasing decisions that meet an organization's needs for goods and services in a way that benefits not only the organization but society, while minimizing its impact on the environment. Organization integrates the sustainability into business model as a resultant of ESG principles. This is achieved by ensuring that the working conditions of its suppliers' employees are decent, the products or services purchased are sustainable, where possible, and that socio- economic issues, such as inequality and poverty, are addressed.

# GENERAL CONDITIONS OF CONTRACT (GCC)

BSES

# GENERAL CONDITIONS OF CONTRACT (GCC)

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

## 1. General Instructions & Applicability

1.1. All Bids shall be prepared and submitted strictly in accordance with these instructions. The Bidder shall be solely responsible for all expenses incurred in the preparation and submission of the Bid. Under no circumstances shall the Purchaser be held liable for such costs, regardless of the outcome of the bidding process.

1.2. The Purchaser reserves the right to seek clarifications or additional information from any Bidder at any stage of the evaluation process. The Purchaser may, at its discretion, reject any Bid that is incomplete, non-responsive, or fails to meet the requirements stated in the Bid Documents. The decision of the Purchaser regarding the responsiveness or rejection of any Bid shall be final and binding, without any financial or other obligation on its part.

1.3. The Bidder shall be deemed to have carefully examined, read, and fully understood all instructions, terms, conditions, and technical requirements specified in the Tender Documents prior to submission of its Bid.

## 2. Definitions and Interpretations

2.1. COMPANY / OWNER / PURCHASER / BUYER / CUSTOMER shall mean BSES Rajdhani Power Limited (BRPL), a company incorporated under the Companies Act, 2013, having its registered office at BSES Bhawan, Nehru Place, Delhi – 110019. The expression shall include its authorized representatives, agents, successors, and permitted assigns.

2.2. BIDDER / SELLER / SUPPLIER / VENDOR / CONTRACTOR / AGENCY / MANUFACTURER shall mean the entity submitting a quotation or proposal in response to this bid enquiry issued by the Purchaser. The term Contractor refers to the successful Bidder(s) whose bid has been accepted by the Purchaser and on whom the Letter of Acceptance or Letter of Award is issued, and shall include the Contractor's heirs, legal representatives, successors, and permitted assigns, wherever applicable.

2.3. OFFER SHEET shall mean the Bidder's formal and firm offer submitted to BRPL in accordance with the specifications set forth in the Bid Documents.

2.4. CONTRACT PRICE/RATE shall mean the price specified in the Letter of Intent, Letter of Award, Rate Contract, or Purchase Order, as applicable.

2.5. SITE shall mean the location(s) where the Works, Goods, or Services are to be delivered, installed, commissioned, or executed, as specified elsewhere in the Tender Documents.

2.6. STORE shall mean the designated area or location where goods and materials are stored, or as otherwise defined in the Contract.

2.7. ENGINEER IN CHARGE shall mean the Company's authorized or nominated representative responsible for supervising and administering the execution of the Works under the Contract.

2.8. APPLICABLE LAW shall mean the Constitution of India and all laws, rules, regulations, directives, notifications, codes, orders, or instructions having the force of law as issued by any competent legislative or governmental authority, including but not limited to laws relating to taxes, duties, assessments, expropriation, and compulsory acquisition, as amended from time to time. Any resulting implications shall constitute a Change in Law or Change in Permits, as applicable.

2.9. OTHER CLEARANCES shall mean all consents, approvals, permits, or authorizations required to be obtained from governmental or local authorities necessary for commencing or completing the work.

2.10. DEFECT LIABILITY PERIOD shall mean the period during which the Contractor shall remain responsible for the repair or replacement of any defective part of the Works executed under the Contract, at no additional cost to the Purchaser.

2.11. TENDER SPECIFICATION shall mean the technical and commercial requirements, Indian Standard specifications, and description of works detailed in the Tender Documents, including all documents and references expressly or implicitly forming part of the Tender.

2.12. SPECIFICATIONS shall collectively mean all stipulations contained in the RFQ, Commercial Terms and Conditions, Instructions to Bidders, Technical Specifications, and any Amendments, Revisions, Deletions, or Additions issued by the Purchaser from time to time.

2.13. CODES AND STANDARDS shall mean all applicable codes and standards referred to or implied in the Specifications.

2.14. CHANGE OF WORK shall mean any addition, deletion, suspension, or modification to the scope, quality, functionality, or requirements of the Work as defined in the Contract, resulting in a corresponding change to the Technical Specifications and/or completion schedule.

2.15. GOOD INDUSTRY PRACTICE shall mean the level of skill, care, diligence, prudence, and foresight reasonably expected from a competent and experienced service provider engaged in similar activities under similar circumstances, in compliance with prevailing laws, regulations, and industry standards.

2.16. CONTRACT shall mean the agreement formed by the Letter of Award or Acceptance, Purchase Order or Work Order, Special Conditions of Contract (SCC), General Conditions of Contract (GCC), the Tender and its Annexures, and all addenda, corrigenda, and clarifications issued by the Purchaser.

2.17. EFFECTIVE DATE OF CONTRACT shall mean the date of issuance or award of the Contract, which shall also be deemed the Contract Commencement Date.

2.18. CONTRACT PERIOD shall mean the total duration agreed upon between the Contractor and Purchaser for execution of the Contract, inclusive of any extended contract period for reason beyond the control of the Contractor and/or Purchaser due to force majeure.

2.19. CONTRACT COMMENCEMENT DATE shall mean the date of issuance or award of the Contract, which shall be deemed the Effective Date of Contract.

2.20. CONTRACT COMPLETION DATE shall mean the date marking the expiry of the Guarantee or Defect Liability Period, which shall be deemed the Contract Completion Date.

2.21. ACCEPTANCE shall mean and deemed to include one or more of the following as will be stipulated in the specification:

2.21.1. Written approval by the Purchaser's Inspector authorizing dispatch of material from the Supplier's works.

2.21.2. Acceptance of material at Purchaser site stores after its receipt and due inspection/ testing and release of material acceptance note.

2.21.3. In case of supply and installation contracts, acceptance shall mean issuance of the Equipment/Material Takeover Receipt after successful installation, commissioning, and final acceptance.

## 3. Contract Documents Priority & Formation

3.1. The documents forming the Contract shall be read as mutually explanatory. In case of any ambiguity or discrepancy, the same shall be clarified and resolved by the Purchaser, whose interpretation shall be final. Unless otherwise provided, the order of precedence of Contract documents shall be as follows:

3.1.1. Contract Agreement/Purchase Order/Work Order
3.1.2. Letter of Acceptance / Letter of Intent / Letter of Award
3.1.3. Agreed Minutes of the Tender Negotiation Meetings
3.1.4. Agreed Minutes of the Tender Technical Meetings
3.1.5. Priced Bill of Quantities
3.1.6. Technical Specifications, Drawings, and Scope of Work
3.1.7. Tender Document including all Appendices, Addenda, and Corrigenda (latest revisions to take precedence)
3.1.8. Applicable Codes and Standards

3.2. In the event of any inconsistency, the interpretation most consistent with achieving the Project's technical, legal, and statutory objectives shall prevail. No oral communication or instruction shall supersede the written Contract documents.

## 4. Governing Laws & Dispute Resolution

4.1. The Contract shall be governed by and interpreted in accordance with the laws of India.

4.2. Any dispute, controversy, or claim arising out of or relating to this Contract, or the breach, termination, or invalidity thereof, shall first be sought to be resolved amicably through mutual consultation between the Parties.

4.3. In the event that an amicable resolution is not achieved within a reasonable period, the dispute shall be referred to arbitration in accordance with the provisions of the Arbitration and Conciliation Act, 1996, as amended by the Arbitration and Conciliation (Amendment) Act, 2023. The Arbitral Tribunal shall consist of three (3) arbitrators — one to be appointed by each Party, and the third, who shall act as the presiding arbitrator, to be jointly appointed by the two arbitrators so nominated.

4.4. The seat and venue of arbitration shall be New Delhi, India, and the language of proceedings shall be English. The arbitral award rendered by the Tribunal shall be final and binding upon both Parties.

## 5. Change in Law

5.1. Change in Law shall mean the occurrence of any of the following events after the Effective Date of the Contract:

5.1.1. The enactment or coming into force of any new Applicable Law.
5.1.2. Any amendment, modification, alteration, or repeal of an existing Applicable Law, or the issuance of any new or revised directive, regulation, or order thereunder.
5.1.3. Any change or variation in the rate, nature, or applicability of taxes, duties, levies, or charges payable in connection with this Contract.

5.2. In the event of any Change in Law, the impacted Party shall promptly notify the other Party in writing with relevant details.

5.3. If such Change in Law results in any increase or decrease in the cost, expense, or liability of the Supplier in performing its obligations under the Contract, an equitable adjustment shall be made to the Contract Price and/or the Schedule of Completion as mutually agreed between the Parties.

5.4. The Parties agree to negotiate in good faith to reasonably compensate or adjust obligations affected by such Change in Law to ensure the fair performance of the Contract.

## 6. Site Examination & Local Conditions

6.1. The Bidder shall be deemed to have visited and examined the site(s) of the Works and to have satisfied itself as to all existing site conditions and relevant information affecting the execution of the work.

6.2. Prior to submitting its Bid, each Bidder shall, at its own cost and expense, undertake or procure any additional investigations, explorations, tests, studies, and obtain any supplementary data relating to the physical conditions at or adjacent to the site which may influence the cost, duration, progress, or performance of the Works. The Bidder shall rely solely on such investigations and information in preparing its Bid and in fulfilling the Contract.

6.3. The Purchaser shall not entertain any claims or requests for adjustment in contract price, schedule, or any other terms arising from unforeseen or difficult site conditions, terrain, or local circumstances, once the Bid has been submitted.

6.4. The Bidder must see the site of the work, surrounding locality, local traffic rules, site approaches etc. carefully. No claim of any sort shall be entertained on account of any site conditions. If any approach from main road is required or existing approach is to be improved and maintained, for carriage of materials by the Bidder, the same shall be provided, improved and maintained by him at his own cost.

## 7. Language, Measurement & Precedence

7.1. The Contract issued by the Company to the Contractor, along with all related correspondence, documents, instructions, and communications, shall be prepared and maintained in the English language. In case of any translation of Contract documents, the English text shall prevail and govern in the event of any conflict or ambiguity.

7.2. All dimensions, units, quantities, and measurements shall be expressed and interpreted strictly in accordance with the Metric System (International System of Units - SI). Any deviation or alternative units must be clearly specified and mutually agreed upon in writing.

## 8. Scope of Work & Responsibilities

8.1. The scope of work under this Contract shall encompass turnkey execution on an end-to-end basis, including but not limited to Design, Engineering, Manufacture, Shop Testing, Inspection, Packing, Dispatch, Supply, Loading, Unloading, Storage at Site, Assembly, Erection, Complete Pre-Commissioning Checks, Testing & Commissioning at Site, Documentation, Training, Obtaining Statutory Clearances & Certifications from the Electrical Inspector, and the Final Handing Over of the Complete Projects covered under this tender to BSES Rajdhani Power Ltd. (BRPL). This shall include comprehensive Marine cum Storage cum Erection Insurance Policy (MSE), provided on a on Single Point responsibility basis.

8.2. 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

8.3. All works shall be performed strictly in accordance with the NIT conditions and applicable technical specifications. The Contractor shall comply rigorously with all relevant laws, codes, safety regulations, labour statutes, and environmental standards.

8.4. The detailed scope of supplies and services for the successful completion, testing, commissioning, and handover of the awarded packages shall be as set forth in the NIT. The Bidder shall quote against the Bill of Quantities listed in Volume II of this RFQ. Any materials or services not specifically mentioned in the BOQ but required for successful erection, testing, and commissioning shall be deemed included within the Bidder's scope.

8.5. Variations in quantities or additional requirements, if any, will be communicated to the successful Bidder during project execution, with site conditions potentially influencing such changes.

8.6. All related drawings, data, and instruction manuals shall be provided as required.

8.7. Digital Documentation & E-Governance: All submissions, including but not limited to drawings, Quality Assurance Plans (QAP), Factory Acceptance Test (FAT) and Site Acceptance Test (SAT) reports, invoices, test certificates, and project progress reports shall be provided digitally via the Purchaser's designated portal or email as specified.

8.8. Unforeseeable Sub-Surface Conditions: If during execution the Contractor encounters sub-surface conditions differing from those indicated by existing soil tests or its own investigations, necessitating changes in method or corrective actions, all associated costs shall be borne solely by the Contractor. No time or cost compensation shall be granted by the Purchaser for such conditions.

8.9. Construction Water and Power: The Contractor shall arrange and bear all costs for construction water and power supply, including installation, operation, and maintenance of pumps, storage tanks, and distribution systems as required on site.

8.10. Watch & Ward and Lighting: The Contractor shall be solely responsible for the provision and maintenance of lights, guards, fencing, and security arrangements, including round-the-clock security with CCTV coverage for materials stored on site. Adequate number of trained security personnel must be deployed at storage yards, stores, and work areas to prevent theft, pilferage, or damage. Compliance with BRPL's site safety and security regulations is mandatory.

8.11. Site Office, Facilities & Storage at Site: The Contractor shall arrange accommodation and conveyance for its staff and shall be allocated sufficient space for site stores. Storage must allow easy access for identification and inspection, comply with IS: 4082, and all incoming/outgoing materials must be recorded in a register maintained by the Contractor. The Contractor assumes full responsibility for safeguarding all materials and shall provide adequate weather protection. BRPL disclaims any liability for loss or damage. The Contractor shall maintain site cleanliness and prevent pollution; breach of this will result in removal of personnel and penalties at the discretion of the Engineer-in-Charge (EIC).

8.12. The Contract Price inclusive of insurance for loading/unloading, storage, handling, and erection during execution. No separate charges for barricading or watch & ward will be paid. No idle labour charges will be admissible in the event of any suspension of work by the Company or stoppage caused in the work due to any other reason resulting in Bidders' labour or equipment being rendered idle at any time during the duration of contract.

8.13. Identity Cards (ID Cards) shall be issued exclusively by BRPL Security ID Card Cell. Contractors must maintain records and return IDs upon employee termination. Non-compliance will attract penalties. A detailed employee deployment list must be submitted to BRPL Security before contract commencement.

8.14. Site Supervision and Advance Intimation: The Contractor shall appoint a dedicated Site In-Charge or Project Manager and support team to be present on-site throughout contract duration, as certified by the EIC. The Contractor is responsible for supervision by qualified personnel to ensure compliance with drawings, specifications, and instructions. The Contractor shall submit for approval the site organizational structure and personnel details upon receipt of the LOI or Work Order.

8.15. Written approvals from the EIC must be obtained before commencement of works, including timely submissions of plans for resource deployment, material procurement, and key activities.

8.16. Necessary Statutory Clearances from CEI of Delhi & any other authority for energizing shall be in the scope of the Bidder. Electrical Inspector Clearance fees shall be in Bidder's scope. The related fees, payments and pursuance work shall be in scope of Bidder only

8.17. Coordination with Other Agencies: The Contractor shall collaborate closely with BRPL and other appointed agencies, extending site facilities, plants, and equipment as requested without additional cost.

8.18. The Contractor shall procure necessary permissions (e.g., road cutting clearance) from road owning agencies & local authorities; statutory fees will be borne by BRPL. There will be no price escalation given to bidder even if there is delay in the project due to ROW permission

8.19. All labor, equipment, tools, scaffolding, and materials form part of the Contractor's scope. A qualified workforce and technical staff list must be submitted to the EIC promptly post-award, including relevant certifications.

8.20. The Contractor shall arrange accommodation and transport for staff at site.

8.21. Delivery of major items (GIS, PTR, Cable, etc.) must align with site progress. OEM shall perform joints and terminations; the Contractor shall provide full support.

8.22. The Contractor shall manage receipt, unloading, marking, staking, and storage of materials, ensuring insurance coverage. Copies of insurance policies must be provided to BRPL. Any damage or loss requires immediate claim lodging by the Contractor, with prompt replacement to avoid delays. For all the insurance policies taken, Contractor shall be responsible for settlement of claims with the underwriters without any liability on the purchaser and will arrange replacements/ rectification expeditiously without waiting for the settlement of insurance claim, at contractor's own cost and this shall not entitle the Contractor for any extension of Time and Cost Overrun.

8.23. Material movement (loading/unloading) and use of cranes, hydras, trailers fall under the Contractor's responsibility.

8.24. Adequate weather protection is required for materials against sun and rain.

8.25. Cable Handling: During trenchless or open digging, underground cable damage risks mandate pre-excavation use of Cable Route Tracer devices approved by BRPL; reports must be submitted for clearance. Failure to comply shall result in heavy penalties for cable damage.

8.26. Cable laying works require follow-up sheath voltage tests, availability of appropriate tools/testing equipment, and submission of cable laying schedules for quality checks.

8.27. Statutory Compliance and Certification: Obtaining Electrical Inspection Clearance (EIC) certification from BSES Electrical Inspector (up to 33kV) and other statutory authorities (above 33kV) for substation commissioning is the sole responsibility of the Contractor.

8.28. 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.

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

## 9. Specifications, Codes & Standards

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

9.2. Product manufacturer or brand names cited in the Contract Documents serve solely to define the required type and quality of products. The Bidder shall not substitute or alter the specified brands or product qualities without the express prior written consent of BRPL. All products and equipment must be used or installed in full compliance with the original manufacturer's guidelines unless otherwise instructed by BRPL.

9.3. In all cases, the Bidder must comply with relevant codes, standards, and requirements prescribed by any applicable government agencies.

9.4. In the absence of specific BSES standards, the Bidder shall follow the relevant Indian Standards (IS) or International Electrotechnical Commission (IEC) standards as applicable.

## 10. Representations and Warranties

10.1. The Contractor represents and warrants that it possesses full legal capacity, valid licenses, permits, and approvals required to perform all obligations under this Contract.

10.2. The Contractor warrants that all Goods supplied under this Contract:
- 10.2.1. Are brand new and free from any defects in design, materials, and workmanship
- 10.2.2. Fully conform to the Contract specifications and requirements
- 10.2.3. Are suitable and fit for the intended purpose as specified in the Contract documents

10.3. The Contractor further warrants that all Services performed shall be executed with the highest degree of skill, care, and diligence consistent with Good Industry Practice and prevailing professional standards.

## 11. Ethics, Integrity & Code of Conduct

11.1. The Contractor shall fully comply with all anti-bribery, anti-corruption, conflict of interest, gifts and gratuities, and integrity policies issued or communicated by the Purchaser. For Contracts exceeding specified thresholds, the Contractor shall be required to execute an Integrity Pact as per the Purchaser's guidelines.

11.2. Any breach of these ethics and integrity obligations by the Contractor may lead to disciplinary actions including, but not limited to, termination of the Contract, forfeiture of performance security deposits, recovery of losses incurred by the Purchaser, debarment from future procurement opportunities, and reporting to relevant regulatory or enforcement authorities.

## 12. Sustainability, ESG & Legal Compliance

12.1. The Contractor shall implement an Environmental, Social, and Governance (ESG) program appropriate to the scope of work, which shall include but is not limited to:

12.1.1. Compliance with applicable Extended Producer Responsibility (EPR), electronic waste, hazardous waste, plastic waste, and battery waste management regulations;
12.1.2. Adherence to RoHS/REACH standards where applicable;
12.1.3. Design and supply of energy-efficient products meeting prescribed star ratings or efficiency classes;
12.1.4. Take-back and responsible disposal or recycling of packaging and end-of-life equipment where mandated;
12.1.5. Occupational health and safety management systems aligned with IS/ISO 45001;
12.1.6. Social safeguards including prohibition of child labour, forced labour, assurance of fair wages, and provision of safe and dignified workplaces.
12.1.7. Adoption of environmentally responsible practices such as waste minimization, recycling, and strict prohibition of hazardous materials usage, in accordance with relevant laws and regulations.

12.2. The Contractor shall support the Purchaser's Scope-3 greenhouse gas emissions tracking efforts by submitting quarterly reports detailing the embodied carbon content of supplied goods (where available) and associated logistics emissions. The Contractor shall provide reasonable assistance in this regard at no additional cost.

12.3. The Contractor shall prioritize the use of recycled or returnable packaging materials and minimize single-use plastics except where necessary for product protection. All wooden packaging shall be sourced from legally compliant suppliers. Pallets, drums, and similar packaging materials shall be collected and returned for reuse or recycling where feasible.

12.4. The Contractor shall maintain accurate records, documentation, and evidence of compliance with all ESG requirements and shall provide such information to BRPL or relevant authorities as reasonably requested, in the format and frequency specified.

## 13. Data & Cybersecurity

13.1. For any scope involving software, firmware, or networking components, the Contractor shall:
13.1.1. Provide comprehensive cyber hardening guidelines;
13.1.2. Maintain a vulnerability disclosure window of thirty-six (36) months following delivery;
13.1.3. Deliver timely security patches and firmware updates as they become available;
13.1.4. Supply a software bill of materials (SBOM) listing all software components included;
13.1.5. Ensure no hard-coded credentials exist in delivered software or devices.
13.1.6. Any connection to the Purchaser's network must be authorized in writing prior to implementation.

13.2. The Contractor shall handle any personal data processed in relation to this Contract in full compliance with applicable data protection laws. Appropriate technical and organizational security measures must be implemented, and the Contractor must promptly notify the Purchaser of any data breaches or security incidents impacting Purchaser data.

## 14. Local Content and Eligibility

14.1. The Contractor shall comply fully with the Public Procurement (Preference to Make in India) Order and related norms. This includes submitting accurate declarations of local content in goods and services, and consenting to verification and audits by the Purchaser or authorized agencies. Any false or misleading declarations shall entitle the Purchaser to disqualify the Contractor, terminate the Contract, and impose debarment as per applicable regulations.

14.2. Bidders originating from countries sharing land borders with India must adhere to the registration and eligibility criteria specified by the Government of India. Failure to comply with these requirements will render the bid ineligible for consideration and may lead to Contract termination if discovered post-award.

## 15. Manufacturing Approvals & Clearances

15.1. Transmittal approval documents - including Guaranteed Technical Parameters (GTP), drawings, Quality Assurance Plans (QAP), and other relevant documents - shall be submitted as per the approved project schedule to the designated BRPL official for review and approval. BRPL shall provide approval or comments within seven (7) calendar days of the initial submission. Should resubmission be required, the Contractor shall complete it within five (5) calendar days. Subsequent approvals or comments from BRPL on such resubmissions will be issued within five (5) calendar days. Repeated resubmissions are discouraged and may impact timelines.

15.2. Manufacturing activities shall commence only after the Contractor receives formal transmittal approval and manufacturing clearance from BRPL.

15.3. All documents submitted for transmittal approval must reflect pre-award discussions and confirmations between BRPL and the Contractor to ensure accuracy and compliance.

15.4. Delays in obtaining transmittal approval shall not be accepted as valid grounds for extension of delivery timelines or waiver of liquidated damages.

15.5. The Contractor shall submit the complete Quality Assurance Plan (QAP) or Factory Quality Plan (FQP) covering the entire scope within four (4) weeks of issuing the Letter of Acceptance (LOA) or Purchase Order for Employer/Owner approval. All works shall be conducted strictly in accordance with the approved QAP.

## 16. Errors, Omissions & Discrepancies

16.1. The Contractor shall be solely responsible for all discrepancies, errors, and omissions found in the drawings, documents, or any other information submitted by it, regardless of whether such submissions have been approved, reviewed, or accepted by BRPL. Notwithstanding the foregoing, any design or drawing errors directly resulting from inaccurate or incomplete data or written instructions furnished by BRPL shall not be attributed to the Contractor.

## 17. Quantity Variations, Extra Items/Works

17.1. The Contractor shall execute and complete the Work fully in accordance with the Contract and under the directions and satisfaction of the Engineer-in-Charge (EIC).

17.2. The EIC may issue, at their discretion, further drawings, written instructions, details, directions, and explanations (hereinafter referred to as "EIC's Instructions"), relating to:

- 17.2.1. Variation or modification in design, quality, specifications, quantity; omission or substitution of any work.
- 17.2.2. Timing or sequencing of work.
- 17.2.3. Discrepancies between drawings, Bill of Quantities, and/or specifications.
- 17.2.4. Removal and substitution of any materials, equipment, or resources brought to site by the Contractor.
- 17.2.5. Execution of additional work deemed necessary for completion.
- 17.2.6. Removal and/or re-execution of any work executed.
- 17.2.7. Substitution of any personnel employed on site.
- 17.2.8. Rectification of defects under the "Defects Liability" clause.
- 17.2.9. Opening for inspection of any covered work.
- 17.2.10. Changes in lines, levels, positions, or dimensions of any part of the Work.

17.3. The Contractor shall comply promptly with all EIC's Instructions. Verbal instructions involving variations must be confirmed in writing by the Contractor within seven (7) days and approved in writing by the EIC.

17.4. If the EIC's Instructions require work beyond the Contract scope and are not due to Contractor's breach, the EIC shall compensate the Contractor for such work as extra, valued as provided herein.

17.5. Variations shall not invalidate or vitiate the Contract. The value of all variations shall be considered in the final certification.

17.6. No variation shall be undertaken without written instructions from the EIC, except for quantity variations resulting naturally from site conditions. Verbal instructions must be confirmed in writing by the EIC within thirty (30) days of Contractor's written confirmation.

17.7. Extra or additional work instructed by the EIC shall be valued at Contract rates. Absent applicable rates, pricing shall be agreed based on:
- 17.7.1. Quoted rates for similar tender items.
- 17.7.2. If unavailable, calculation based on:
  - 17.7.2.1. Direct labour costs plus indirect charges, based on related BIS codes and standard consumption factors or as accepted by EIC.
  - 17.7.2.2. Material cost inclusive of taxes, duties, and delivery to site with invoice proof.
  - 17.7.2.3. Plant and equipment hire and operational charges per standard norms or as accepted by EIC.
  - 17.7.2.4. Overheads and profit payable to Contractor.

17.8. If work is incomplete or non-compliant with specifications, the EIC may approve payment at reduced rates considered reasonable.

17.9. Contractor shall submit detailed rate analyses and supporting documents when requested. EIC's valuation of claims shall be final and binding.

17.10. Quantities listed in the Bill of Quantities (BOQ) are estimates and subject to re-measurement. Contractor shall not claim loss of profit or damages due to quantity differences or omission of work.

17.11. Rates in the BOQ shall remain firm regardless of variations in quantities or total Contract sum.

## 18. Free Issue Materials/Equipment

18.1. Materials and equipment provided as Free Issue by the Purchaser to the Bidder for fulfilling obligations under this Agreement shall remain the exclusive property of the Purchaser. The Bidder shall clearly label and identify such Free Issue Items as the Purchaser's property until the completed Goods are delivered in accordance with the Agreement terms.

18.2. Risk of loss or damage to all Free Issue Items shall transfer to the Bidder upon receipt and shall remain with the Bidder until the completed Goods are delivered to the Purchaser as per the Agreement.

18.3. The Bidder shall take all necessary measures to preserve and maintain the Free Issue Items in good condition and shall utilize them solely for the purposes stated in the Agreement.

18.4. Disposal or management of any surplus Free Issue Items shall strictly follow written instructions provided by the Purchaser.

18.5. The Bidder shall execute and submit an Indemnity Bond, in a format approved by the Purchaser, covering the custody, use, and return of Free Issue Items.

## 19. Quality Assurance, Inspection, Testing and Test Certificates

19.1. The Contractor shall procure all equipment solely from authentic sources approved by the Company and as per Company specifications.

19.2. The Contractor shall prepare a detailed Quality Assurance Plan (QAP) and test procedures identifying all manufacturing stages, associated quality checks, raw material inspections, and Customer hold points. This document shall include inspection methods, acceptance criteria, and standards. The Contractor must obtain Purchaser approval prior to manufacturing commencement. The Purchaser retains the right to review Contractor's in-house inspection reports and quality checks at stages other than Customer hold points and may issue remarks requiring additional testing, rectification, or rejection, which the Contractor shall comply with.

19.3. Witness and Hold points represent critical inspections or tests during manufacturing where the Contractor must notify the Purchaser in advance to enable witnessing. Final inspection is a mandatory hold point. Work shall proceed beyond any hold point only after explicit clearance by the Purchaser or receipt of a witness waiver letter.

19.4. The Purchaser's waiver of any quality assurance activity at any stage shall not exempt the Contractor from fulfilling all Contract requirements, codes, and referenced standards, nor preclude the Purchaser from subsequently rejecting non-conforming materials or work.

19.5. The contractor shall submit all test certificates and joint inspection reports related to equipment's/materials, wherever applicable.

19.6. Manufacture items shall not be dispatched without prior receipt of a Material Dispatch Clearance Certificate (MDCC) or explicit instructions from the Purchaser.

19.7. All in-house testing and inspections shall be conducted at no additional cost. Such inspections shall be overseen by the Purchaser or its authorized third-party inspection agency. Costs of futile or abortive inspection visits shall be deducted from Contractor invoices. The Bidder shall provide at no additional cost to the Company such assistance, instruments, machines, labour and materials as are normally required for examining, measuring and testing any work and the quality, weight or quantity of any material used and shall supply samples of materials before incorporation in the works for testing as may be selected and required by the EIC.

19.8. Cement shall be of grade 43 ordinary port land cement conforming to IS 8112/53 grade O.P.C. conforming to IS 12269, aggregate for cement concrete shall confirm to IS 383, reinforcement for cold twisted bars shall confirm to IS 1786, the bricks for brick work shall correspond to IS 1077, Structural steel shall confirm to relevant IS code, water to be used shall comply with requirement of IS 456. Bidder shall provide all requisite facilities for field tests and laboratory tests shall be carried out in the laboratory having ISO 9001-2000 Certified Testing Lab for which no extra payment shall be made. The Bidder shall maintain mandatory Test Register with Engineer-in-Charge as provided in latest Indian Standard Specifications

19.9. All samples shall be supplied to Company if required by the Bidder at his own cost. The Bidder shall take approval of the EIC prior to start the work for all samples of materials including mix design of concrete to be utilized for the works to be executed. The mix design of concrete, testing of reinforcement steel and structural steel shall be carried out by an external agency approved by the Company. The cost of all such tests carried out by the external agencies or consultants shall be borne by the Bidder at his own cost and are deemed to be included in the unit rates quoted in the BOQ. The Bidder can also have concrete cubes tested in an approved laboratory in lieu of a testing machine at site but at his own cost and with the prior written consent of the Company. The Engineer-in-Charge/QC department or any person authorized by them shall at all times have access to the works and to all workshops and places where work is being prepared or from where materials, manufactured articles or machinery are being obtained for the works and the Bidder shall afford every facility for and every assistance in or in obtaining the right to such access.

19.10. No work shall be covered up or put out of view without the approval of the EIC or his representative and the Bidder shall afford full opportunity to the EIC or his representative to examine and measure any work which is about to be covered up or put out of view and to examine foundations before permanent work is placed thereon. The Bidder shall give due notice to the EIC or his representative whenever any such work or foundations is or are ready or about to be ready for examination and the EIC or his representative shall, without unreasonable delay, unless he considers it unnecessary, attend for the purpose of the examining such foundations.

19.11. The Purchaser reserves the right to send any supplied material to recognized laboratories for testing at any time, with testing costs borne by the Contractor. If materials fail to meet the specified technical requirements, the Contractor shall bear all associated charges and penalties. To prevent dispute, the Contractor should appoint a representative to witness material sealing at the storage site before dispatch for testing.

## 20. Inspection & Test Charges

20.1. The Goods shall be subjected to inspection by the Purchaser and/or a third-party inspection agency appointed by the Purchaser. Such inspections shall include stage-wise and final inspections as per the mutually agreed Quality Assurance/Quality Control (QA/QC) procedures. Additionally, inspections may be conducted at the Purchaser's site or storage facilities. The Contractor shall repair or replace any damaged or rejected Goods to the satisfaction of the Purchaser at no additional cost.

20.2. Inspection charges are included in the total contract value, whereas third-party inspection fees shall be borne by the Purchaser. However, any costs arising from futile or abortive visits by the Purchaser's inspectors to the Contractor's premises shall be deducted from the Contractor's invoices.

20.3. No shipment of Goods, whether in whole or in part, shall be made under this Purchase Order until the Contractor has received a written Release for Shipment Notice from the Purchaser or its authorized representative.

20.4. Requests for stage-wise or pre-dispatch inspections must be submitted to the Purchaser at least seven (7) days in advance, utilizing the official request format provided by BRPL.

## 21. Documentation

21.1. The Contractor shall procure all materials and equipment exclusively from BRPL-approved sources, strictly adhering to BRPL specifications and Transmittal Approvals. The Contractor shall submit copies of all relevant Material and Type Test Certificates, Operation and Maintenance (O&M) Manuals, as well as Approved and As-built drawings for the supplied equipment. Compliance with BRPL's specifications and Field Quality Procedures is mandatory and must be ensured by the Contractor throughout the project.

## 22. Packing, Handling, and Storage

22.1. Packing: The Contractor shall pack, or cause to be packed, all Commodities in suitable crates, boxes, drums, containers, cartons, or other appropriate packaging to ensure safe shipment by road or rail to BRPL's Delhi/New Delhi stores or site. Packaging shall provide adequate protection to prevent damage during transit. Wherever feasible, biodegradable packaging materials should be used in compliance with prescribed environmental standards.

22.2. Packing List: Each package shall contain a detailed packing list itemizing the contents with exact weight, external dimensions (length, width, and height), Item SAP Code, Purchase

Order number, and date. One copy of the packing list must be enclosed inside each package delivered.

22.3. Prior to commencement of supply, the Contractor shall provide the Material Safety Data Sheet (MSDS) and detailed handling and storage instructions or manuals, where applicable. A copy of these documents shall be submitted and maintained at the storage or site location along with the first lot of materials delivered.

## 23. Delivery Terms & Address

23.1. The Goods shall be delivered to BRPL's designated Store(s) and/or Site(s). All shipments shall be made on a Free on Road (FOR) destination basis, inclusive of any applicable local taxes and duties.

23.2. The Contractor shall be responsible for unloading of the Goods at the respective BRPL Store(s) or Site(s).

23.3. Where applicable, the Contractor shall ensure issuance of all required transit documents, including E Way Bills, necessary for lawful transportation of the Goods. The logistics partner or transporter shall not be held liable for any loss, penalties, or confiscation arising due to improper documentation or mis-declaration.

## 24. Transportation

24.1. The Contractor shall be responsible for arranging the transportation of Goods from the Contractor's or Sub-Contractor's works or warehouses to the Buyer's designated Store(s) or Site(s).

24.2. All charges related to transportation from the Contractor's works to the Buyer's Store(s) or Site(s) are deemed included in the total order value and shall not be billed separately.

## 25. Transit Insurance

25.1. The Contractor shall be responsible for arranging Transit Insurance for all materials and Goods.

25.2. In the event of damage or loss of cargo during transit, the Contractor shall coordinate directly with the relevant insurance company to procure insurance coverage, lodge claims, and facilitate settlement. Regardless of the insurance outcome, the Contractor must replace and deliver the damaged or lost Goods to the Purchaser within thirty (30) days of the incident, at the Contractor's sole expense, including all associated costs for replacement and delivery.

## 26. Acceptance & Rejection of Goods

26.1. Goods shall be accepted only upon receipt of the Material Dispatch Clearance Certificate (MDCC).

26.2. The Purchaser shall not accept materials if LR/ RR / Bilty and the Original Tax Invoice (Transporter Copy) are not handed over at store/site. The Contractor shall draw all dispatch documents in favour of Purchaser as Consigned to and billed to.

26.3. The materials shall be supplied during working hours from 10AM to 5PM. No delivery shall be effected after this time unless prior intimation is given to the Purchaser.

26.4. The Contractor shall take signature of the authorized person at store/site with Purchaser's seal duly receipting the materials and the quantities in the absence of which payment shall not be made by the Purchaser.

26.5. The Contractor shall ensure exact quantities are supplied as per MDCC and if the quantities are short-supplied, as per verification at the Contractor's store/site, the same shall be adjusted and net payment shall be made accordingly.

26.6. The Purchaser retains the exclusive right to reject any goods that do not comply strictly with the terms and conditions of this Purchase Order.

**27. Price Validity**

27.1. For Contractors awarded the contract, the agreed prices shall remain fixed and valid throughout the entire duration of the contract until its completion.

**28. Prices/Rates/Taxes**

28.1. Price basis for supply of materials & services:

28.1.1. The contract price/rates finalized for this contract shall be firm for the entire duration of the contract and are not subject to any variation and escalation for any reason whatsoever.

28.1.2. The supply prices are inclusive of packing, forwarding, and loading at manufacturer's premises, payment of GST, Freight, and any other local charges. Octroi is presently not applicable in Delhi and however if applicable shall be reimbursed at actuals.

28.1.3. The supply prices shall also include unloading at BRPL Delhi/New Delhi stores/sites.

28.1.4. Transit insurance shall be arranged by the Contractor at no additional cost to the Purchaser.

28.1.5. GST is included in the total contract price. GST payments will be processed only upon submission of the Contractor’s valid GST registration and a self-declaration on the Contractor’s letterhead confirming GST compliance and deposit as per applicable laws. The Contractor must provide their GST registration number.

28.1.6. Income Tax (IT) at applicable rates will be deducted from Contractor invoices as Tax Deduction at Source (TDS).

**29. Taxes & Duties**

29.1. All taxes, duties, turnover tax, labour cess, etc. (except GST) levied by State or Central Governments or local bodies shall be borne by the Contractor. Any new taxes and duties levied by the government during the term of this Agreement shall be borne by BRPL. Income tax and TDS will be deducted at source from the Contractor’s invoices as applicable. The Contractor must furnish their GST registration number.

29.2. GST on actuals will be paid upon submission of GST registration and a self-declaration on the Contractor’s letterhead confirming that the tax has been or will be deposited as per applicable tax laws.

29.3. As per Notification No. 39/2021 # Central Tax dated 21st December 2021, effective from 01/01/2022, a registered person (i.e., Recipient/Purchaser) can claim input tax credit only for invoices reflected in GSTR2A or GSTR2B (which requires 100% matching of invoices). Suppliers must deposit GST by filing GSTR-1 and GSTR-3B.

29.4. If the Supplier/Contractor fails to comply and the Recipient/Purchaser cannot avail input tax credit due to non-filing or non-compliance of GSTR-1 and GSTR-3B for the month/quarter of supply, the Recipient/Purchaser reserves the right to withhold 100% of the GST amount from subsequent payments until the default is rectified.

29.5. To release withheld payments under the GST Act, the Supplier/Contractor must submit proof of payment via GST Portal screenshots reflecting the Recipient/Purchaser's name, along with the relevant GSTR-1 and GSTR-3B filings for the applicable period. Payments will not be released until such proof is provided.

29.6. Furthermore, the Recipient/Purchaser reserves the right to recover any financial loss incurred (including tax, interest, penalties, and loss of input credit) due to the Supplier/Contractor's non-compliance or non-filing of GSTR-1 and GSTR-3B.

29.7. For goods delivered on FOR site basis, the Supplier/Contractor is responsible for complying with all rules regarding the issuance of E-way bills. Any violation may result in penalties and seizure of goods during transit. All penalties and pre-deposits related to such violations shall be borne by the Supplier/Contractor. The Supplier/Contractor is also responsible for ensuring timely release of seized goods. Any supply delay caused by seizure shall attract liquidated damages as per contract provisions.

29.8. For goods not covered under GST, applicable Excise Duty (ED), VAT, or CST shall be payable extra at prevailing rates.

29.9. BRPL Tax Details:
29.9.1. GSTIN: 07AAGCS3187H2Z3
29.9.2. PAN No.: AAGCS3187H

29.10. The Seller must submit a detailed statement of invoices and amounts to the concerned officer within seven (7) days after the end of each month corresponding to the supply period. Failure to submit shall be taken as no requirement for reconciliation.

## 30. Variation in Taxes, Duties & Levies

30.1. The total order value shall be adjusted for any variations in statutory levies imposed by competent authorities through fresh notifications issued within the stipulated delivery period. In the event of any reduction in taxes, duties, or levies, such benefits shall be passed on to the Buyer.

30.2. No other taxes, duties, or levies beyond those specified above shall be payable by the Buyer, except for new levies, taxes, or duties imposed by competent authorities via fresh notifications after the issuance of the purchase order but within the stipulated delivery period.

30.3. Any changes in taxes, duties, or levies shall only apply to the portion of the purchase order remaining unexecuted on the date of such notification. Changes occurring after the scheduled delivery date shall not affect the terms or value of the purchase order.

30.4. The purchase order value shall remain unaffected by any variations in exchange rates.

## 31. Taxes & Duties on Raw Materials and Bought-Out Components

31.1. Taxes and duties applicable to raw materials and bought-out components shall be included within the total order value and shall not be subject to any escalation or variation for any reason throughout the duration of the contract.

## 32. Building and Other Construction Workers (BOCW) Act (Applicable for All Civil and Construction Works)

32.1. The Building and Other Construction Workers (BOCW) Act applies to any establishment employing or having employed ten or more building workers at any time during the preceding twelve months in any building or construction work. The Contractor performing such construction work must register with the Registering Officer under Section 7 of the BOCW

Act, along with applicable state government rules, and submit the Registration Certificate issued by the Registering Officer of the concerned State Government's Labour Department.

32.2. Under this Act, the Contractor shall pay a cess at the rate of 1% on the cost of construction work, which shall be deducted from each interim bill. The cost of materials, when billed separately as a distinct schedule item, shall be excluded from the cess calculation. The Contractor is required to comply with all applicable provisions of the BOCW Act.

## 33. Tax Indemnity Clause

33.1. The Contractor (including its affiliates in India or overseas, agents, third-party contractors, or any other persons appointed by such affiliates for this Agreement) shall bear sole responsibility for compliance with and payment of all taxes—direct or indirect—including but not limited to income tax, transfer pricing, value added tax, SGST, CGST, IGST, UTGST, GST Compensation Cess, customs duty, excise duty, Research and Development Cess, cesses, interest, penalties, or any other tax/duty/amount/charge/liability arising under laws or regulations applicable in India or overseas, or from demands or recoveries initiated by any revenue authority.

33.2. If any tax liability (including but not limited to income tax, transfer pricing, value added tax, SGST, CGST, IGST, UTGST, GST Compensation Cess, customs duty, excise duty, Research and Development Cess, etc.), cesses, interest, penalties, or other charges become payable by the Purchaser due to the Contractor's or its affiliates' failure to comply with relevant laws or regulations, the Contractor undertakes to indemnify the Purchaser for such amounts.

33.3. Furthermore, the Contractor agrees to indemnify and keep indemnified the Purchaser against all actions, proceedings, claims, losses, damages, costs, and expenses directly or indirectly arising from any failure by the Contractor or its affiliates to comply with applicable legal obligations.

33.4. The parties agree to the following procedure in the event the Purchaser receives any demand or notice relating to non-compliance by the Contractor or its affiliates with tax laws:

33.4.1. The Purchaser shall notify the Contractor in writing within five (5) common working days of receipt of such communication, or as soon as reasonably possible if the response time is shorter.

33.4.2. Upon receipt of notification, the Contractor shall either accept the demand and reimburse the Purchaser within five (5) working days of payment or propose disputing the demand.

33.4.3. If the Contractor opts to dispute the demand and the Purchaser agrees, the Purchaser will contest the demand following due legal process, refraining from paying the tax demand during litigation. The Contractor shall reimburse all litigation costs incurred, including counsel fees and filing charges. Should any coercive recovery measures be initiated, the Purchaser may pay the sum and recover it from the Contractor within five (5) working days.

33.4.4. If the demand is finally determined by a tribunal or authority and payment was made by the Purchaser, the Contractor shall reimburse the amount within ten (10) days of payment. Conversely, if no amount is payable and a refund arises, the Purchaser shall pass the refund to the Contractor within ten (10) days of receipt.

## 34. Invoicing Instructions

34.1. Invoices shall be prepared in triplicate — (1) Original for the recipient, (2) Duplicate for the transporter, and (3) Triplicate for the supplier — and delivered to: BSES RAJDHANI POWER LIMITED, BSES BHAWAN, NEHRU PLACE, NEW DELHI - 110019. Material Dispatch Clearance Certificates (MDCC) will be issued separately for Capex and Opex, and suppliers must submit invoices accordingly.

34.2. The Contractor shall obtain GST registration in the state from which the supply is made. Suppliers must possess a valid GST registration number and issue GST tax invoices and supporting documents compliant with the SGST Act, CGST Act, IGST Act, UTGST Act, GST Compensation Cess Act and applicable rules. Failure to submit GST-compliant invoices shall render the tax amounts (SGST, CGST, IGST, UTGST, GST Compensation Cess) subject to withholding during payment.

34.3. Invoices must be issued in the name of BSES RAJDHANI POWER LIMITED, with the store/site address as specified in the MDCC. Invoices should comply with all GST Invoice, Debit Note, and Credit Note requirements, including supplier details, GSTIN, HSN codes, item details, tax rates, etc., as outlined in government regulations and the GST INV-01 invoice template.

34.4. The Contractor must charge appropriate CGST, SGST, UGST, IGST, and GST Compensation Cess as applicable.

34.5. Timely Issuance of Invoices/Debit/Credit Notes:

34.5.1. Contractors shall provide invoices and debit/credit notes promptly to allow the Purchaser to claim input tax credit within prescribed deadlines per GST laws. Adjustments (credit notes, purchase returns, debit notes) must be processed within legally mandated timeframes.

34.5.2. In case of advance payments, the Contractor agrees to raise a tax invoice. Upon receipt of advance, the Purchaser will issue a payment voucher as per applicable GST rules. Four copies of invoices are required, including the Electronic Reference Number if mandated by law. Persons in charge of conveyance must carry required documents and devices.

34.6. Transit Documents and E Way Bills: Where applicable, the Contractor is responsible for issuing transit documents/E Way Bills for goods movement. Logistic partners or transporters shall not be liable for losses or confiscation due to improper documentation or misdeclaration. The Supplier must comply with all E-way bill regulations. Violations may attract penalties and seizure of goods. The Supplier shall bear all penalties and pre-deposits and is responsible for obtaining release of goods from authorities like CGST/SGST. Delays due to seizure shall attract liquidated damages as per contract.

34.7. All Contractors/Service Providers must include the following minimum details in invoices submitted:

34.7.1. Invoice/Credit Note number and date
34.7.2. Contractor/service provider address and GSTN
34.7.3. Customer name and address as per GST registration and GST registration number
34.7.4. 'Shipped to' and 'Billed to' addresses
34.7.5. Place of supply
34.7.6. Description of goods/services with units of measurement
34.7.7. HSN/SAC codes
34.7.8. Taxable value (gross and discount detailed separately if applicable)
34.7.9. Tax rate and amount for CGST, SGST, and IGST separately
34.7.10. Contractor's signature (for e-invoices, a physical signature is not required)
34.7.11. Indication of reverse charge applicability

## 35. Bill Submission Procedure

35.1. All monitoring, measurement, billing & payment processes shall be on IT enabled platform of BRPL as per Company's guidelines issued from time to time and bidders to ensure adherence. The company may modify the procedure for the submission of bills. The Contractor shall be obliged to submit its bill as per the procedure stipulated by the company from time to time.

35.2. All bills must be uploaded to BRPL portal (BTS - Bill Tracking System) for certification by the Engineer In-Charge or Package Engineer.

35.3. Further the contractor shall also submit original bill (hard copy) along with supporting documents at Vendor Support Cell of BRPL. The bills shall be made in favour of BSES Rajdhani Power Ltd, BSES Bhawan, Nehru Place, New Delhi - 110019.

35.4. Each bill shall be complete in all respects, including compliance with ESI, HR, Quality, HSE, Stores, and Finance requirements. The site follows an established procedure for bill processing. Incomplete bills or invoices will not be processed for payment.

## 36. Power to Withhold Payment

36.1. The Employer reserves the right to withhold payment of Running Account (RA) bills, in whole or in part, for reasons including but not limited to non-compliance with major contract terms such as quality and progress of work, at the sole discretion of the Engineer In-Charge.

36.2. Such withholding of payment does not absolve the Contractor from the obligation to execute work diligently and promptly, nor does it entitle the Contractor to claim interest, anticipated profits, or losses on the withheld amounts.

36.3. All pending compliances must be fulfilled by the Contractor before submission of the next RA bill for the withheld amount to be released. If compliances are not completed before the next RA bill, the hold amount will be released once the Contractor meets the Employer's satisfaction.

36.4. If work is not performed strictly in accordance with the contract, or if any claim (just or unjust, including claims for wrongful death or property injury) arises against the Employer related to the Contractor's work, the Employer shall have the right to withhold payments, final or otherwise, to an extent deemed adequate to secure against delays, losses, or claims.

36.5. In cases where the Employer chooses not to require correction of defective or non-conforming work, an equitable deduction from the contract price shall be mutually agreed upon between the Contractor and Employer. Failing agreement, the deduction shall be determined through the dispute resolution process. Pending such resolution, the Employer may withhold a reasonable sum from payments due to the Contractor.

## 37. Terms of Payment and Milestones

37.1. Payments will be issued upon the achievement of each specified milestone, as outlined below:

37.2. **FOR SUPPLY OF EQUIPMENT AND MATERIALS:**

i. 70% pro-rata of supply value item-wise shall be payable against R/A bills for supply of equipment and materials within 30 days against receipt & acceptance of material at site and submission of following documents duly certified by BRPL Project-in-charge, complete in all respects:
   a) Signed copy of accepted Purchase Order (for first payment)
   b) LR / RR / BL as applicable
   c) Challan as applicable
   d) One (01) copy of Contractor's detailed Recipient Invoice showing Commodity description, quantity, unit price, total price and basis of delivery, and being 100% of the value of the consignment claimed.
   e) One (01) copy of Contractor's transporter invoice duly receipted by BRPL Stores & Original certificate issued by BRPL confirming receipt of the subject material at Stores/Site and acceptance of the same as per the provisions of the contract.

f) One (01) copy Packing List / Detailed Packing List
g) Approved Test certificates / Quality certificates, if applicable
h) Certificate of Origin, if applicable
i) Material Dispatch Clearance Certificate (MDCC)
j) Insurance Policy / Certificate, if applicable
k) Warranty / Guarantee Certificate, if applicable
l) Checklist for bill submission

ii. 20% pro-rata on account of supply value of the actual executed value after installation/erection of material duly certified by BRPL Project-in-charge.

iii. Balance 10% on account of supply value of the actual executed value shall be paid in 30 days after completion of successful acceptance testing, commissioning and handing over of complete systems duly certified by BRPL Engineer-in-Charge specified in the tender and on submission of performance Bank Guarantee of 10% amount, in our format valid up to a defect liability period from the date of handing over of the scheme including submission of Electrical Inspector Clearance Certificate, Compliance of final punch point, No Demand Certificate, Letter of Indemnity by the Contractor (The format of No Demand Certificate and Letter of Indemnity are attached as Annexure) and after reconciliation & adjustments of payments, if any towards quantities of materials issued from purchaser's stock and consumed by the contractor for expeditious completion of the job.

37.2.1. **FOR LAYING, ERECTION, INSTALLATION AND TESTING & COMMISSIONING:**

i. 90% pro-rata payment of total installation value of the actual executed value shall be made progressively on submission of your running invoices on Monthly basis duly certified by our Engineer In charge & shall be paid within 30 days on receipt of such bills at our office.

ii. Balance 10% on account of total installation value of the actual executed value payable shall be paid in 30 days after completion of successful acceptance testing, commissioning and handing over of complete systems duly certified by BRPL Engineer-in-Charge specified in the tender and on submission of performance Bank Guarantee of 10% amount, in our format valid up to a defect liability period from the date of handing over of the scheme including submission of Electrical Inspector Clearance Certificate, Compliance of final punch point, No Demand Certificate, Letter of Indemnity by the Contractor (The format of No Demand Certificate and Letter of Indemnity are attached as Annexure) and after reconciliation & adjustments of payments, if any towards quantities of materials issued from purchaser's stock and consumed by the contractor for expeditious completion of the job.

iii. Purchaser has the right to recover tax loss, interest and penalty suffered due to any non-compliance of tax laws by the Contractor. In the event, Purchaser is not able to avail any tax credit due to any shortcoming on the part of the Contractor (which otherwise should have been available to Purchaser in the normal course), then the Contractor at his own cost and effort will get the shortcoming rectified. If for any reason the same is not possible, then the Contractor will make 'good' the loss suffered by Purchaser due to the tax credit it lost. In such event, any amount paid to the Contractors shall be first attributable to the tax (GST) charged in the invoice and the balance shall be considered towards the 'value' of supply of goods/ services.

iv. Purchaser shall deduct "Tax Deducted at Source" wherever applicable and at the rate prescribed under the GST Laws or any other Indian law and remit the same to the Government. Necessary TDS certificates as per law shall be issued by the purchase to the Contractor.

v. Any liability arising out of dispute on the tax rate, classification under HSN, calculation and payment of tax to the Government will be to the Contractor's account.

vi. Where the supply of Goods is liable to GST under reverse charge mechanism, then the Contractor should clearly mention the category under which it has been registered and also that "the liability of payment of GST is on the Recipient of Supply".

## 38. Performance Guarantee

38.1. The Contractor shall submit the following Bank Guarantees within specified timelines:

| Type of Bank Guarantee | Submission Timeline | Validity Period |
|---|---|---|
| Contract Performance Bank Guarantee (10% of Total Contract Value including GST) | Within 28 days of Issue of LOI/ LOA/ Purchase Order | Valid until 90 days beyond the Project Completion / Handing Over |
| Bank Guarantee against Advance (For the advance payment made) | Along with invoice for advance amount | Valid until completion of supplies/work under the contract |
| Equipment Performance Bank Guarantee (10% of Total Contract Value including GST) | At the time of claiming last payment and issuance of final Taking Over certificate by Purchaser/Owner | Valid until completion of Defect Liability Period plus 3 months |

38.2. All Bank Guarantees shall be issued in favour of BSES Rajdhani Power Ltd. and must conform to the format prescribed by BRPL.

38.3. Performance Guarantee Forfeiture: Each Performance Bond established under Clause 38.1 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 Contractor has failed to comply with any term or condition outlined in the Contract.

38.4. Each Performance BG established under will be automatically and unconditionally forfeited without recourse if BRPL in its sole discretion determines that Contractor has failed to comply with any term or condition outlined in the contract.

38.5. Performance Guarantee Release: All Performance Bonds shall be released without any interest within seven (7) days following the expiry of the validity period specified in Clause 38.1, except in cases outlined under Clause 38.4.

38.6. Notwithstanding anything stated in this agreement, it is agreed by the Seller that in case of default by the seller in furnishing the Performance Bank Guarantee, the purchaser/BRPL, without prejudice to the rights available with the purchaser, shall be entitled to retain a total sum not exceeding 120% of the amount of required performance bank guarantee for the tenure and upon the terms as specified in this agreement. It is agreed that the purchaser shall not be paying any interest for the said sum retained by the purchaser in lieu of default by the seller in furnishing the performance bank guarantee and no claim of any nature shall be maintainable from the side of seller, disputing the above said retention. Whereas, in case, after the deduction of above sum by the purchaser, if the seller at any point of time, submits the PBG of the required value and tenure and requests for the refund of the amount retained on this ground, the purchaser shall be releasing the money retained in lieu of PBG without any interest/cost.

## 39. Defects Liability Period/ Warranty / Guarantee

39.1. 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 Defect Liability Period shall be twenty-four (24) months from the date of Final Takeover of Packages by the Purchaser. The Bidder warrants the satisfactory performance of all works, equipment, and materials supplied as per the contract scope for twenty-four (24) months generally for substations or individual packages, and for a period of sixty (60) months for specified equipment such as GIS, PTR, Panels, CRP, Cable & Joints, from the date of Final Takeover.

39.2. 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.

39.3. The Contractor is liable to rectify all defects arising from works executed or any act or omission during the Warranty/Defect Liability 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.

39.4. The works shall be guaranteed against any defect or failure which may arise due to faulty materials, design or workmanship for a period of 24 months from the date of handing over of the substation. In case any defect in the work is observed during the defect liability period, the same shall be rectified by the Bidder at own cost including supply of all materials, labour, equipment and any other appliance in this regard (as per prevailing rates) for the fulfilment of all obligations under the Contract and to the satisfaction of the Company, within 10 days from the date of receipt of intimation from BRPL.

39.5. The Contractor shall repair or replace any materials/items supplied that exhibit defects or failures due to faulty materials, workmanship, or design throughout the Defect Liability Period.

39.6. If during the Defects Liability Period any goods are found defective, the Bidder shall promptly replace or rectify them at its own cost, including dismantling and reinstallation, as directed by the Purchaser. If removed from site, the goods must be returned at the Contractor's cost within the agreed schedule from receipt of intimation.

39.7. The Contractor shall dispatch service personnel within 48 hours in emergencies and ensure availability of manpower and spares throughout the warranty period.

39.8. 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 Contractor. 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 Contractor. BRPL will charge the Contractor for the costs incurred for fault restoration or may set off such costs against any amount payable by BRPL to the Contractor or deduct from the PBG submitted by the Contractor. Contractor shall pay BRPL the amount within 30 days.

39.9. Fault root cause analysis shall be jointly conducted by BRPL's CES, O&M, OEM teams and the Contractor. If faults arise from reasons other than faulty material, design, or workmanship, the Contractor shall be exempt from further liability or cost.

**40. Latent Defect Liability Period**

40.1. Upon completion of the Defect Liability Period, the Contractor's responsibility shall cease except for latent defects.

40.2. Latent defects are defined as inherent defects in materials or deficiencies arising from design or design implementation that are not apparent during the Defect Liability Period.

40.3. The Contractor's Liability for latent defects warranty shall be for a period of Five (5) years commencing from the date of Taking over of the package and shall be commence along with the Defects Liability Period for all the supply items and the work executed under the contract.

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

**41. Support beyond the Guarantee Period**

41.1. The Contractor shall ensure the availability of spare parts and necessary technical support for a minimum period of ten (10) years following the completion of the equipment guarantee period under the contract. The Contractor must notify BRPL at least twelve (12) months in advance of the End-of-Life Support for the supplied product or technology.

**42. Return, Replacement or Substitution**

42.1. BRPL shall promptly notify the Contractor upon identification of any defective commodity. At its sole discretion, BRPL may return such defective commodities to the Contractor for replacement at no cost to BRPL or reject the commodities and procure the same or similar items from a third party. In the event of such third-party procurement, BRPL shall provide the Contractor with proof of the replacement purchase cost.

42.2. All costs associated with replacement, substitution, shipping, labor, and other related expenses incurred in connection with the return and replacement or third-party procurement of the commodity shall be borne by the Contractor. BRPL reserves the right to deduct such costs from any payments due to the Contractor.

42.3. Should the cost of the substitute commodity exceed the price quoted in the Contractor's bid, the Contractor shall reimburse BRPL for the difference.

42.4. At BRPL's sole discretion, materials or goods rejected and not collected by the Contractor within forty-five (45) days from the date of rejection notification may be disposed of by BRPL.

**43. Effective Date of Commencement of Contract**

43.1. The Contract shall be deemed to commence on the date of issuance of the Letter of Intent, Letter of Acceptance, or Purchase Order, whichever is earlier, and this date shall be considered as the effective commencement date for all contractual obligations.

**44. Time - The Essence of Contract**

44.1. The date specified for completion of the "Project" in the Letter of Acceptance or Purchase Order issued to the Contractor shall be deemed to be of the essence of the Contract. The

Contractor is required to complete the Project on or before the stipulated schedule and completion date.

## 45. Project Completion Timelines

45.1. The contractual delivery for the Goods or Services shall adhere strictly to the defined schedule of **5 Months.**

45.2. The Contractor shall submit a detailed PERT chart or L2 Network plan for execution of the awarded package to BRPL for review and approval within fifteen (15) days of issuance of Letter of Intent (LOI) or Letter of Award (LOA).

45.2.1. **Timeline:**

| SL NO | ACTIVITY | TIMELINE |
|---|---|---|
| 1 | Zero Date (Letter of Intent/Award) | Zero Date |
| 2 | Mobilization of manpower | 15 days from Zero Date |
| 3 | Submission of Drawings/Documents/calculations for Engineering Approval | 15 days from Zero Date |
| 4 | Engineering Approvals | 30 days from Zero Date |
| 6 | Procurement/Supplies | 75 days from Zero Date |
| 7 | Testing & Commissioning of line | 130 days from Zero Date or as per the mutually agreed schedule |
| 8 | Handing Over | 150 days from Zero Date or as per the mutually agreed schedule |

45.3. Delivery shall be at F.O.R BRPL - Delhi stores/sites.

45.4. The Contractor shall submit a deployment plan for Tools & Plants (T&P) and manpower required for the project. Failure to deploy required T&P, manpower, or construction materials may result in the Employer arranging these at the Contractor's cost plus a 20% service charge, deductible from payments due.

45.5. The Contractor shall mobilize the team at site immediately upon receipt of order and plan round-the-clock parallel working to meet schedule milestones.

45.6. Weekly progress meetings shall be held on site between the Contractor and Engineer-in-Charge. The Contractor shall submit a weekly report detailing manpower deployment and major milestones achieved.

45.7. Strict adherence to the agreed schedule is mandatory. Failure to maintain quality or timeliness may result in the Employer withdrawing work wholly or partially without notice or liability.

45.8. Project schedules shall be periodically reviewed with the Employer, who may direct corrective actions including additional resources or night work at no extra cost. The Employer reserves the right to revise work schedules to meet project requirements without entitlement for extra payment.

45.9. The Contractor shall carry out work on Sundays and holidays, except National Holidays, if required to meet the schedule with prior written permission from Engineer-in-Charge.

45.10. BRPL Engineer-in-Charge shall certify final completion of work.

## 46. Extension of Time and Time Overrun

46.1. Extension of time may be granted at the Company's discretion if delays are not the Contractor's fault, subject to the Contractor submitting detailed justification within ten (10)

days of the delay's occurrence. Such extension does not warrant any increase in contract price and does not prejudice the Company's right to recover liquidated damages.

## 47. Liquidated Damages

47.1. LD FOR DELAY IN COMPLETION OF WORK

47.1.1. Time is the essence of the Contract. Following issuance of the Letter of Intent/Letter of Award, the contractual network (L2 network) shall be finalized and approved by BRPL. The Contractor must adhere strictly to the agreed completion schedule and intermediate milestones.

47.1.2. 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.

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

47.1.4. The maximum liquidated damages (LD) for delay shall not exceed 10% of the Contract Value.

47.1.5. It is agreed that liquidated damages constitute a genuine pre-estimate of damages and are not a penalty.

47.2. OVERALL LIQUIDATED DAMAGES:

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

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

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

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

47.4. 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 Contractor or from the Performance Bond or file a claim against the Contractor.

47.5. If the Penalty is levied as per the Order terms & conditions; BRPL will raise the Invoice for the penalty amount along with applicable GST rates. Accordingly, after setting off the penalty Invoice amount, net payment shall be made.

## 48. Recoveries

48.1. Whenever any sum is recoverable from the Contractor under this contract, the Purchaser shall be entitled to recover such amount by appropriating, in whole or in part, any sums due or that may become due to the Contractor under this contract. If such sums are insufficient to cover the full amount recoverable, the Contractor shall pay the outstanding balance to the Purchaser upon demand.

## 49. The Micro, Small and Medium Enterprises (MSME)

49.1. If the Contractor's establishment falls under the scope of the Micro, Small and Medium Enterprises Development Act, 2006 and its amendments, the Contractor shall declare this

status within the bid. Failure to do so will be deemed as confirmation that the Contractor is a non-MSME unit. The Contractor must also submit a copy of the Udyog Aadhaar (UA) and Udyam Registration Number, along with the PAN number.

## 50. Transfer and Subcontracting

50.1. The Contractor shall not subcontract, transfer, assign, or otherwise part with the Contract or any part thereof, either directly or indirectly, without the prior written approval of the Purchaser.

50.2. Notwithstanding any subcontracting, the Contractor shall remain entirely responsible for the execution, completion, and satisfactory performance of the Work, in full compliance with the Purchase Order, specifications, approved drawings, and data sheets. The Contractor shall also be fully accountable for any acts, omissions, defaults, or negligence of any subcontractor.

## 51. Intellectual Property Rights and Royalties

51.1. The Contractor shall indemnify the Purchaser and the Purchaser's Representative against all claims and proceedings arising from infringement or alleged infringement of any patent rights, registered designs, copyright, design, trademark, trade name, know-how, or other intellectual property rights (collectively referred to as "Intellectual Property Rights") relating to the Works, Contractor's equipment, machines, methods, plant, materials, or anything required for execution of the Works. In case of infringement, the Contractor shall, at its own cost, either rectify, modify, or replace the infringing item so that infringement ceases, or procure necessary rights or licenses from the affected third party.

51.2. The Contractor shall be promptly notified of any claim made against the Purchaser. The Contractor shall, at its cost, conduct negotiations for the settlement of such claim, and any litigation or arbitration that may arise from it. The Purchaser or the Purchaser's Representative shall not make any admission that might be prejudicial to the Contractor unless the Contractor has failed to take over the conduct of the negotiations, litigation or arbitration within a reasonable time after having been so requested. In the event of the Contractor failing to act at the Purchaser's Representative's notice, the Purchaser shall be at full liberty to deduct any such amount of pending claim from any amount due to the Contractor under the Contract or any other contract and the balance portion of claim shall be treated as debt due from the Contractor.

51.3. Intellectual Property Rights in any plant, materials, drawings, designs, plans, documents, specifications, data, know-how, charts, or information provided by the Purchaser remain the sole property of the Purchaser. The Contractor has only a limited right to use these for execution of the Works.

51.4. Intellectual Property Rights in respect of any Plant, Materials, Drawings and Designs, plans, calculations, drawings, documents, know-how and information relating to the Works which are proprietary to the Contractor and/ or its third-party licensors ("Contractor's IPR") shall continue to vest with the Contractor and/ or its third-party licensors and the Contractor shall grant and/ or procure from its third party licensors, at its own cost, a worldwide, perpetual, royalty-free, non-exclusive license (along with the right to sub-license) to use and reproduce such Contractor's IPR for the use, operation, maintenance and repair of the Works.

51.5. If any patent, trademark, trade name, registered design or software is developed by the Contractor or its Subcontractor specifically for the execution of the Works, then all Intellectual Property Rights in respect of such design, trademark, trade name or software shall be the absolute property of the Purchaser and shall not be utilized or retained by the Contractor (or its Subcontractors) for any purpose other than with the prior written consent of the Purchaser.

51.6. If the Contractor uses proprietary software (whether customized or off the shelf) for the purpose of storing or utilizing records in relation to the Works, the Contractor shall obtain at

its own expense, the grant of a worldwide, royalty-free, perpetual licence or sublicence (including the right to sublicense) to use such software, in favour of the Purchaser provided that the use of such software under the licence or the sublicense may be restricted to use any such software only for the design, construction, reconstruction, manufacture, installation, completion, reinstatement, extension, repair and operation of the Works or any part thereof.

51.7. If any software is used by the Contractor for the execution of the Works over which the Contractor or a third party holds pre-existing title or other rights, the Contractor shall obtain for the Purchaser, a worldwide, royalty-free, perpetual license for the right to use and apply that software (together with any modifications, improvements and developments thereof).

## 52. Contractor Code of Conduct

52.1. Contractor acknowledges having reviewed the BRPL policy on legal and ethical code required to be followed by Contractors encapsulated in the "Vendor/Contractor Code of Conduct" displayed on the official website of BRPL (www.bsesdelhi.com) also, which shall be treated as a part of the agreement/contract/PO/WO.

52.2. Contractor undertakes that he shall adhere to the Contractor Code of Conduct and also agrees that any violation of the Contractor Code of Conduct shall be treated as breach of the agreement/contract/PO/WO.

52.3. In event of any such breach, irrespective of whether it causes any loss/damage, company (BRPL) shall have the right to recover loss/damage including liquidated damages from Contractor.

52.4. The Contractor hereby indemnifies and agrees to keep indemnified the company (BRPL) against any claim/litigation/liability/penalty including litigation cost arising out of any violation of Contractor Code of Conduct by the Contractor or its officers, agents & representatives etc.

## 53. Limitation of Liability

53.1. Except in cases of wilful misconduct, fraud, or gross negligence, neither Party shall be liable to the other for loss of use of any works, loss of profit, loss of contracts, or any other indirect or consequential damages arising out of or in connection with the Contract. The total liability of the Contractor to the Purchaser under this Contract shall not exceed the Contract Value.

53.2. Notwithstanding the above, this clause shall not limit the liability of the Contractor in the following cases:

53.2.1. Fraud, willful misconduct, or unlawful acts

53.2.2. Acts or omissions that violate the fundamental rules of diligence that a conscientious Contractor would observe under similar circumstances

53.2.3. Intellectual property infringement

53.2.4. Breach of confidentiality or data security obligations

53.2.5. Tax and statutory dues liabilities

53.2.6. Recovery of liquidated damages

53.2.7. Third-party death or personal injury

## 54. Liability of Suppliers/Contractors

54.1. Subject to the due discharge of its obligations under the Contract and except in case of willful misconduct, fraud, or gross negligence on the part of the Contractor or on the part of any person acting on behalf of the Contractor, with respect to any loss or damage caused by the Contractor to the Purchaser's property or the Site, the Contractor shall not be liable to the Purchaser for the following:

a) For any indirect or consequential loss or damage; and

b) For any direct loss or damage that exceeds:

i. The total payments made and expected to be made to the Contractor under the Contract including reimbursements, if any; or
ii. The insurance claim proceeds that the Contractor may be entitled to receive from any insurance purchased by the Contractor to cover such a liability, whichever is higher.

54.2. This limitation of liability shall not affect the Contractor's liability, if any, for damage to third-party property or injury or death of a person due to negligence of the Contractor or any Person or firm acting on behalf of the Contractor in executing the order.

54.3. Notwithstanding anything contained in the Contract, the Contractor shall not be liable for any wilful misconduct, fraud, or gross negligence on the part of the Purchaser or any of its affiliates, any Contractor, or any party, other than Contractor and/or, its directors, officers, agents or representatives or its affiliates, or Subcontractor, or the Contractor or any third party engaged by it.

54.4. Notwithstanding anything contained in the Contract, including but not limited to approval by the Purchaser of any drawings, documents, Contractor list, supply of information or data or the participation of the Purchaser in any meeting and/or discussion or otherwise, shall not absolve the Contractor from any of its liabilities or responsibilities arising in relation to or under the Contract.

## 55. Indemnification

55.1. The Contractor shall indemnify and hold harmless the Company from and against any and all liabilities, claims, damages, losses, or expenses arising out of or resulting from:
55.1.1. any breach non-observance or non-performance by contractor or its employees or agents of any of the provisions of this Work Order.
55.1.2. any act or omission of contractor or its employees or agents.
55.1.3. 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.
55.1.4. Any damages or loss related to free-issued materials, for which the Bidder shall submit an Indemnity Bond.

55.2. The Contractor shall at all times indemnify the Company against all liabilities to third parties, including employees or agents of the Company or the Contractor, for bodily injury, property damage, or any other loss arising out of or in connection with the execution or completion of the Works. This includes all costs, charges, and expenses incurred by the Company due to claims from such persons.

## 56. Events of Default

56.1. Each of the following events or occurrences shall constitute an event of default under the Contract:
56.1.1. The Contractor fails or refuses to pay any amounts due under the Contract;
56.1.2. The Contractor 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 valid extension thereof;
56.1.3. The Contractor 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 Contractor's creditors file any petition relating to bankruptcy of Contractor;
56.1.4. The Contractor fails to complete the works in accordance with the approved schedule of works.
56.1.5. The Contractor fails to comply with any reasonable instructions or directions issued by the Company in connection with the execution of the works.

56.1.6. The Contractor 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 Contractor of notice of such failure from BRPL specifying the failure.

## 57. Consequences of Default

57.1. If any Event of Default occurs and continues, BRPL may, by written notice, terminate the Contract forthwith.

57.2. Upon occurrence of an Event of Default, BRPL may, without prejudice to any other rights or remedies available under law or the Contract, exercise one or more of the following remedies;
- 57.2.1. Invoke and present the Performance Bond for payment;
- 57.2.2. Procure the same or equivalent Commodities from any third-party source; and/or
- 57.2.3. Recover from the Contractor any losses, damages, or additional expenses incurred as a result of the Contractor's default.

## 58. Force Majeure

58.1. An "Event of Force Majeure" shall mean any event or circumstance not within the reasonable control directly or indirectly, of the affected Party, but only if and to the extent that:
- 58.1.1. 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 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.
- 58.1.2. 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.
- 58.1.3. Such event is not the direct or indirect result of the failure of such Party to perform any of its obligations under this Contract.
- 58.1.4. Such Party has given the other Party prompt notice describing such events, the effect thereof and the actions being taken to comply with the above clause.

58.2. **Specific Events of Force Majeure**

58.2.1. 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:
- 58.2.1.1. Natural elements or other acts of God, such as storms, floods, earthquakes, lightning, cyclones, landslides, or other natural disasters.
- 58.2.1.2. Explosions or fires.
- 58.2.1.3. Epidemics, pandemics, or plagues.
- 58.2.1.4. Declared war by the Government of India.
- 58.2.1.5. Dangers of navigation or perils of the sea.
- 58.2.1.6. Cyber security incidents impacting grid operations.
- 58.2.1.7. Pandemic-related lockdowns.
- 58.2.1.8. Climate change events beyond traditional natural disasters.
- 58.2.1.9. Embargoes.
- 58.2.1.10. Supply chain or industrial disturbances beyond reasonable control.

58.2.2. Note: Force Majeure shall not apply to financial inability, labor shortages, power failures, strikes, accidents, or subcontractor defaults.

58.3. **Notice of Events of Force Majeure**

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

58.3.1.1. 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

58.3.1.2. 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.

58.3.1.3. Use all reasonable efforts to resume full performance of the obligation as soon as practicable

58.3.1.4. Keep the other party informed of all such efforts to resume full performance of the obligation on a regular basis.

58.3.1.5. Provide prompt notice of the resumption of full performance or obligation to the other party.

58.4. **Mitigation of Events of Force Majeure**

58.4.1. Each Party shall:

58.4.1.1. 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;

58.4.1.2. 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

58.4.1.3. 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.

58.5. **Burden of Proof**

58.5.1. 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.

58.6. **Termination for Certain Events of Force Majeure**

58.6.1. 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.

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

58.6.2.1. Bidder fails to complete the execution of works within the approved schedule of works, terms and conditions.

58.6.2.2. In case the Bidder commits any Act of Insolvency, or is adjudged insolvent

58.6.2.3. Has abandoned the contract

58.6.2.4. Has failed to commence work or has suspended the progress of works

58.6.2.5. Has failed to proceed with the works with due diligence and failed to make such due progress

58.7. **Limitation of Force Majeure event**

58.7.1. The Contractor shall not be relieved of any obligation under the Contract solely because the cost of performance is increased, whether as a consequence of adverse economic consequences or otherwise.

58.8. **Extension of Contract Period due to Force Majeure event**

58.8.1. 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.

58.9. **Effect of Events of Force Majeure**

58.9.1. 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 the failure to perform such obligations shall be due to an event of "Force Majeure".

## 59. Suspension or Extension

59.1. The Purchaser reserves the right to suspend or reinstate execution of the whole or any part of the Works without affecting the validity of the Contract provisions. Any orders for suspension or reinstatement shall be provided to the Contractor in writing. The completion time for the Works will be extended by a period equivalent to the duration of the suspension.

59.2. For any aggregate suspension period less than six (6) months, the Contractor shall not be entitled to claim reimbursement. If the suspension of the Works extends beyond six (6) months, the Purchaser will reimburse the Contractor only for necessary and demonstrable direct costs incurred, subject to satisfactory substantiation. Overheads, incidentals, and profit shall not be considered. The Purchaser's decision regarding such claims will be final and binding. The Purchaser shall bear no liability for suspension or delay arising from any default on the part of the Contractor or its sub-contractors; the Purchaser's decision in this respect shall also be final and binding.

## 60. Protection of Property

60.1. The Contractor shall be fully responsible for any damage caused by its operations. The Contractor shall ensure the protection of all persons, including members of the public, employees of the Purchaser, employees of the Contractor and subcontractors, and safeguard all public and private property, including structures, buildings, plants, equipment, and utilities-whether located above or below ground.

60.2. The Contractor shall provide and maintain all necessary safety measures, such as barriers, signboards, warning lights, and alarms, to ensure adequate protection of persons and property. The Contractor shall give reasonable notice to the Purchaser and any affected parties regarding public or private property and utilities that may be subject to damage during the execution of the works, and shall coordinate all necessary arrangements for the removal, replacement, or protection of such property and utilities with the concerned authorities.

## 61. Severability

61.1. If any provision of this Agreement is found to be invalid, illegal, or unenforceable by a court of competent jurisdiction, such invalidity or unenforceability shall not affect the remaining provisions of the Agreement, which shall continue to be valid and enforceable to the fullest extent permitted by law.

## 62. Waiver of Rights

62.1. No failure or delay by either Party in enforcing any provision of this Agreement shall be deemed a waiver of that provision or of any subsequent breach. Any waiver granted must be expressly made in writing and shall apply only to the specific instance and shall not constitute a waiver of any other rights or breaches occurring thereafter.

## 63. Cleanliness & Precautions at Site

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

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

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

63.2.2. Windbreakers of appropriate height on all sides of earmarked area using CGI sheets shall be raised to ensure that no construction material dust fly outside earmarked area.

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

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

63.2.5. Overloading of vehicles shall be strictly prohibited.

63.2.6. The construction material at site shall be stored under wet and covered conditions.

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

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

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

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

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

63.2.12. Bidder shall ensure that no tree shall be harmed and no tree roots shall be destroyed/cut while performing the task under contract.

63.2.13. Contractor shall comply the provisions of The Delhi Preservation of Trees Act 1994.

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

## 64. Safety Code

64.1. The Contractor shall ensure that all safety precautions required by applicable laws are strictly observed at the work site. The Contractor shall be fully responsible for the safety of its workers, as well as all other personnel present at the site or premises. No worker under the age of eighteen (18) years shall be employed by the Contractor.

64.2. The Contractor shall comply with all safety requirements as detailed in the Company's Safety Manual, accessible at https://www.bsesdelhi.com, throughout all phases of the Contract.

64.3. Where subcontracting is approved in writing by the Company, the main Contractor shall ensure that all safety provisions are enforced by subcontractor personnel.

64.4. Contractors employing two hundred (200) or more employees, including contract workers, shall appoint a dedicated Safety Coordinator to oversee compliance with contractual safety obligations. Contractors with fewer employees shall nominate an employee to fulfill this role. The Safety Coordinator shall liaise with the Company's Safety Officer and have their name prominently displayed on a notice board at the work site.

64.5. The Contractor shall be fully liable for any non-compliance with safety measures, including consequences such as injuries, fatalities, and associated compensation liabilities.

64.6. In the event of any accident, the Contractor shall immediately submit a detailed report to the Owner and Safety Officer outlining the circumstances, injuries or fatalities, extent of property damage, and remedial measures taken to prevent recurrence. Additionally, the Contractor shall provide a monthly summary report of all accidents to the Owner.

## 65. Statutory Obligations

65.1. The Contractor shall comply with all applicable laws, by-laws, regulations, various Acts, Rules, codes, and standards including but not limited to

65.1.1. -The Child Labour (Prohibition & Regulation) Act, 1986,
65.1.2. -The Contract Labour (Regulation & Abolition) Act, 1970,
65.1.3. -The Employees' Pension scheme, 1995,
65.1.4. -The Employees Provident Funds and Miscellaneous Provisions Act, 1952,
65.1.5. -The Employees State Insurance Act, 1948,
65.1.6. -The Equal Remuneration Act, 1976,
65.1.7. -The Industrial Dispute Act, 1947,
65.1.8. -The Maternity Benefit Act, 1961,
65.1.9. -The Minimum Wages Act, 1948,
65.1.10. -The payment of Bonus Act, 1965,
65.1.11. -The Payment of Gratuity Act, 1972,
65.1.12. -The Payment of Wages Act, 1936,
65.1.13. -The Delhi Shops & Establishment Act, 1954,
65.1.14. -The Company's Liability Act, 1938,
65.1.15. -The Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2013,
65.1.16. -The Delhi Preservation of Trees Act 1994,
65.1.17. -The Workmen Compensation Act, 1923,
65.1.18. -Building and Other Construction Workers (Employment and Regulations) Act 1996,
65.1.19. -Building and Other Construction Workers (Cess) Act 1996,
65.1.20. -The Employers Liability Act, 1938,
65.1.21. -Indian Electricity Act, 2003 and Indian Electricity Rules,
65.1.22. -GST tax,
65.1.23. -And all other applicable laws, as amended, including any statutory approvals required by Central or State Government authorities, including the Ministry of Labour.

65.2. The Contractor shall indemnify the Purchaser fully for any financial liabilities arising out of non-compliance with the above provisions.

65.3. The Contractor shall comply all laws of the land and prevailing orders issued by various Govt Departments like Dept. of Power/DERC/NGT/Dept. of Forest/Dept. of Environment/DPCB/CPCB/Court orders etc. Broadly, the compliance shall be as detailed below, but not limited to:

65.3.1. An Electrical license.
65.3.2. PF Code No. and all employees to have PF A/c No. under PF every Act, 1952.

65.3.3. All employees to have a temporary or permanent ESI Card as per ESI Act.
65.3.4. ESI Registration No.
65.3.5. Sales Tax registration number, if applicable.
65.3.6. PAN No.
65.3.7. Work Contract Tax Registration Number/ VAT Registration.
65.3.8. Labour License under Contract Labour Act (R & A) Act 1970.
65.3.9. Delhi Building and other Construction Workers (Regulation of Employment and Conditions of Services) Rules, 2002(B.O.C.W.)
65.3.10. Additional obligations include:
65.3.10.1. Procuring a third-party Insurance Policy before starting work
65.3.10.2. Adhering to the Minimum Wages Act applicable in the state
65.3.10.3. Ensuring payment of salaries/wages exclusively via ECS into employees' bank accounts by the 7th of the succeeding month; in exceptional cases, crossed cheques may be issued, with full disclosure to HR (CMC)
65.3.10.4. Maintaining accurate Wage and Attendance Registers
65.3.10.5. Providing and maintaining a First Aid Box at the site
65.3.10.6. Submitting latest PF and ESI challans with certificates confirming timely deduction and deposit of contributions for all employees
65.3.10.7. Securing a Workman Compensation Policy, if applicable
65.3.10.8. Securing Labour License before starting work, if applicable

65.4. Prior to commencement, the Contractor shall provide the Company with permanent PF Code and ESI details of all employees.

## 66. Staff and Workman

66.1. It shall be the responsibility of the Contractor to:
66.1.1. Obtain the necessary Contract Labour License from the relevant authorities and maintain liaison with them. The Company shall provide required forms for obtaining such licenses. However, the Contractor shall bear all associated expenses, including registration with the Provident Fund Department relevant to the scope of work. The Contractor shall ensure monthly PF deposits for all staff and labor and furnish all related documentation to the Company.
66.1.2. Obtain and maintain workman insurance coverage for all deployed workers.
66.1.3. Maintain proper records for all employed workers in the form of various registers, including but not limited to:
66.1.3.1. Register of workmen
66.1.3.2. Register of muster rolls
66.1.3.3. Register of overtime
66.1.3.4. Register of wages
66.1.3.5. Any other registers required by the latest amendments to labour laws
66.1.4. Maintain all records in the prescribed formats.
66.1.5. Disburse monthly wages to workers and supervisors promptly and in the presence of Company representatives or as directed by labour authorities.
66.1.6. Maintain proper liaison with Project authorities, local police, and all other relevant governmental or local bodies.
66.1.7. Pay all workmen no less than the minimum wages prescribed under applicable State or Central labour laws. The Contractor shall ensure full compliance with the Minimum Wages Act, PF Act, ESIC Act, Workmen Compensation Act, Contract Labour Regulation and Abolition Act, and all related rules. In case of statutory non-compliance, the Company reserves the right to act at the risk and cost of the Contractor.
66.1.8. Employ the required number of skilled, semi-skilled, and unskilled workers as per site requirements to complete the project on schedule. The Contractor shall provide necessary safety equipment such as safety shoes, helmets, belts, and gloves to all workers and staff during erection and other works.

66.1.9. Employ adequate engineering and supervisory staff to ensure timely project completion. The day-to-day management and supervision of site works shall be the responsibility of the Contractor's Engineer-in-Charge, who will report to the Company's Engineer-in-Charge and assist in overall project execution.

## 67. Insurances

67.1. The Contractor, at their own cost, shall procure and maintain a Comprehensive Marine cum Storage cum Erection (MSE) insurance policy covering the entire Project cost.

67.2. Such insurance coverage shall be held jointly in the names of the Purchaser and the Contractor. The Contractor shall have the authority to liaise directly with the insurance company or companies throughout the Contract period and shall be responsible for maintaining all insurance policies in force.

67.3. The Contractor shall bear all risks of loss or damage to equipment during handling, transportation, storage, erection, commissioning, and all activities until the satisfactory completion and handover of Performance Guarantee tests of the plant. The Contractor shall promptly present all claims and shall be responsible for repairing or replacing any damaged or lost equipment.

67.4. For all insurance policies obtained, the Contractor shall handle claim settlements directly with underwriters without imposing any liability on the Purchaser. The Contractor shall arrange for replacement or rectification promptly without awaiting insurance claim settlements, bearing all related costs. Such events shall not entitle the Contractor to any extension of contract time or additional cost claims.

67.5. **Marine Transit Risk and Erection All Risk Coverage:**

67.5.1. The Contractor shall secure coverage for marine transit risk related to supply materials at 100% of their declared value and erection all-risk coverage for 100% of the Project cost. This coverage shall include, but is not limited to, loss or damage from AOG perils, earthquakes, and acts of terrorism.

67.6. **Third Party Insurance:**

67.6.1. Prior to commencing work, the Contractor shall obtain third-party insurance at their own cost to cover any loss, damage, or injury to property or persons (including those of the public, employees, and representatives of any outside agency or the Company) arising out of or in connection with performance of the work or temporary works. The Contractor shall be responsible for settling all claims related to third-party insurance without involving the Purchaser/Owner and shall promptly arrange replacement or rectification at their own cost.

67.7. **Group Personal Accident Insurance:**

67.7.1. The Contractor shall secure accidental insurance coverage for all staff deployed under this Agreement, covering death, permanent total disability, and partial permanent disability due to external accidents, with a minimum coverage of Rs. 15 Lakh (Table C). Permanent total disability coverage shall be 125% of the basic sum assured. The Contractor shall ensure same-day on-the-spot claim settlement with the legal heirs of any victim, without awaiting insurance claim settlements and without any liability on BRPL. The Contractor shall bear the full premium costs of this coverage and provide copies of all relevant policies within fifteen (15) days of commencement of work.

67.8. **Insurance for Man, Material & Machinery Deployed at Site:**

67.8.1. The Contractor shall be responsible for insuring its personnel, materials, and machinery deployed at the site for the awarded package. Copies of such insurance policies shall be furnished to the Purchaser prior to the start of work.

67.9. **Workman Compensation:**

67.9.1. The Contractor shall obtain and maintain a valid insurance policy under the Workman Compensation Act to cover all workers who are not already covered under Employees' State Insurance (ESI) and Provident Fund (PF), engaged in executing the jobs covered under this Contract. A copy of the insurance policy shall be provided to the Company for reference and record-keeping. If all workers are covered under ESI and PF, the Contractor shall certify this status to the Company.

67.9.2. The Contractor shall indemnify and keep the Company indemnified against all claims for compensation under the provisions of the Workmen Compensation Act, 1923, as amended from time to time, or under any other applicable law related to compensation payable to workers employed by the Contractor, subcontractors, or agents for work under this Contract. This indemnity includes all costs, expenses, and liabilities incurred by the Company in connection with such claims, without prejudice to the Company's rights to recover amounts.

67.9.3. The Company shall be entitled to deduct from any amounts due or to become due to the Contractor all moneys paid or payable in connection with such claims, costs, or expenses. The Contractor agrees to abide by the Company's decision concerning the sums payable under this clause.

## 68. Human Resource Issues

68.1. The Contractor shall execute the works using its own resources and shall bear all costs related to salaries, allowances, perks, travel expenses, advances, insurance, safety measures, security, transportation, and any other miscellaneous expenses for their employees and workmen during the tenure of the Annual Maintenance Contract (AMC). The Contractor shall also be solely responsible for payments related to outpatient care, hospitalization, and compensation in the event of any accident, injury, or death.

68.2. The issuance of ID cards for the Contractor's workforce shall be managed exclusively by the BRPL Security ID Card Cell. Contractors must maintain records of identity cards and promptly collect and return cards upon employee separation. Failure to comply will attract penalties. Contractors shall submit a detailed employee list to BRPL Security prior to contract commencement.

68.3. The Contractor shall deploy manpower immediately as required to perform the specified work.

68.4. The Contractor must ensure that no disputes arise concerning service conditions or payments during the contract period. Employees of the Contractor shall not make claims or demands on the Company for employment, wages, allowances, or related matters at any time.

68.5. The Contractor shall not deploy personnel below 18 years of age and shall not deploy female workers between 7 PM and 6 AM.

68.6. The Contractor shall be solely responsible for any disputes arising between it and its employees and shall indemnify the Company against all resultant losses, damages, and claims. All legal dues to employees must be paid timely or within eight days post-termination.

68.7. The Contractor shall provide and ensure regular use of all necessary safety gear by its workforce, including safety shoes, helmets, gloves, belts, goggles, etc., at its own cost.

68.8. The Contractor shall maintain discipline among its workforce and adhere to the Company's disciplinary procedures at the site. The Company reserves the right to object to the presence of any Contractor employee deemed to exhibit misconduct or negligence; such personnel must be replaced immediately upon request.

68.9. The Contractor shall ensure compliance with:

68.10. Payment of minimum wages as notified by the Government of the National Capital Territory of Delhi

68.11. Salary disbursement strictly via ECS

68.12. Timely deduction and deposit of ESI and PF contributions, with submission of relevant documentation to the Company

68.13. The Company reserves the right to require Contractor services on holidays or beyond normal working hours, with written communication provided by the Engineer In-Charge.

68.14. The Contractor shall ensure none of its personnel engage in activities detrimental to the Company's interests. Any violations may lead to actions as per tender terms.

68.15. The Contractor is responsible for all applicable taxes and duties payable to central, state, or local authorities.

68.16. Contractor employees shall not be considered employees of the Company and are not entitled to Company benefits or facilities. Should the Company incur liabilities due to Contractor employee-related laws or enactments, such costs shall be recoverable from the Contractor, including any sums payable.

68.17. The Contractor shall fully comply with all applicable statutory Acts.

68.18. The Contractor shall submit compliance documentation as per the format attached as Annexure I.

68.19. The Contractor shall adhere to the Vendor/Bidder Code of Conduct as specified in the NIT.

## 69. Environmental, Health & Safety Plan

69.1. 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:

- 69.1.1. Comply with all of the elements of the EHS Plan and any regulations applicable to the work.
- 69.1.2. Comply with the procedures provided in the interests of Environment, Health and Safety.
- 69.1.3. Ensure that all of their employees designated to work are properly trained and competent.
- 69.1.4. 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 Contractors' instructions.
- 69.1.5. Make arrangements to ensure that all employees designated to work on or visit the site present themselves for site induction before the commencement of work.
- 69.1.6. Provide details of any hazardous substances to be brought onsite.
- 69.1.7. Ensure that a responsible person accompanies any of their visitors to site.
- 69.1.8. All contractor's staff are accountable for the following:

69.1.9. 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.
69.1.10. Keep tools in good condition.
69.1.11. Report to the Supervisor any unsafe or unhealthy condition or any defects in plant or equipment.
69.1.12. Develop a concern for safety for themselves and for others.
69.1.13. Prohibit horseplay.
69.1.14. Not to operate any item of plant unless they have been specifically trained and are authorized to do so.

## 70. Guidelines Regarding Inspection & Maintenance of Pits/Dugs

70.1. The contractor shall ensure strict compliance of the following directions:
70.1.1. The sites of all manholes, pits, holes, tanks or any other opening in the ground of any kind shall be regularly inspected and maintained.
70.1.2. Schedule and protocols of inspections and maintenance shall be drawn up and notified to BRPL.
70.1.3. These sites shall be cordoned off to render them inaccessible to the public.
70.1.4. The existence of these sites shall be clearly & visibly marked by the display of signboards/ signages.
70.1.5. If they are required to be covered, it shall be ensured that the covers are in place.
70.1.6. If required, as per law, prior permission from authorities shall be secured before the commencement of work.
70.1.7. Bidder shall follow all laws of the land and prevailing borders issued by various Govt departments like Dept of Power / DERC /NGT/ Dept of Forest/Dept of Environment/DPCB/Court Orders etc.

## 71. Measures Related to the Tree Pruning, Excavation near Tree and Construction & Demolition

71.1. Notwithstanding anything stated in the tender document, work contract or any other communication issued related to the performance of the work order awarded, it is clarified that the Contractor and its associate/employees/worker, during the performance of work under this tender, shall ensure full compliance of the provisions of all environment laws/rules/directions by any authority including judicial authority/ regulation related to excavation near tree and construction & demolition activity, and shall mandatorily comply the following instructions:

71.1.1. **Tree Pruning, Planning, Installation and Maintenance of Utility Apparatus in proximity to trees shall be done mandatorily by ensuring the following prescribed measures:**

71.1.1.1. No excavation work shall be done within two (2) meters of the Tree Trunk.
71.1.1.2. Any exposed roots beyond 2 meters of the tree trunk, should be protected with dry sacking and backfilling must be done with a suitable manure mixture and/or the compost material mix as soon as possible on the completion of the works.
71.1.1.3. For any excavation to be carried out beyond the prescribed distance of 2 meters but within 3 meters from the tree trunk, manual methods (by use of hand) or by using trenchless techniques shall be preferred over use of a mechanical excavation.
71.1.1.4. No roots shall be cut during the excavation work.
71.1.1.5. Not to lean any materials against or chain mechanical plants to the trunk of the trees.

71.1.1.6. Avoid any soil contamination from oil, gasoline, paint and paint thinner or other chemicals.

71.1.1.7. No concrete or construction or repairing work shall be done at least within two (2) meter radius of the trunk of trees.

71.1.1.8. All the electric wires and high-tension cables and other apparatus relating to supply of electricity shall permanently be removed from the tree's branches.

71.1.2. **Records to be maintained by the supervisor to demonstrate adherence to the guidelines for excavation in Proximity to the Trees:**

71.1.2.1. Ensure pre and post photography and videography of the site demarcated for the excavation work and the same shall not be deleted/removed until securing the prior permission of the Circle head O&M.

71.1.2.2. While digging and upon exposure to the roots– take immediate photographs of the same and report the matter to senior officers for further guidance.

71.1.2.3. If any unauthorized layering of other cables is being carried out at the digging site by some other agency/person, then immediately capture photographs of the same and inform the seniors, who shall take suitable legal actions, if required, which includes intimating to tree officer about such unauthorized laying of wires by such agency.

71.2. **DUST MITIGATION MEASURES FOR CONSTRUCTION & DEMOLITION ACTIVITIES**

71.2.1. Any construction/demolition/excavation related activity performed in furtherance of the performance of work under award, be undertaken only after ensuring the Dust Mitigation Measures prescribed as follows:

71.2.1.1. Dust/wind breaking walls of appropriate height around the periphery of the construction site.

71.2.1.2. Installation of Anti-Smog Gun(s) (for >20,000 m2 built up area).

71.2.1.3. Tarpaulin or green net on scaffolding around the area under-construction and the building.

71.2.1.4. All vehicles including carrying construction material and construction debris of any kind should be cleaned and wheels washed.

71.2.1.5. All vehicles carrying construction material and construction debris should be fully covered and protected.

71.2.1.6. All construction debris and construction material of any kind should be stored on the site and not dumped on public roads or pavements.

71.2.1.7. No loose soil or sand or Construction & Demolition Waste or any other construction material which may cause dust, shall not be left uncovered.

71.2.1.8. No grinding and cutting of building materials in open area. Wet jet should be used in grinding and stone cutting.

71.2.1.9. Unpaved surfaces and areas with loose soil should be adequately sprinkled with water to suppress dust.

71.2.1.10. Roads leading to or at construction sites must be paved and blacktopped i.e., metallic roads (for >20,000 m2 built up area).

71.2.1.11. Construction and demolition waste should be recycled on-site or transported to authorized recycling facility and due record of the same should be maintained.

71.2.1.12. Every worker working on construction site and is involved in loading, unloading and carriage of construction material and construction debris should be provided with dust-mask to prevent inhalation of dust particle.

71.2.1.13. Arrangement should be provided for medical help, investigation and treatment to workers involved in the construction of building and carry of construction material and debris relatable to dust emission.

71.2.1.14. Dust mitigation measures shall be displayed prominently at the construction site for easy public viewing.

71.2.1.15. Ensure the compliance of all dust control measure.

71.3. It is clarified that BRPL has zero tolerance with respect to the non-compliance/breach of environment laws/rules/directions by any authority including judicial authority/ regulation. Accordingly, in case of breach by the Contractor/its associate/employee/worker to the laws/rules as detailed above, shall be termed as serious breach to the terms of work order and BRPL shall be free to take all actions against Contractor for such breach of contract including the termination of the said contract. Additionally, the Contractor shall also be liable to indemnify BRPL/its Directors/Officers/Employees/Associates in full including the payment of all loss/penalties/compensation including environment compensation as imposed by any judicial/quasi-judicial citing/alleging such breach.

71.4. The Contractor shall also be under a mandate to provide an Undertaking to BRPL, which includes that the excavation, tree pruning, construction and demolition work, if performed by such Contractor, the same shall be in strict adherence of all environment laws/rules/directions by any authority including judicial authority/ regulation and all the measures provided in work order/tender under the head/title "Measures related to the Tree Pruning, excavation near tree and construction & demolition".

## 72. Commissioning & Acceptance Test

72.1. Upon completion of the Works, the Contractor shall conduct a trial run or operational test in the presence of the Engineer in Charge. The system shall be operated under the Contractor's supervision during this period. The Contractor shall promptly undertake any necessary rectifications or modifications identified during the trial run.

72.2. Upon satisfactory completion of the trial run, the system shall be considered energized and placed into commercial operation. The Engineer In Charge will issue a certificate of acceptance confirming successful commissioning.

## 73. Work Completion Certification, Handing Over

73.1. 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.

73.2. Upon the successful completion of all testing and commissioning of the items and works under the package, and subject to the Purchaser's/Owner's satisfaction, the Purchaser shall issue a "Taking Over Certificate" to the Contractor. This certificate shall serve as the final acceptance of the package and shall only be issued after the Purchaser receives the corresponding certificate from the Owner.

## 74. Punch List and Outstanding Work

74.1. The Contractor shall, in coordination with the Purchaser, prepare and update on a continuing basis during the period between completion of structure and final completion, punch lists (based on the preliminary punch list) of outstanding items requiring completion or rectification.

74.2. The Contractor shall rectify or complete all outstanding work or plant items to the standards specified in the Contract and according to the schedule set forth in the punch list. If the Contractor fails to commence or diligently proceed with such outstanding work as per the agreed schedule, the Purchaser may arrange for completion of the outstanding work. The reasonable costs incurred for such completion shall be certified by the Purchaser and deducted from the contract price or otherwise paid by the Contractor to the Purchaser.

74.3. The parties may mutually agree that any outstanding work items shall be carried out by the Purchaser or deleted from the punch list, subject to an agreement on the appropriate compensation or allowance to be paid or granted by the Contractor to the Purchaser in respect of such outstanding items.

## 75. Rectification/Correction and Replacement of faulty/defective/damaged work

75.1. The Employer may reject defective or unsatisfactory work or materials. The Contractor shall proceed immediately with the correction of rejected, defective, or unsatisfactory workmanship or materials and shall have all objectionable materials and defective work removed from the site (or any place used for storing materials for use on the work) and replaced.

## 76. Demobilization

76.1. Prior to handing over the site, the Contractor shall ensure the removal of all its belongings, materials, equipment, supplies, wastes, and any other property brought or generated at the site or work area.

76.2. The Contractor shall, as soon as reasonably practicable and in accordance with all applicable laws and regulations, remove or dispose of all debris, rubbish, and waste, taking all necessary measures to prevent any damage to the site or adjacent property.

76.3. Regarding labour and accommodation, the Contractor shall be fully responsible for the removal of all its workmen, laborers, and any temporary structures, hutments, sheds, or dwellings erected for the execution of the works, ensuring complete clearance of the site prior to handover.

## 77. Contract Closure

77.1. Upon completion of all works in accordance with the scope and specifications of the Contract, the process for contract closure shall be initiated. The following key activities, as applicable, shall be undertaken to effect contract closure:

77.1.1. Completion of works and issuance of the Work Completion Certificate by the Purchaser.
77.1.2. Resolution and closure of all outstanding punch points.
77.1.3. Finalization and certification of measurements by the Engineer-in-Charge or the designated Engineering representative.
77.1.4. Joint final reconciliation of Free Issue Materials (FIM) between the Contractor and Purchaser.
77.1.5. Joint reconciliation and finalization of delay analysis, including Liquidated Damages (LD), if applicable.
77.1.6. Submission of No Demand Certificate by the Contractor.
77.1.7. Submission of Indemnity Bond by the Contractor.
77.1.8. Reconciliation and confirmation of the Contract Payment Register and associated accounts by both Contractor and Purchaser.

## 78. Patent Rights and Royalty

78.1. In the event that the Contractor, during the course of performing its obligations under this GCC, acquires, invents, or develops any proprietary knowledge, information, process, or invention which qualifies, or may qualify, as a trademark, copyright, patent, trade secret, geographical indication, or any other intellectual property right, the Bidder shall promptly disclose such creation to BRPL. All title, interest, and rights to such intellectual property shall vest exclusively in BRPL, and the Contractor shall execute all documents necessary to ensure BRPL's sole ownership without delay.

78.2. The Contractor warrants that, in performing its obligations, no intellectual property rights of any third party shall be infringed, whether by violation of statute, passing off, or otherwise. The Contractor shall bear sole responsibility for any infringement claims, and shall fully indemnify and hold BRPL harmless from and against any and all losses, damages, liabilities, costs, or expenses (including reasonable legal fees) incurred as a result of any such infringement. Any compensation, damages, or expenses paid by BRPL to third parties in connection with such infringement shall be recoverable in full from the Contractor.

## 79. Confidentiality/Secrecy

79.1. The Contractor shall not, without the Company's prior written consent, disseminate, publish, or otherwise utilize in any form of advertising, publicity, sales release, or media any photograph, reproduction, or description of the Works under this Contract, nor disclose the site details, dimensions, quantities, or other related information concerning the Works.

79.2. The Contractor, along with its employees and representatives, shall maintain strict confidentiality regarding all information encountered in the execution of the Contract, as detailed below.

79.2.1. Documents: All maps, plans, drawings, specifications, schemes, and other documents or information related to the Contract/Project, including any material supplied to the Bidder by BRPL for contract execution, shall be treated as confidential and remain the property of BRPL. Such documents shall be used solely for purposes of the Contract and shall not be disclosed or used for any other purpose. Disclosure

79.2.2. to third parties is permitted solely where such disclosure is necessary for the execution of the Work, and only upon the third party's execution of a confidentiality agreement acceptable to BRPL, explicitly committing to uphold confidentiality obligations equivalent to those set forth herein.

79.2.3. Geographical Data: Maps, layouts, site photographs, and regional imagery depicting installations of national or BRPL significance shall not be published, disclosed, or exported without BRPL's prior written approval. Any necessary disclosure to third parties shall be subject to confidentiality agreements satisfactory to BRPL, executed prior to disclosure.

79.2.4. Violation: In the event of any breach of these confidentiality provisions, the Contractor shall indemnify and hold the Company harmless from any loss, cost, damage, or claim (including claims asserted by third parties) arising as a result of such breach. Any actual or suspected data breach or cyber incident must be promptly notified to BRPL and investigated at the Contractor's expense.

79.3. Furthermore, the Bidder shall be liable for compensation or damages as determined by the competent authority of BRPL.

## 80. Progress Reports of Work Execution and Information

80.1. Throughout the manufacturing and erection stages of critical equipment under this Contract, the Contractor shall, at its own expense, submit periodic progress reports as reasonably required by the Purchaser. These reports shall include relevant supplementary materials such as charts, network diagrams, photographs, and test certificates. The format, size, and number of copies of such reports shall be specified by the Purchaser.

80.2. Quantitative progress reports shall refer to the project schedule in sufficient detail to enable the Purchaser to assess performance, schedule witness dates, and evaluate forecasts, including reports on key subcontracts, where applicable. Within seven (7) days after each report submission—and at other times as reasonably requested by the Purchaser—the Contractor and Purchaser shall meet to discuss progress.

80.3. Weekly progress reports shall include but not limited to:

80.3.1. Executive summary

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

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

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

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

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

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

80.5. In addition to the above, the Contractor shall promptly furnish all reports, records, and information as may be requested by the Company, in a form and frequency specified by the Company. The Company retains the right to alter the format and requirements of such submissions, and the Contractor shall be bound to comply with any revised reporting obligations as communicated by the Company

## 81. Dispute Resolution & Arbitration

81.1. The Parties shall make all reasonable efforts to resolve amicably, through mutual discussions, any disputes or differences arising out of or in connection with this Contract. In the event that such disputes remain unresolved for thirty (30) days from the date either Party notifies the other in writing of the dispute, either Party may refer the matter to arbitration.

81.2. Arbitration shall be conducted by a tribunal comprising two arbitrators - one to be appointed by each Party. The two arbitrators thus appointed shall mutually select a third individual to act as the presiding arbitrator prior to entering upon reference, if and when required. The arbitration proceedings shall be undertaken in accordance with the provisions of the Indian Arbitration and Conciliation Act, 1996 and its 2015 and 2019 amendments. The seat and venue of arbitration shall be New Delhi, India. The language of all proceedings, documents, and communications shall be English. The arbitral process shall be completed within a maximum period of three (3) months from constitution of the arbitral tribunal.

81.3. Reference to negotiation and/or arbitration may proceed regardless of whether the Works have been completed, provided that the contractual obligations of both the Purchaser and the Contractor shall remain unaffected during pendency of arbitration. Under no circumstances shall the Contractor suspend execution of the Works, in whole or in part, on account of

ongoing arbitration. Payments due to the Contractor shall continue to be made as per the terms of the Contract.

81.4. All disputes arising out of or in relation to this Contract that require recourse to judicial proceedings shall be subject to the exclusive jurisdiction of the courts at Delhi, India.

**82. Termination Due To Contractors Default**

82.1. The Purchaser shall have the right to terminate this Contract by providing the Contractor with seven (7) days' prior written notice if any of the following events occurs:

82.1.1. The Contractor fails to complete the execution of the Works within the approved schedule, terms, and conditions stipulated herein.

82.1.2. The Contractor commits an act of insolvency or is adjudged insolvent by a court of competent jurisdiction.

82.1.3. The Contractor abandons the Contract.

82.1.4. The Contractor fails to commence the Works or suspends the progress of the Works for an unreasonable period.

82.1.5. The Contractor fails to proceed with the Works with due diligence and fails to make satisfactory progress.

**83. Remedy for Contractor's Default**

83.1. If the quality of the Works performed by the Contractor fails to meet the contract requirements, the Purchaser shall have the right to demolish or reject such defective work and have it re-executed at the Contractor's risk and cost.

83.2. If the Contractor is unable to perform the Works in accordance with the agreed schedule and other contract provisions, the Purchaser may, after providing seven (7) days' written notice to the Contractor, have the Works rectified, completed, or carried out by an alternative agency at the Contractor's risk and cost.

**84. Risk & Cost**

84.1. If the Contractor fails to execute the Works as per the NIT specifications or as agreed in the Contract within the scheduled period, including any extensions granted, the Contract shall be terminated. BRPL reserves the right to complete the Works through alternative sources at the Contractor's risk and cost. Any additional expenditure incurred shall be debited to and recovered from the Contractor under the Contract.

**85. Termination for convenience of Purchaser**

85.1. The Purchaser may, at its sole discretion, terminate this Contract in whole or in part by providing the Contractor with thirty (30) days' prior written notice, including notice via email. The Purchaser shall pay the Contractor for all supplies and services rendered up to the effective date of termination, subject to submission of an appropriate invoice by the Contractor.

85.2. Upon receipt of the termination notice, the Contractor shall, within thirty (30) days or by the date specified in the notice:

85.2.1. Cease all further Work, except for such activities as may be necessary to protect and preserve completed portions of the Facilities or to leave the site in a safe and clean condition as directed by the Purchaser.

85.2.2. Terminate all subcontracts, except those which the Purchaser specifies will be assigned to it.

85.2.3. Remove all Contractor's equipment and personnel, including subcontractors' personnel, from the site and clear all debris, rubbish, and wreckage, leaving the site clean and safe.

85.2.4. Deliver to the Purchaser all completed portions of the Facilities as of the termination date.

85.2.5. To the extent permitted by law, assign to the Purchaser all rights, title, and benefits relating to the Facilities, Plant, Equipment, and subcontracts as at the termination date.

85.2.6. Deliver to the Purchaser all non-proprietary drawings, specifications, and other documentation prepared in connection with the Facilities as of the termination date.

85.3. In the event of such termination, the Purchaser shall pay the Contractor the following amounts, after deducting any claims the Purchaser may have under the Contract:

85.3.1. The contract price attributable to the completed parts of the Facilities as of the termination date.

85.3.2. Reasonable costs incurred by the Contractor for removal of equipment from the site and repatriation of personnel.

85.3.3. Pre-approved and reasonable costs for fulfilling bona fide obligations or commitments with third parties connected to the Contract that are not otherwise covered.

85.4. Payment as described above shall constitute the Contractor's sole and exclusive remedy for termination by the Purchaser under this clause. The Contractor hereby waives all other claims, including loss of profits or any other damages or expenses related to such termination.

85.5. The Contractor agrees that all claims for compensation must be fully substantiated with sufficient detail to allow evaluation by the Purchaser. All subcontracts shall be terminated except those assigned to the Purchaser pursuant to this clause.

## 86. Entire Agreement & Amendment

86.1. This Agreement constitutes the entire understanding between BRPL and the Contractor regarding the subject matter herein and supersedes all prior agreements, whether written or oral, that relate to such matters. Any modification, amendment, or alteration to this Agreement shall be valid only if documented in writing and duly executed by authorized representatives of both BRPL and the Contractor.

## 87. Notice & Communication

87.1. Any notice or other formal communication under this Agreement shall be in writing, signed by or on behalf of the party issuing it, and shall be sent by registered post with acknowledgement due (A.D.) to the addresses of the Contractor or BRPL as stated herein, or to such other addresses as may be mutually agreed upon in writing by the Parties from time to time.

87.2. Notices and formal communications may also be transmitted via the official email addresses of the authorized representatives of the Contractor or BRPL. Such electronic communications shall be deemed duly delivered upon successful transmission and acknowledgement by the recipient.

87.3. All communications, correspondence, and documentation pertaining to the Purchase Order shall be directed strictly as specified in this Agreement.

## 88. Acceptance

88.1. The Contractor hereby acknowledges and confirms review of BRPL's Policy on legal and ethical standards for contractors, as set forth in the "Vendor/Contractor Code of Conduct" displayed on BRPL's official website (www.bsesdelhi.com). The Contractor agrees that the Contractor Code of Conduct shall form an integral part of the Contract, Purchase Order (PO), or Work Order (WO). The Contractor undertakes to fully comply with the Vemdor/Contractor Code of

Conduct, and acknowledges that any violation shall constitute a breach of the Contract/PO/WO. In the event of such breach, whether or not it causes any actual loss or damage, BRPL reserves the right to recover any loss or damage from the Contractor. The Contractor shall indemnify and hold harmless BRPL against any claims, litigation, or other consequences arising out of any breach or violation of the Contractor Code of Conduct by the Contractor, its officers, agents, or representatives.

88.2. Acceptance of the Contract includes acceptance of all terms and conditions referenced therein, including technical specifications, drawings, general conditions, detailed scope of work, and any equipment drawings provided to the Contractor.

88.3. The contractual obligations of BRPL and the Contractor are strictly limited to the terms and conditions set forth in the Contract. No amendment, modification, or alteration to the Contract shall be valid unless made in writing and signed by authorized representatives of both Parties.

88.4. All services and supplies under this Contract are expected to be fully aligned with BRPL's Vision, Mission, and Values. These can be reviewed at https://www.bsesdelhi.com/web/BRPL/about-bses.

BSES

BSES RAJDHANI POWER LIMITED

**ENVIRONMENT, HEALTH & SAFETY CONDITIONS FOR SCHEME BASED CONTRACTS/ SERVICE LEVEL AGREEMENTS INVOLVING SITE WORK**

## 1. General Requirements

1.1 The contractor shall ensure that safety of all the workers, materials, Installation and equipment belonging to him or to others and working at the site is ensured through effective and practicable safety management systems.

1.2 The contractor shall be responsible for compliance to provisions of all safety requirements under various notices, acts, rules and relevant applicable legislations.

1.3 The contractors shall comply with all health & safety requirements as deemed necessary by BRPL from time to time.

1.4 Works shall be carried out by the contractor after taking necessary "Permit to work". Also, the work shall not be carried out without use of Protective equipment like shoes, safety belts, helmets etc. adhering to safety compliance.

1.5 All the equipment being used shall be timely calibrated.

## 2. QEHS Policy

The contractor as per requirement of CEA Measures Relating to Safety and Electric Supply Regulations, 2010 shall follow the Quality, Environment, Health & Safety Policy of BRPL. The contractor shall implement quality, health & safety management systems in accordance to BRPL EHS policy and ensure that intentions of such policy are met.

## 3. Health & Safety Plan

3.1 The contractor shall document a detailed and comprehensive Contract specific health & safety plan incorporating HIRA (Hazard Identification & Risk Analysis) to BRPL. This plan shall necessarily include detailed policies, procedures, method statement for each activity to be performed and regulations which, when implemented, will ensure compliance of the contract provisions stated herewith.

3.2 The contractor shall provide health & safety plan for such activities required to be carried out under the awarded contract as deemed necessary by BRPL.

## 4. EHS Organization & Responsibility

4.1 The contractor supervisor will play the role of safety supervisor. The safety supervisor shall hold a diploma degree from a recognized institute or university as per CEA Regulations, 2010. Also, simultaneously contractor has to ensure their competency in safety or EHS with 40 hours training from reputed agency (like RLI/Allied Boston/ National Safety Council) or trainer, which should be verified earlier by BRPL safety department accordingly. 4.2 The training certificate should not be more than one year old.

4.3 Apart from above, as an owner of the company the contractor & their other key persons are also responsible for safety compliance and related issues.

## 5. First Day at Work –Induction Training and Issuance of ID-Card

5.1 The contractor shall ensure that all his workers have under gone the safety induction and have been issued with a valid ID card prior to start work at BRPL site.

5.2 All contractor workers shall undergo above as per the BRPL site specific procedure issued from time to time.

5.3 The contractor shall ensure that no worker is in any O&M activities until the valid ID card is issued and the same is available by each worker at site including that of sub-contractor(s).

5.4 In case any worker lost the ID card issued to him, the contractor shall ensure that such incidences are promptly reported to BRPL and duplicate or new ID card is issued immediately after completing formalities as deemed necessary by BRPL.

## 6. Provision of Safe Working Conditions

6.1 Proper barricading shall be created during height work, excavation/civil work, cable laying work, working on pole, etc. During civil/excavation work usage of safety net shall be ensured. Dimensions of barricading while cable laying work- Height- 2 mtr, Length- 1.5 mtr. There shall not be any gap in between two barricades. LED Bacon light shall be placed at 1st and every 4th barricade. However, while working

on pole during supply maintenance work there should be a barricading cone and caution tape . In narrow lanes, where proper barricading as per rules is not possible, use barricading as per the approval of respective safety circle head in writing and copy forwarded to safety and uploading in QMS.

6.2 PPE' REQUIREMENT

6.2.1 The contractor shall ensure all the required PPEs given in clause 6.2 and shall allow their workers to start work at site only after proper verification of adequacy of safety gears/PPE required for the specific job at site by the Safety personnel/Site Engineer of BRPL. Any other PPE apart from the list mentioned as deemed necessary as per the work shall also be provided like boots during excavation work, etc.

Contractor has to ensure the quantity and quality of PPEs during procurement and continuous usage of following PPE's by his staff.

| S.NO. | NAME OF THE PPEs | LINEMAN / FITTER/SKILLED | HELPER/UNSKILLED | SUPERVISOR |
|---|---|---|---|---|
| 1 | SAFETY HELMET | ✓ | ✓ | ✓ |
| 2 | SAFETY FULL BODY HARNESS (POSITIONING BELT) | ✓ | X | X |
| 3 | ELECTRICAL HAND GLOVES (for electrical works) | ✓ | ✓ | X |
| 4 | SAFETY SHOES | ✓ | ✓ | ✓ |
| 5 | SAFETY GOGGLES | ✓ | ✓ | ✓ |
| 6 | REFLECTIVE JACKET | ✓ | ✓ | ✓ |

6.2.2 Contractor has to ensure for proper procurement and distribution of required PPE's among their workers with receiving in attached format (Annexure- 1) which will be verified by the safety department during inspection.

6.2.3 If any of the contractor staff found without PPEs, the said PPE's will be issued to them from BRPL store with immediate effect. And the 20% extra amount with procurement cost will be recovered from their next monthly bill cycle.

**Note:** PPEs shall strictly be as per the brand mentioned in clause 6.2.4

6.2.4 **Technical Specification of the PPEs**

**6.2.4.1. Safety Shoes** – With Composite / Fiber toes (CE approved / IS 15298) – Mandatory for all personnel working at BRPL O&M. The safety shoes shall meet the following features:

1. Electric Shock Resistant Sole
2. Impact Resistant
3. Scrap/Heat Resistant
4. Slip Resistant
5. Oil and Acid Resistant
6. Rubber PU Sole
7. Anti puncture

Lead MAKE: BATA/HONEYWELL/KARAM

**6.2.4.2 Safety Helmets**: (IS 2925 - 1984 or DGMS) with chin strap – Mandatory for all personnel working at BRPL O&M. The specification of safety helmet shall be as given below:
V-GARD HDPE Yellow With 4 Point Fas Trac Ratchet Suspension

| | |
|---|---|
| Shell Material | UV stabilized HDPE, Non vented |
| Suspension | • With 4 Point Fas Trac Ratchet Suspension sewn headband<br>• Textile straps made from polyester Suspension<br>• point fixing: good positioning, ...stability, better air circulation due to ...limited contact areas with the head<br>• Easy clean sweatband |
| Size | 52-62 cm |
| Accessory slot | Standard 30 mm with removable HDPE dead plugs suitable to leak proof fitting |
| Approvals | ANSI/ IEC Z89.1 Class E (electrical) |
| Additional | Low temperature -10°C (acc. to GB2811), High temperature +50°C |
| Colours | Yellow |
| weight | 360 g |

Lead MAKE: 3M / KARAM / UFS

**6.2.4.3 Full Body positioning Harness**: (CE approved / IS 3521 / EN 361 / EN 355) – Shall be used while work is in progress at height more than 1.8 meter or where from a person may fall and get injured. The specification of the Full body harness shall be as given below:

| | |
|---|---|
| Anchorage | Adjustable two chest attachment D-rings and A dorsal attachment D-ring |
| Adaptability | Adjustable shoulder and thigh straps |
| Convenience | Shoulder and thigh straps differentiated by a dual color scheme. |
| Ergonomics | Idealy. Positioned sit strap for extended comfort. |
| Size | Standard |
| weight | 1200GMS |
| ENERGY ABSORBING FORKED LANYARDS : | |
| Spec. | 44mm wide polyamide webbing. |
| Length | 1.5 Meter |

There should not be any metallic part in the full body harness.

Lead MAKE: KARAM /LIFEGEAR/UFS/HONEYWELL

**6.2.4.4 Flex Chem Full View Safety Goggles** – Shall be used to protect workers eyes from foreign materials and flying particles. Mandatory for all personnel working at BRPL O&M. Safety goggles shall meet the following feature:

1. Acetate lens for special applications requiring superior chemical resistance.
2. Industrial version of tough and popular first responder goggles.
3. SoftFlex low profile frosted frame for increased comfort.
4. Comfortable headband with length adjustment.
5. Indirect venting for comfortable, long lasting wear can be worn with safety helmets and over prescription spectacles.
6. Sightgard + premium anti-fog coating (EN 166 "N") with good anti- scratch properties.

Technical Specification:

| | |
|---|---|
| Weight | 95g. |
| Lens thickness | 1.0mm |
| Overall width | 173mm |
| Overall length | 90mm |
| Bridge | 47.6mm |
| Lens base | 5.5 curve |
| Lens size | 86.1mm verticle, 174mm diagonal |
| Headband | Adjustable length at max.440mm(long enough to fit together with helmets) |
| Material & colors | |
| Lens | Acetate clear, coating, Sightgard + anti-fog according to EN 166 "N" & anti scratch. |
| Body | PVC smoke |
| Headband holder | Nylon |
| Headband | Adjustable grey elastic fixed on frame side parts |
| Marking / Approvals | |
| Standard number | EN 166 |
| Frame marking | MSA EN 166 34-FT CE |
| Lens marking | 2C-1.2 MSA 1 FT N CE |
| Filter class | 2C (Ultra violet radiation with enhanced color recognition) |
| Scale number | 1.2: luminous trasmittance-89% |
| Optical class | 1 (best class, for permanent wear) |
| Mechanical resistance | F (low energy impact 45m/s) T (at extreme temperature -5 to $+55^0$ C) |
| Resistance to | N(distorted vision due to lens fogging) |
| UV filter | 99.9% |
| Ordering information | 10145578-FlexiChem Sightgard + clear , 6x |

Lead MAKE: MSA / UVEX/ UFS/3M/KARAM

**6.2.4.5 Electrical Insulating Hand Gloves** – Shall be used to prevent electric shock based upon the hazards/risks involved in a particular activity. Safety goggles shall meet the following features:

- Breakthrough manufacturing process for exception dry grip.
- Soft and flexible for enhanced tactility, high dexterity and wearer comfort.
- Ergonomic design featuring tapered fingers to reduce hand fatigue.
- Relaxed wrist for easy on/off.

| | **For LT work** | **For HT work** |
|---|---|---|
| Length | 360mm | 360mm |
| Class | 2 | 0 |
| Thickness | 3.6mm | 1mm |
| Proof test voltage | 20000 | 5000 |
| Maximum use voltage | 11000 | 1000 |

| | |
|---|---|
| Tensile strength | >16mpa[Mega Pascal] |
| Puncture resistance | >18N/mm [Newton per mili meter] |
| Elongation at break | >600% [Stretching length] |
| Tension set | <15% |

- It should be resistant to oil, acid, ultra violet rays and very low temperature.
- Each pair of glove should be marked with class, category, month & year of manufacturing, CE logo, batch no. and certified laboratory no.
- EN certified to electrical and thermal hazards,
- EN certified to thermal & electrical hazards to confirm EN 60-903,
- EN certified to mechanical hazard to EN-388

Lead MAKE: Honeywell / ANSELL/CATU

**6.2.4.6 Arc Protection Face Shield**

a) ATPV value is 10 cal/cm2
b) It shall have a slotted hard hat and chin guard
c) Visible light transmission (VLT) shall be 70%
d) It should have anti fog lens
e) It should have a provision for replacement of lens and brackets.
f) It should cover the complete face and the complete neck region.
g) It must not hinder the work. Must be comfortable for the height jobs as well as in the ground.
h) Carry bag for the kit.

Lead MAKE: Oberon/Honeywell

**6.2.4.7 Certificates required for all PPEs**:

1. Manufacturer Certificate
2. Test Certificate
3. Authorization of Dealership/Distribution ship

## 7. Integrated Management System & Audits

7.1 The Contractor shall work in the framework of Integrated Management System (IMS) and shall maintain documentation as prescribed in the IMS Manual of BRPL. IMS Manual can be obtained directly from site engineer/Division Head/Respective Head.

7.2 All contractors during their currency of contract shall strive to continuously improve and demonstrate strict compliance to ISO 9001, 14001 & 45001 standards of BRPL.

7.3 To verify compliance and to continually improve the management system, all contractors shall be subjected to both internal & external audits.

## 8. Medical Examination

8.1 The contractor shall arrange a medical examination of all his employees including his sub-contractor employees like lineman, ALM, supervisor, Fitter, welders, gas cutters, drivers and all the workers supposed to work at height (and any other trade specified deemed necessary by BRPL at the time of deployment then annually) before employing, after illness or injury, if it appears that the illness or injury might have affected his fitness and, thereafter, once in every year as per the provisions of applicable laws or as prescribed by BRPL with proper record.

8.2 Records of medical examination as described above shall be maintained at the contractor premises
8.3 No person about whom the Contractor knows or has reason to believe that he is a deaf or he has a defective vision or he has a tendency to giddiness shall be required or allowed to work in any O&M

operation or other construction work which is likely to involve a risk of any accident either to the worker himself or to any other person.

**9. Working at Height**

9.1 The Contractor shall ensure that all works carried out at a height of 2 Meter or more shall only be started after obtaining a permit to work at height, which shall be issued as per the procedure of BRPL by authorized personnel.
9.2 The contractor shall ensure that all control measures mentioned and agreed through above work permit or as deemed necessary by BRPL are enforced and complied all the time during activities carried out at height.
9.3 Safety full body harness and ladder along with the required PPEs shall be used during height work.
9.4 Barricading cone and tape shall be used along with creation of proper safety zone.
9.5 Proper scaffolds and/or temporary work platforms shall be provided for working at height at elevations 1.5 meters or more where no permanent work platform is available to work safely. The elevated work platforms shall have guardrails and provided with ladders for access/egress. Ladders shall not be used as work platforms.
9.6 Whenever it is required to carry out work at height where scaffolding cannot be provided, use of safety net is must. All safety net systems shall meet the requirements of Indian Standard (IS: 5175).
9.7 No working at height shall be carried out without supervision.

**10. Reporting of Near Miss/ Incidents / Dangerous Occurrences**
10.1 In case of any incident/ accident occurs during the O&M activities undertaken by the Contractor thereby causing a dangerous occurrence or near miss or any minor or major or fatal injury to his employees due to any reason, whatsoever, it shall be sole responsibility of the Contractor to promptly inform the same to Department Head in prescribed form and also to all authorities envisaged under the applicable laws.

**11. Suspension of Work**
11.1 BRPL shall have the right at its sole discretion to suspend the work till compliance of safety norms, if in its opinion the work is being carried out in such a way that it may cause accidents and endanger the safety of the persons and / or property, and / or equipments.
11.2 In such cases, the contractor shall be informed in writing about the nature of hazards and possible injury /accident and he shall comply to remove all shortcomings promptly. Decision of BRPL shall be conclusive and binding on the Contractor in such aspects.
11.3 The contractor shall not be entitled to damages / compensation for suspending of work due to safety reasons and the period of such stoppage of work will not be taken as an extension of time for completion of the facilities as per the work order and will not be the ground for wavier of levy of liquidated damages.
11.4 The contractor shall follow and comply with all safety Rules of BRPL, relevant provisions of applicable laws pertaining to the safety of workmen, employees plant and equipment as may be prescribed from time to time without any demur, protest or contest or reservation. In case of any nonconformity between statutory requirement and safety rules of the BRPL referred above, the latter shall be binding on the contractor unless the statutory provisions are more stringent.

**12. OHS Appreciation Policy**
12.1 If the contractor observes all the safety rules and codes, statutory laws and rules during the period of the contract awarded by the BRPL and no accident occurs then BRPL may consider the performance of the contractor and safety score card will be prepared. The best contractor will be appreciated by suitable "SAFETY AWARD" as per scheme as may be announced separately from time to time.

**13 Guidelines for Penalty Policy Implementation**

13.1 Total penalty shall be calculated by multiplying the number of safety violations and the penalty amount specified for such violations in Appendix - 1. (Example – If at first offence persons are found working without safety helmet at 3 locations, the penalty would be 3X2000 = Rs.6000/-)

13.2 The amount of penalty can be increased or decreased based upon the seriousness of safety violations. The decision of recommending authority shall be final one.

13.3 Recommending authority shall send his factual observations to Department Head and Safety Head who in turn shall either reject or approve it. If approved, he shall send it to Finance & Accounts for execution. Finance Accounts shall execute the penalty and confirm the same & shall send it back to Department Head and Safety Head.

13.4 Recommending Authority means the Department Head, HODs, Site Safety officer / Supervisor, representatives from OHS and other personnel authorized jointly by O&M.

13.5 Penalties will be imposed for non-documentation and non-compliance of EHS related requirements/documents mentioned in the contract. The contractor shall maintain all the mentioned documentation at his premises.

13.6 Safety Head may impose penalty for serious violations directly.

13.7 All penalties shall be imposed directly on the concerned contractors. No penalty shall be imposed on individuals.

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## Appendix – 1

## Penalty Policy on Safety Violation

| Class | Type of Offense | Penalty Detail | Execution Channel |
|---|---|---|---|
| A | Not Wearing Safety Helmets Safety shoes/ Safety Goggles / Electrical insulating hand gloves/ reflective jacket/Not using (electrically) safe tools and equipment. (Poor quality or damaged item means noncompliance) | # First Offence - Warning Note & Rs.2000/-<br># Second Offence - Warning Note & Fine of Rs.5000/-<br># Third Offence- Action for termination of contract & Fine of Rs.15000/- | Recommendation by OHS-Representative/Department Head<br>Approval by Safety Head<br>Deduction by Finance & Account |
| B | Not wearing Full Body Harness/fall arresters while working at a height more than 1.8 meter or where from a person may fall. Not using Safety Net to arrest falling objects and personnel.<br>Not using Arc Protection Face Shield /proper ladder.<br>Not using barricading cone and tape.<br>(Poor quality or damaged item means noncompliance) | # First Offence -Warning Note & Fine of Rs.5000/-<br># Second Offence - Warning Note for dismissal and a Fine of Rs.10000/-<br># Third Offense - -Action for termination of contract and a fine of Rs.25000/- | Recommendation by OHS-Representative/Department Head<br>Approval by Safety Head<br>Deduction by Finance & Account |
| C | Any other unsafe work practices or condition which is considered having potential for fatality or injury. | # First Offence - Warning Note & Fine of Rs.10000/-<br># Second Offence - Action for termination of contract and fine of Rs.20000/-. | Recommendation by OHS-Representative/Department Head<br>Approval by Safety Head<br>Deduction by Finance & Account |

Notes:

# If there are 03 violations by an individual employee, his services will be terminated.
# If there are 03 violations in one quarter under any category, will be recommended for termination of contract order.

## Appendix – 2

## Penalty Policy on non- submission of EHS related requirements

| Record of following EHS related requirements shall be maintained at contractor's premises. | | |
|---|---|---|
| Requirement | Penalty Detail | Execution Channel |
| 1. Contract specific health & safety plan and HIRA (Hazard Identification & Risk Analysis)<br><br>2. Safety supervisor training records on EHS (40 hrs training)<br><br>3. Bills/challan of PPE's along with test certificates (if procured by the contractor)<br><br>4. PPE's receipt by worker (as per Annexure #1)<br><br>5. Medical examination record of workers<br><br>6. ID card of workers<br><br>7. Calibration Certificates of equipments | Warning Note & a Consolidated Fine of Rs.5000/- on non-availability of proof of any of these mentioned 7 types of documents | Recommendation by OHS-Representative<br>Approval by Safety Head<br>Deduction by Finance & Account |

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**Annexure-1**

**Format for PPE's Receipt by workers**

Name of Site ----------

Division----------

Name of Contractor ----------

| S. NO. | NAME | DESI. | Safety Helmet | Electrical Insulating Hand gloves | Full Body Harness | Safety Shoes | Safety Goggle | Reflective Jacket | SIGNATURE |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

Signature of Contractor / Date…….

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## APPENDIX II

ANNEXURE – 2.01

## FORMAT OF ADVANCE BANK GUARANTEE
**(To be executed on a Non-Judicial Stamp Paper of appropriate value)**

This Guarantee made at _____ this [___] day of [_____] 20XX

1. WHEREAS M/s BSES Rajdhani Power Limited, a Company incorporated under the provisions of Companies Act, 2013 having its Registered Office at BSES Bhawan, Nehru Place, Delhi 110019, India hereinafter referred to as the " Owner ", (which expression shall unless repugnant to the context or meaning thereof include its successors, administrators, executors and assigns).

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

3. AND WHEREAS as per clause ____of Conditions of Contract, the Contractors are obliged to provide to the Owners an unconditional bank guarantee for an amount equivalent to ten percent (10%) of the total Contract Value for the timely completion and faithful and successful execution of the Contract from **[_____]** *pl. specify the name of Bank)* having its head/registered office at **[_____]** through its branch in _____*(pl. specify the name of Branch through which B.G is issued)* hereinafter referred to as "the Bank", (which expression shall unless it be repugnant to the context or meaning thereof be deemed to include its successors and permitted assigns).

4. NOW THEREFORE, in consideration inter alia of the Owner granting the Contractors the Contract, the Bank hereby unconditionally and irrevocably guarantees and undertakes, on a written demand, to immediately pay to the Owner any amount so demanded (by way of one or more claims) not exceeding in the aggregate [Rs. ].....*(in words)* without any demur, reservation, contest or protest and/or without reference to the Contractor and without the Owner needing to provide or show to the Bank, grounds or reasons or give any justification for such demand for the sum/s demanded.

5. The decision of the Owner to invoke this Guarantee and as to whether the Contractor has not performed its obligations under the Contract shall be binding on the Bank. The Bank acknowledges that any such demand by the Owner of the amounts payable by the Bank to the Owner shall be final, binding and conclusive evidence in respect of the amounts payable by the Contractor to the Owner. Any such demand made by the Owner on the Bank shall be conclusive and binding, notwithstanding any difference between the Owner and the Contractor or any dispute raised, invoked, threatened or pending before any court, tribunal, arbitrator or any other authority.

6. The Bank also agrees that the Owner at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor without proceeding against the Contractors notwithstanding any other security or other guarantee that the Owner may have in relation to the Contractor's liabilities.

7. The Bank hereby waives the necessity for the Owner first demanding the aforesaid amounts or any part thereof from the Contractors before making payment to the Owner and further also waives any right the Bank may have of first requiring the Owner to use its legal remedies against the Contractors, before presenting any written demand to the Bank for payment under this Guarantee.

8. The Bank's obligations under this Guarantee shall not be reduced by reason of any partial performance of the Contract. The Bank's obligations shall not be reduced by any failure by the Owner to timely pay or perform any of its obligations under the Contract.

9. The Bank further unconditionally and unequivocally agrees with the Owner that the Owner shall be at liberty, without the Bank's consent and without affecting in any manner its rights and the Bank's obligation under this Guarantee, from time to time, to:

   (i) vary and/or modify any of the terms and conditions of the Contract;

   (ii) Forebear or enforce any of the rights exercisable by the Owner against the Contractors under the terms and conditions of the Contract; or

   (iii) Extend and/or postpone the time for performance of the obligations of the Contractors under the Contract;

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

10. This Guarantee shall be a continuing bank guarantee and shall not be discharged by any change in the constitution or composition of the Contractors, and this Guarantee shall not be affected or discharged by the liquidation, winding-up, bankruptcy, reorganization, dissolution or insolvency of the Contractors or any of them or any other circumstances whatsoever.

11. This Guarantee shall be in addition to and not in substitution or in derogation of any other security held by the Owner to secure the performance of the obligations of the Contractors under the Contract.

12. NOTWITHSTANDING anything herein above contained, the liability of the BANK under this Guarantee shall be restricted to _____*(insert an amount equal to ten percent (10%) of the Contract Value)* and this Guarantee shall be valid and enforceable and expire on _____*(pl. specify date)* or unless a suit or action to enforce a claim under this Guarantee is filed against the Bank on or before the date of expiry.

13. On termination of this Guarantee, all rights under the said Guarantee shall be forfeited and the Bank shall be relieved and discharged from all liabilities hereunder.

14. The Bank undertakes not to revoke this Guarantee during its validity except with the prior written consent of the Owner and agrees that any change in the constitution of the Bank or the Contractors shall not discharge our liability hereunder.

15. This Guarantee shall be governed by the laws of India. Any suit, action, or other proceeding arising out of, connected with, or related to this Guarantee or the subject matter hereof shall be subject to the exclusive jurisdiction of the courts of **Delhi,** India.

Dated this …… day of …….. …20XX at …….

(Signature)

……
(Name)
……
(Designation with Bank Stamp)
Attorney as per
Power of Attorney No.....

Date.....

ANNEXURE – 2.02

**FORMAT OF PERFORMANCE BANK GUARANTEE**
**(To be executed on a Non-Judicial Stamp Paper of appropriate value)**

This Guarantee made at _____ this [___] day of [_____] 20XX

1. WHEREAS M/s BSES Rajdhani Power Limited, a Company incorporated under the provisions of Companies Act, 2013 having its Registered Office at BSES Bhawan, Nehru Place, Delhi 110019, India hereinafter referred to as the " Owner ", (which expression shall unless repugnant to the context or meaning thereof include its successors, administrators, executors and assigns).

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

3. AND WHEREAS as per clause ____of Conditions of Contract, the Contractors are obliged to provide to the Owners an unconditional bank guarantee for an amount equivalent to ten percent (10%) of the total Contract Value for the timely completion and faithful and successful execution of the Contract from **[_____]** *pl. specify the name of Bank)* having its head/registered office at **[_____]** through its branch in _____*(pl. specify the name of Branch through which B.G is issued)* hereinafter referred to as "the Bank", (which expression shall unless it be repugnant to the context or meaning thereof be deemed to include its successors and permitted assigns).

4. NOW THEREFORE, in consideration inter alia of the Owner granting the Contractors the Contract, the Bank hereby unconditionally and irrevocably guarantees and undertakes, on a written demand, to immediately pay to the Owner any amount so demanded (by way of one or more claims) not exceeding in the aggregate [Rs. ].....*(in words)* without any demur, reservation, contest or protest and/or without reference to the Contractor and without the Owner needing to provide or show to the Bank, grounds or reasons or give any justification for such demand for the sum/s demanded.

5. The decision of the Owner to invoke this Guarantee and as to whether the Contractor has not performed its obligations under the Contract shall be binding on the Bank. The Bank acknowledges that any such demand by the Owner of the amounts payable by the Bank to the Owner shall be final, binding and conclusive evidence in respect of the amounts payable by the

Contractor to the Owner. Any such demand made by the Owner on the Bank shall be conclusive and binding, notwithstanding any difference between the Owner and the Contractor or any dispute raised, invoked, threatened or pending before any court, tribunal, arbitrator or any other authority.

6. The Bank also agrees that the Owner at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor without proceeding against the Contractors notwithstanding any other security or other guarantee that the Owner may have in relation to the Contractor's liabilities.

7. The Bank hereby waives the necessity for the Owner first demanding the aforesaid amounts or any part thereof from the Contractors before making payment to the Owner and further also waives any right the Bank may have of first requiring the Owner to use its legal remedies against the Contractors, before presenting any written demand to the Bank for payment under this Guarantee.

8. The Bank's obligations under this Guarantee shall not be reduced by reason of any partial performance of the Contract. The Bank's obligations shall not be reduced by any failure by the Owner to timely pay or perform any of its obligations under the Contract.

9. The Bank further unconditionally and unequivocally agrees with the Owner that the Owner shall be at liberty, without the Bank's consent and without affecting in any manner its rights and the Bank's obligation under this Guarantee, from time to time, to:

(i) vary and/or modify any of the terms and conditions of the Contract;

(ii) Forebear or enforce any of the rights exercisable by the Owner against the Contractors under the terms and conditions of the Contract; or

(iii) Extend and/or postpone the time for performance of the obligations of the Contractors under the Contract;

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

10. This Guarantee shall be a continuing bank guarantee and shall not be discharged by any change in the constitution or composition of the Contractors, and this Guarantee shall not be affected or discharged by the liquidation, winding-up, bankruptcy, reorganization, dissolution or insolvency of the Contractors or any of them or any other circumstances whatsoever.

11. This Guarantee shall be in addition to and not in substitution or in derogation of any other security held by the Owner to secure the performance of the obligations of the Contractors under the Contract.

12. NOTWITHSTANDING anything herein above contained, the liability of the BANK under this Guarantee shall be restricted to _____*(insert an amount equal to ten percent (10%) of the Contract Value)* and this Guarantee shall be valid and enforceable and expire on _____*(pl. specify date)* or unless a suit or action to enforce a claim under this Guarantee is filed against the Bank on or before the date of expiry.

13. On termination of this Guarantee, all rights under the said Guarantee shall be forfeited and the Bank shall be relieved and discharged from all liabilities hereunder.

14. The Bank undertakes not to revoke this Guarantee during its validity except with the prior written consent of the Owner and agrees that any change in the constitution of the Bank or the Contractors shall not discharge our liability hereunder.

15. This Guarantee shall be governed by the laws of India. Any suit, action, or other proceeding arising out of, connected with, or related to this Guarantee or the subject matter hereof shall be subject to the exclusive jurisdiction of the courts of **Delhi,** India.

Dated this …… day of …….. …20XX at ……..

(Signature)

……
(Name)
……
(Designation with Bank Stamp)
Attorney as per
Power of Attorney No.....

Date.....

BSES

ANNEXURE – 2.03

**BRPL BANK DETAILS WITH IFSC CODE:**

| | |
|---|---|
| 1. Name of the Bank: | State Bank of India, |
| 2. Branch Name & Full Address: | IFB, 1, Tolstoy Marg, Jawahar Vyapar Bhawan, New Delhi 110001 |
| 3. Beneficiary Name: | BSES Rajdhani Power Limited |
| 4. Bank Account No: | 40214820999 |
| 5. IFSC Code: | SBIN0009601 |

BSES

ANNEXURE – 2.04

**FORMAT OF WARRANTY/GUARANTEE CERTIFICATE**

BSES RAJDHANI POWER LIMITED BSES Bhawan, Nehru Place, New Delhi -110019.

Ref. Purchase Order No. :

Dear Sir,

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

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

Bidder Name & Signature

BSES

ANNEXURE – 2.05

**GST UNDERTAKING**

The Bidder shall give an undertaking in the following words on each invoice in the absence of which tax payment as on the Bidder's invoice may be withheld.

"The tax component as mentioned in the invoice shall be deposited with the GST Department as per law by way of actual payment or by way of legal set off as per law. The turnover billed shall be duly declared in my GST returns a copy of which shall be filed with the Purchaser. Should the input tax credit to the Purchaser be denied by way of any lapse on the part of the Bidder, the same shall be paid on demand and in any case the Purchaser is authorized to deduct the tax equivalent amount from the amount payable to the Bidder"

BSES

ANNEXURE – 2.06

## FORMAT OF WARRANTY / DEFECT LIABILITY PERIOD – SERVICES

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

Bidders Name & Signature

BSES

ANNEXURE – 2.07

## SUMMARY OF COMMERCIAL TERMS AND CONDITIONS

| SL NO | PARTICULARS | CLAUSE AS PER TENDER | BIDDER'S CONFIRMATION |
|---|---|---|---|
| 1 | Validity of Bid | 180 days from the date of submission of the bid | |
| 2 | Price Basis | **"Firm"**, FOR Delhi store(s)/site(s) basis. Prices shall be inclusive of all taxes & duties, freight up to Delhi store(s)/site(s). | |
| 3 | Unloading | Unloading at stores/sites shall be in the Contractor's scope | |
| 4 | Insurances | Insurances in Bidder's scope | |
| 5 | Payment Terms | **Supply:**<br>i. 70% pro-rata of supply value item wise shall be payable against R/A bills for supply of equipment and materials within 30 days against receipt & acceptance of material at site and submission<br>ii. 20% pro-rata on account of supply value of the actual executed value after installation/erection of material duly certified by BRPL Project-in- charge.<br>iii. Balance 10% on account of supply value of the actual executed value shall be paid in 30 days after completion of successful acceptance testing, commissioning and handing over of complete systems duly certified by BRPL Engineer-in-Charge<br><br>**Services:**<br>i. 90% pro-rata payment of total installation value of the actual executed value shall be paid in 30 days on receipt made progressively on submission of your running invoices on Monthly basis duly certified by our Engineer In charge<br>ii. Balance 10% on account of total installation value of the actual executed value payable shall be paid in 30 days after completion of successful acceptance testing, commissioning and handing over of complete systems duly certified by BRPL Engineer-in-Charge. | |
| 6 | Project Schedule | 150 days from the date of LOI/LOA/PO or completion as per the BRPL schedule. | |
| 7 | Defect Liability Period | DLP shall 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.<br>**Panels, CRP, 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.<br>For other Equipment: As per technical Specification of equipment. If not specified, DLP shall 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. | |
| 9 | Liquidated Damages | **Supply Portion:** 0.5% (half percent) of the total price for every week of delay or part thereof for undelivered units subject to maximum of 10% of total contract value<br>**ETC & Civil Portion:** At the rate of 0.5% of the total contract price per each week of delay or pro-rate thereof, by which the completion is delayed. Max LD of delay is 10% of contract value. | |
| 10 | Contract Performance Bank Guarantee | 10% (Ten percent) of the Total contract price (Incl. GST) shall be submitted within 15 days of award of contract with the validity till completion of the contract period. | |

| | | | |
|---|---|---|---|
| 11 | Performance Bank Guarantee | 10% (Ten percent) of the Total contract price (Incl. GST) valid till completion of defect liability plus 3 months | |
| 12 | Reverse Auction | Acceptance for participation in Reverse Auction event | |

**Seal of the Bidder:**

**Signature:**

**Name:**

BSES

BSES RAJDHANI POWER LIMITED

ANNEXURE – 2.08

**FORMAT OF NO DEMAND CERTIFICATE**

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

To ,

BSES RAJDHANI POWER LIMITED,
BSES Bhawan, Nehru Place,
Delhi -110019.

Name of the Project:
Contract No.:
Date of Contract:
Name of the Contractor:
We, M/s _____(Contractor) do hereby acknowledge and confirm that we have claimed Rs. _____ (Rs. _____) towards full and final settlement of our claims from BSES Rajdhani Power Limited, in respect of the aforesaid WO/PO/Contract No.: #######. Dated. ####. including all amendments, if any, to the said Contract, to our entire satisfaction and we further confirm that we have no claim whatsoever pending with BSES Rajdhani Power Limited under or in respect of the said Contract.
Notwithstanding any protest, note or objection recorded or raised by us in any correspondence, documents, measurement books and / or final bills etc.
(a) we confirm that BSES Rajdhani Power Limited stands fully discharged of all its obligations,
(b) we shall make no claim of any nature on BSES Rajdhani Power Limited or any of its affiliates or personnel, and
(c) we waive all our rights to lodge any claim or protest in future, in respect of the said Contract.

We have paid in full all applicable duties, levies, taxes and statutory and other amounts payable by us in connection with the above-mentioned Contract and amounts payable to or in relation to third parties engaged by us including our contractors, Contractors, employees and labour. No payment in this regard is pending or unpaid and we have no (and shall have no) claim against BSES Rajdhani Power Limited in this regard.
No refund has been received/ is envisaged to be received or reasonably believed to be receivable on account of taxes, duties or any other payment made by us in respect of the Contract. In case any refund corresponding to any amount paid or reimbursed by BSES Rajdhani Power Limited is received in the future, the same will be passed on to BSES Rajdhani Power Limited promptly and without any demand from them in this regard.
We are issuing this "NO DEMAND CERTIFICATE" in favor of BSES Rajdhani Power Limited with full knowledge of its contents and with our free consent without any influence, misrepresentation, coercion etc.

Date:
Place:

Signature:
Name:
Designation:
(Company Seal)

ANNEXURE – 2.09

**FORMAT FOR LETTER OF INDEMNITY**

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

Place:_____
Date: _____
To,

BSES Rajdhani Power Limited, BSES Bhawan, Nehru Place, Delhi -110019.

Dear Sirs,

WO/PO/Contract No. _____Dated _/__/___

For _____

Settlement of Dues
In consideration of your awarding the subject Work Order/Purchase Order/Contract to us and in further consideration of your having agreed to pay our final bill towards settlement of the dues in respect of the subject Work Order/Purchase Order/Contract, inter alia, on our assurances and representations that :
(a) We have paid in full all amounts payable by us including but not limited to duties, levies, taxes, cess, octroi, royalties, statutory payments, amounts payable to or in relation to third parties engaged by us including our contractors, Contractors, employees and labour, and
(b) we have fully complied with all requirements under applicable laws in connection with the subject Purchase Order/Work Order/Contract,
We_____,
unconditionally and irrevocably agree and undertake, to pay and/or settle entirely at our own cost and indemnify, defend and hold harmless you, your affiliates and your/your affiliates' personnel, directors and representatives, (hereinafter collectively referred to as "Indemnified Parties") from and against any and all liabilities, judgments, damages, losses, claims, costs and expenses, claimed, suffered or incurred or, likely to be claimed, suffered or incurred at any time by or against the Indemnified Parties or any of them as a result of, or arising out of, or in any way related to any failure or delay in payment of any of the amounts or compliances by us as aforesaid for any reason whatsoever.
Any notice(s) or communication(s) by you shall be sufficient proof that the Indemnified Parties have suffered or incurred loss, damages, liabilities etc. as aforesaid and we shall upon receipt of such notice(s) or communication(s) immediately, without any delay or demur or contest, make payment to you of the entire amount demanded under the said notice(s) or communication(s).
This letter of indemnity shall be in addition to and not in derogation of any other indemnity/ guarantee and/or security which we may have executed in your favor or your rights and entitlements under the contract.
This letter shall be governed by and construed and interpreted to accordance with the laws of India, and shall be subject to the exclusive jurisdiction of the courts of law at Mumbai.

Yours faithfully,

For M/s_____
Authorized Signatory

# VOLUME – II

# FINANCIAL BID (PRICE FORMAT)

BSES

BSES RAJDHANI POWER LIMITED

## SUMMARY OF THE QUOTED PRICE

## PACKAGE B1

| SCHEME DESCRIPTION | Scheme no. | Location | Total price for supply F.O.R site incl all Taxes & freight (INR) | Total for Erection, Testing & Commissioning incl all Taxes (INR) | Grand Total (INR) |
|---|---|---|---|---|---|
| Supply, Laying, Testing & Commissioning Of 66kV 3Cx300 Sq.mm. Cables With Required Accessories on Turnkey Basis | 1 | 220kV Najafgarh to G-1 Dwarka grid | | | |
| **Total (incl. GST)** | | | | | |
| **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: .....

BSES

BSES RAJDHANI POWER LIMITED

## SUMMARY OF THE QUOTED PRICE

## PACKAGE B2

| SCHEME DESCRIPTION | Scheme no. | Location | Total price for supply F.O.R site inclusive all Taxes & freight (INR) | Total for Erection, Testing & Commissioning inclusive all Taxes (INR) | Grand Total (INR) |
|---|---|---|---|---|---|
| Supply, Laying, Testing & Commissioning Of 33kV 3Cx400 Sq.mm. Cables With Required Accessories on Single Point responsibility Basis at | 2 | Naraina to Mayapuri & A-43 Mayapuri to Metal Forging | | | |
| | 3 | 220/33KV DTL Dev Nagar substation to DLF mall & A-4 Paschim Vihar substations | | | |
| **Total (incl. GST)** | | | | | |
| **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: .....

**Note: Bidder has to submit Price Bids for all the schemes in the package compulsorily. Any Partial Price bid is liable for rejection.**

# GRAND SUMMARY OF THE QUOTED PRICE

| S. Nos. | PACKAGE DESCRIPTION | Grand Total (INR) |
|---|---|---|
| 1 | **PACKAGE B1** | |
| 2 | **PACKAGE B2** | |
| **Total (incl. GST)** | | |
| **Total 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: .....

**Note:**

1) Bidder may quote either for Package B1 or Package B2 or both Packages. Bidder shall submit a single EMD based on the Packages quoted considering the EMD Value provided in Table 1.
2) All prices for the packages quoted are inclusive of taxes and duties, GST and freight etc. Bidder shall include & indicate any others taxes under the applicable law(s) for supply and services to be performed in the purchaser's country.
3) Bidder shall include & indicate any others taxes under the applicable law(s) for supply and services to be performed in the purchaser's country.
4) The bidder shall, at its own, handle all imported equipment's and handle all formalities for custom clearances, port charges, etc. if any
5) All prices for the packages quoted are against the scope of work under the contract shall be executed strictly as per the NIT conditions and the technical specification.
6) Quoted prices shall be as per the Bill of quantities (BOQ) as attached. However, any items/material/machinery, not specifically mentioned In BOQ as well as in the technical specifications but required for successful completeness, Erection, Testing and Commissioning of the package awarded shall be deemed to be in the scope of the bidder.
7) Insurance as per the clause defined in GCC/SCC and other contract conditions, is included in the quoted prices. However, Bidder shall indicate the value of the insurance taken, separately.
8) Site visit is advisable prior to submission of quotation.

# PRICE BID (SUPPLY, SERVICES, CIVIL)

## Package No B1

## 66kV Cable Laying Works

BSES

## Scheme no.1

## Laying of 02 nos 66kV 3Cx300sq.mm. XLPE cable from 220KV Najafgarh Grid to G-1 Grid sector-16 Dwarka including 01 no Bay. (Route Length -6500M)

## SUPPLY

| S. NO. | DESCRIPTION | UOM | QTY | BASIC (RS) | FREIGHT (RS) | GST (RS) | UNIT LANDED (RS) | TOTAL LANDED COST (RS) |
|---|---|---|---|---|---|---|---|---|
| 1 | CBL,PWR,300MM2;3C;66KV;AL, OFC embedded | M | 13000 | | | | | |
| 2 | JNT KIT HS ST 66KV 3C 300MM2 XLPE, Compatible with OFC embedded cable | EA | 43 | | | | | |
| 3 | TERM KIT HS OD 66KV 3C 300MM2 XLPE, Compatible with OFC embedded cable | EA | 2 | | | | | |
| 4 | KIT,TERM,GIS;66KV;3CX300SQMM;DUMMY PLG, Compatible with OFC embedded cable | EA | 2 | | | | | |
| 5 | CKT BKR,SF6,OUTDOOR;66KV;2000A;3;31.5KA | EA | 1 | | | | | |
| 6 | TRAFO,CURR,1600-800A;1-1-1-1Amp;66KV | EA | 3 | | | | | |
| 7 | TRAFO,INST,CVT;V3/110V/V3/110V/V3;66KV | EA | 3 | | | | | |
| 8 | ARRESTOR, LIGHTNING, ZINC OXIDE,66KV,10KA | EA | 3 | | | | | |
| 9 | BAY MARSHALING BOX | EA | 1 | | | | | |
| 10 | CBL ELEC ARM 1.1KV PVC CU 6C 2.5MM2 | M | 2000 | | | | | |
| 11 | CBL ELEC ARM 1.1KV PVC CU 10C 2.5MM2 | M | 2000 | | | | | |
| 12 | PANEL,CNTRL,C&R F/LINE FEEDER 66KV | EA | 1 | | | | | |
| 13 | ISOLATOR,66KV,2000A,3P,W/O EARTH SWITCH | EA | 3 | | | | | |
| 14 | ISOLATOR,66KV,2000A,3P,W/EARTH SWITCH | EA | 1 | | | | | |
| 15 | FITTING,S/TENSION,BOLT,F/ACSR SNGL ZEBRA | EA | 6 | | | | | |
| 16 | FITTING,S/SUSPENSION,BOLTED,F/ACSR ZEBRA | EA | 6 | | | | | |
| 17 | CABLE INSUL DISC 11KV 120KN | EA | 144 | | | | | |
| 18 | SPACER,BUS BAR,F/ZEBRA CONDUCTOR | EA | 40 | | | | | |
| 19 | T-CONNECTOR,F/ZEBRA CONDUCTOR | EA | 40 | | | | | |
| 20 | CNDCTR,ACSR ZEBRA UNINSUL | M | 350 | | | | | |
| 21 | STRIP,MTLC,EARTHNG;50X6MM;MS GALVANIZED | KG | 2500 | | | | | |
| 22 | ANGL MTL EQ MS 75X75X6MM | MT | 1.0 | | | | | |
| 23 | ANGL MTL EQ MS 65X65X6MM | MT | 1.5 | | | | | |
| 24 | CHNL,STRCTL,ISMC100;100MM;50mm;7.7mm | MT | 2.5 | | | | | |
| 25 | WIRE BARE GI STAY 7/9 SWG | KG | 75 | | | | | |
| 26 | CLAMP,TENSION,FOR 7/9SWG WIRE | EA | 8 | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 27 | MAT,INSLTNG;5M;1M;3MM;ELASTOMER | NOS | 15 | | | | | |
| 28 | FTG,DBL SUSPN BOLTED;TWIN ZEBRA | NOS | 6 | | | | | |
| 29 | FTG,DBL TENSION BOLTED;TWIN ZEBRA | NOS | 6 | | | | | |
| 30 | CNCTR,ELEC TE,CWDG AMPACT;ZEBRA TO ZEBRA | NOS | 45 | | | | | |
| 31 | RD,ERTH,40MM;3000MM;BEAR MS | MT | 3 | | | | | |
| 32 | Danger Plates | EA | 8 | | | | | |
| 33 | Number Plates | EA | 8 | | | | | |
| 34 | Phase Plates | EA | 8 | | | | | |
| 35 | Circuit Plates | EA | 8 | | | | | |
| 36 | TAG, SFTY, RCTNGL;AL;MTLC | NOS | 1160 | | | | | |
| 37 | Warning Tape per BSES Design specification (Width=150mm, Thickness=0.3u) | M | 5300 | | | | | |
| 38 | RCC Cable protection cover as per BRPL specification & drawing. (50 Thick 550 mm wide) | EA | 5596 | | | | | |
| 39 | Passive Ball Marker | EA | 130 | | | | | |
| 40 | Electronic Ball Marker at every at every joint - Active | EA | 43 | | | | | |
| 41 | HDPE Pipes, PN 6 class PE 80 - 225 mm dia. | M | 7200 | | | | | |
| 42 | Cable Route/ Joint Marker as per approved drawing. For 33/66 KV cables. | EA | 152 | | | | | |
| 43 | Galvanized Tower/Gantry structure including Tower and beam | KG | 5000 | | | | | |
| 44 | Galvanized Nut & Bolts | KG | 250 | | | | | |
| 45 | Rubber Mat 1000 mm wide (5 mtr. Length), 33kV grade | EA | 15 | | | | | |
| 46 | Optical Fiber Cable (48 F ,36 nos single mode,G657A1+12 nos multi mode OM2) | M | 2000 | | | | | |
| 47 | 40 mm HDPE duct | M | 1890 | | | | | |
| 48 | Joint enclosure 48F Optic Fiber Cable (48 F ,36 nos single mode, G657A1+12 nos multi-mode OM2) | EA | 4 | | | | | |
| 49 | Coffin for Joint | EA | 43 | | | | | |
| 50 | Glands 10X2.5MM | EA | 60 | | | | | |
| 51 | Glands 5X 2.5MM | EA | 60 | | | | | |
| 52 | Scada Supply (Annexure- B, Part- A) | EA | 1 | | | | | |

## ANNEXURE -B PART A SCADA SUPPLY: - DTL NZF - SCADA BOQ FOR BAY ADDITION WORKS

| DTL NZF - SCADA BOQ for BAY Addition Works | | | | |
|---|---|---|---|---|
| **S.No** | **BOQ** | **Approved Make** | **Unit** | **Qty** |
| 1 | 16 core, 1.5 mm2,multi strained copper cable, ARM FRLS 1.1KV HRPVC, Application: digital signal feedback. Multistranded Copper,Dieelectric with stand 2.5 KV at 50 HZ for 5 Min. | KEI/POLYCAB | Mtrs | 300 |
| 2 | 2 core, 2.5 mm2, multi strained copper cable, ARM FRLS 1.1KV HRPVC ,Application:Auxilary Supply | KEI, PARASHIELD & POLYCAB | Mtrs | 50 |
| 3 | Armored RS485,Twisted pair, 2 pairx 0.5 sqmm,Screened,24gauge Belden YJ70124 or equivalent. | BELDEN | Mtrs | 100 |
| 4 | Un-Armoured RS485, Twisted pair, 2 pairx 0.5 sqmm, Screened, 24-gauge Belden YJ70124 or equivalent. | BELDEN | Mtrs | 50 |
| 5 | Single compression Metal Glands 1 inch,Material : Brass/Stainless steel with nikel plating & Suitable for Industrial grade,Shall comply to IS 12943:1990/IEC 62444,shall withstand -60 deg to 200 deg,Heavy duty. | COMEX or Equivalent | Nos | 10 |
| 6 | Single compression Metal Glands 1/2 inch,Material : Brass/Stainless steel with nikel plating & Suitable for Industrial grade,Shall comply to IS 12943:1990/IEC 62444,shall withstand -60 deg to 200 deg,Heavy duty. | COMEX or Equivalent | Nos | 10 |
| 7 | Single Core - 10 Sqmm Cable for Panel Earthing | KEI, PARASHIELD & POLYCAB | Mtrs | 50 |
| 8 | Lug - 10 Sqmm - Ring Type | STD Make | No's | 4 |
| 9 | SW,ENET,6 TX,2FX DUAL REDUNDANT | RUGGEDCOM/ HIRSCHMANN | NOS | 2 |
| 10 | Armored CAT-6 Cable | DLINK/BELDEN | Mtrs | 305 |
| 11 | CBL,FO,MULTIMODE;ARMD;WAVE LENGTH 1300NM | Finolex, preston or reputed make | Mtrs | 100 |
| 12 | CBL,FO,FO;MULTI MODE;LC-LC,LENGTH 3M | Finolex, preston or reputed make | Nos | 6 |
| 13 | BOX,ELEC,FIB LC MULTIMODE;12PORT;LIU | Preston, Phoenix or reputed make | Nos | 2 |
| 14 | CRD,CPU,2X ETH, 6X RS232-RS485SRL PORT | OEM-SYNERGY SYSTEM SOLUTIONS | NOS | 1 |
| 15 | Synergy Make Rack,19IN 4U HIGH RACK | OEM-SYNERGY SYSTEM SOLUTIONS | NOS | 1 |
| 16 | CRD,CPU,SGL ENDED DIGTL I/P 48VDC input-E70-DIA-002 | OEM-SYNERGY SYSTEM SOLUTIONS | NOS | 1 |
| 17 | Digital Output Cards | OEM-SYNERGY SYSTEM SOLUTIONS | NOS | 1 |
| 18 | CRD,CPU,PWR SPPLY MDL | OEM-SYNERGY SYSTEM SOLUTIONS | NOS | 2 |
| 19 | CRD,CPU,IO SCNR MDL | OEM-SYNERGY SYSTEM SOLUTIONS | NOS | 1 |
| 20 | Cables With Connector for DI,DO & AI Module | OEM-SYNERGY SYSTEM SOLUTIONS | NOS | 2 |

| | | | | |
|---|---|---|---|---|
| 21 | DO Contactors/CMR with Internal Wirings | Paramount or Equivalent | No's | 10 |
| 22 | MFM - ACCORD MAKE<br>MULTI FUNCTION TRANSDUCER TYPE : MFM02<br>PTR : 1KV-999.9KV/50-550V AC<br>CTR : 1A-9999A/1A-5A<br>AUX.SUP:20-60V DC CLASS:0.2S,1KWH = 36000PULSES<br>SR.NO : 0620/2512 | ACCORD | No's | 9389.8 |

| **Materials Specs with Approved Makes** | | |
|---|---|---|
| **B** | **Materials** | **Approved Makes with Specs** |
| 1 | 16 core, 1.5 mm2,multi strained copper cable, ARM FRLS 1.1KV HRPVC ,Application: digital signal feed back Multistranded Copper,Dieelectric with stand 2.5 KV at 50 HZ for 5 Min. | KEI & POLYCAB<br>Voltage Grade :1100V,<br>Standard Applicable IS1554 P-1,<br>Conductor:<br>Material : Annelated Bare Copper as per Class-2 of IS 8130,<br>Nominal Cross Sectional Area : 1.5 Sqmm,<br>Shape od Conductor : Stranded Non-Compacted Circular,<br>Nominal Diameter : 1.6 mm,<br>Max.DC Resistance at 20 deg - 12.10 Ohms/Km,<br>Approx AC Resistance at MAx.operating Temp 15.25 Ohms/Km,<br>Short Circuit Current for 1 sec - 0.16KA.<br>Max Conductor Temp ,<br>Rated - 85 deg.C , During Short Circuit - 160 Deg.C,<br>Insulation :<br>Extruded HR PVC Type-C as per IS5831 & Thickness - 0.8mm,<br>Core Identifications :<br>All cores shall have same base color with number printing in contrast colour.<br>Inner Sheath :<br>Material - Extruded HR PVC Type ST-2 as per IS 5831,<br>Thickness - 0.3 mm,Color-Black<br>Armour:<br>Material : Galvanised Steel Round Wire?Flat Strip as per IS 3975.<br>Nominal Dimension of armour : 4 x 0.8,Type : Strip,<br>Outer Sheath:<br>Material : Extruded FR LSH PVC Type ST-2 as per IS 5831,<br>Thickness - 1.40 mm,Color-Black<br>Cable Data:<br>Approximate Over all Dia of Cable 22.1 mm,Tolerance on Overall dia : +_2.0mm. |
| 2 | 2 core, 2.5 mm2, multi strained copper cable, ARM FRLS 1.1KV HRPVC ,Application:Auxilary Supply | KEI,PARASHIELD & POLYCAB |

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|---|---|---|
| 3 | Armored RS485,Twisted pair, 2 pairx 0.5 sqmm,Screened,24gauge Belden YJ70124 or equivalent. | Armored RS485,Twisted pair, 2 Pair, Screened, ,24gauge Belden YJ70124 or equivalent.<br>Material : Annealed Tin Copper.<br>No of Diameter of strand in conductor : 7 No's/0.30 mm,<br>Dia of Wire : 0.30 mm,<br>Resistance at 20 deg : 70.3 Ohms/KM<br>Material : High density Polyethylene.<br>Thickness of Insulation : 0.6 mm/0.5 mm for Un Armored<br>Elongation at Break : 150%(min)<br>Pairing : Each Pair has different colors.<br>HV Test at Room Temp : 2.0KV for 1 Minute.<br>Material of Screen : Aluminium Mylar Type.<br>Thickness of Tape : 30x40 Microns/30x50 Microns for Un Armored<br>Copper Breading : 90% ATC / 90% for Un Armored.<br>Armouring : Gslvanised steel Wire.<br>Outer Sheath : FRLS PVC<br>Thickness of Sheath : 1.24 mm./1 mm for Un Armored. |
| 4 | Single compression Metal Glands 1 inch & 1/2 Inch | Approved Make : COMEX<br>Gland I Inches Single Compression Gland, Material : Brass/Stainless steel with nikel plating & Suitable for Industrial grade,Shall comply to IS 12943:1990/IEC 62444,shall withstand -60 deg to 200 deg,Heavy duty. Make : Comex or Equivalent. |
| 5 | GI CABLE TRAY :<br>Perforated GI Cable Trays CABLE TRAY – Length :2.5 Mtrs,Thickness-3mm,Depth :100MM,Width :300MM. | STD |
| 6 | SW,ENET,6 Ports,10/100BASE-TX RJ45,2 FO Ports with LC-LC ,Aux - PS1 48V DC & PS2 250 V DC DIN Rail Mounted.<br>Opertaing Temp -40 deg to 80 Deg.<br>Layer 2,Keema Certified. | RUGGEDCOM/HIRSCHMANN<br>The Ethernet/Fiber optic switches Should be a managed switch and are intended to be installed in the control room and shall be complaint to IEC-61850 electrical substation networks and IEEE 1613 standards. Provisions for RSTP/PRP Protocols should be provided on the same switch.<br>Switch design should withstand for power substation automation applications that operate in extremely harsh environments (High and medium voltage S/Stn environments) and it also withstands vibration, electrical surges, fast transients, electrostatic discharge, and extreme temperatures and humidity.<br>Switch features and configuration should be easy to user interface and it must directly integrate with any other IEC-61850 devices.<br>Shall be managed type and have KEMA certifications for IEC 61850.<br>2Number FO Ports shall support Multimode fiber in 10/100 Mbps ports on an SFP (simple form factor pluggable), for ease of functionality and maintenance.<br>Hot Standby/Dual PSU & Redundancy in power source.<br>Link Failure contact alarm - Failure contact alarm shall be achieved by hardware contact that is activated when a link problem occurs.<br>Logs and alarms with Time Stamp - Statistics about link status alarms are to be stored with the accurate timestamp duly tracing all events.<br>Advanced security features - The switches shall support different user levels with different passwords, including the facility to work with different VLANs, following the 802.1Q standard, port security based on MAC addresses, possibility to disable unused ports, authentication protocols shall be provided.<br>High Speed Implementation of RSTP protocol- The switches shall support STP,PRP,Star and RSTP protocols, and shall facilitate for |

| | | |
|---|---|---|
| | | recovery and the fault recovery times shall be within 5 -10msec per switch, always fulfilling the RST protocol.<br>Time Synchronization to RTU/Server and Connected IED/BCU - The switch shall have an internal clock and shall be synchronized from a network SNTP/NTP server, so all time stamped events shall be with a reliable time reference.<br>Tools with License - Diagnostics tool, other necessary tools with a multi user license to be provided along with the switch.Mounting Options - Switch should be DIN Rail Mountable& Suitable Rack with MCB,T.B,Gland Plate & Internal Wiring to be consider for wall fixing.<br>Local USB port for emergency boot is Mandatory. Console Cable to be supplied along with Switch for Maintenance.<br>Operating Temp -40 deg to 80 Deg.<br>Network based distributed security by having a firewall on each port of the switch for all the standard Industrial protocol like IEC-61850 should be available.<br>The switch shall have the facility of Port mirroring and the user shall configure one port to replicate traffic flows of different ports, so the system administrator can monitor the incoming, outgoing, or all kinds of traffic that is going through the ports under study.<br>ITU-T G.8032 support for Ethernet Ring redundancy, ensuring fast failure detection is preferred.<br>The switches shall sustain the stringent levels in temperature range and electromagnetic immunity defined in the 61850-3, but also the advanced functional requirements defined for operation with other IEC-61850 devices.<br>The Switch should be certified on IEC-61850, functional & Environmental specifications by KEMA.<br>The switches shall have advanced security features to be implemented to avoid unauthorized access to the system Such as RADIUS/TACACS & VPN gateway support with IP Sec & SSH. |
| 7 | FO Patch Cable 1300nm_LC-LC Multimode - Patch Cable Non Rugged | Approved Make : Preston 0r Equivalent.<br>Multimode, FO Patch Cable 1300nm, Core Size 62.5µm, Clad Size 125µm Duplex,Insertaion loss<=0.2db,Ceramic Connectors Ferrules,Minimum 100 mating cycles,Operating Temp -40 to 80 deg C. Type of Material: Glass, Number of Fibers: 2(Rx)(Tx),Un armored Both End Connectors:LC-LC,outer Sheath Colour : Orange,Length - as per site requirements. |
| 8 | LIU 12 Ports MM LC Type Panel Mounted LIU BOX including LC Pigtails with adapter panel .EIA/TIA/IEC Complaint,Insertion loss < 0.1dB(for adapters) | Make - Preston or Equivalents<br>LIU 12 Ports MM LC Typ Panel Mounted LIU BOX including LC Pigtails with adapter panel .EIA/TIA/IEC Complaint,Insertion loss < 0.1dB(for adapters),No Of Ports - 12,Fiber Optic Connectors - LC Type. |
| 9 | Tech.Specifications of CAT-6 Cable | |
| | Description | Technical Data |
| | Approved Make | DLINK/BELDEN |
| | Electrical | |
| | Characteristic Impedance | 100 +/- 6Ohm, |
| | Conductor resistance | < 9.38 ohm / 100m, |
| | Operating Voltage | 72 Vdc, |
| | Dielectric Strength | 1.0kV dc or 0.75kV ac for 1 min, |
| | Insulation Resistance | 100 MOhm |
| | Velocity of propagation (NVP) | 69% |
| | Mechanical | |
| | Insulation thickness | 0.2mm nominal |
| | Insulation type | High Density Polyethylene |

| | | |
|---|---|---|
| | Cable diameter | 6.1 mm nominal |
| | Conductor type | 23 AWG solid copper conductor for superior conductivity |
| | Jacket Material | FR-PVC |
| | Operating Temperature range | Range-20° to +70°C |
| | Color code | 1-2 white-orange stripe and Orange 4-5 white-Blue stripe and Blue 3-6 White-Green stripe and Green 7-8 White-Brown stripe and Brown<br>Issue: CAT6 |
| | | Meets TIA /EIA-568-C.2 requirements and comply with CAT-6<br>Compliant for 10/100/1000 Mbps bandwidth<br>Performance specification up to 250 MHz<br>UV resistance outer sheath<br>Inner Sheath Flame Retardant (IEC60332-1)<br>Suitable for Outdoor application,Fire resistant PVC jacket<br>Rugged Double sheath construction<br>RoHS Complaint<br>ECCS Tape armoring provides Excellent Mechanical protection, |
| 10 | Tech.Specifications of FO MM Cable | |
| | Parameters | Technical Data |
| | Make | PRESTON or Equivalent |
| | Characteristics | |
| | Cable Type | 6 Core Multi mode Cable |
| | Fiber Type | 62.5/125 mm |
| | Armoured /Unarmoured | Armoured |
| | Attenuation | ≤ 3.2 dB/km @850nm, ≤1.2 dB/km @1300nm |
| | Band Width | ≥200 MHz.km @850nm, ≥500 MHz.km @1300nm |
| | Core Diameter | 62.5 um ± 3 |
| | Core Cladding Concentricity Error | ≤ 1 µm |
| | Cladding Diameter | 125 ± 1 µm |
| | Cladding Non-circularity | ≤ 1 % |
| | Coating Diameter (Colored) | 250 ± 15 µm |
| | Mechanical Characteristics | |
| | Tensile Strength | 2670 N |
| | Crush Resistance | 2000 Newton |
| | Impact | 25 Nm |
| | Torsion | ± 180 º |
| | Min. Bending Radius | 80mm (temporary) 160mm (permanent) |
| | Temp.Performance | |
| | Operating/ Installation | Temp -30 to +70°C |
| | Cable Construction Details | |
| | | Dimensions |
| | Parameters | |
| | No. of Fibres | 6 Color Bl Or Gr Br Sl Nt |
| | Number of Loose Tubes | 1 Color Nt |
| | Outer Cable Diameter | >=8.0 mm ± 0.5 |
| | Colour of Fiber | BLUE, WHITE, ORANGE, GREEN, BROWN & SLATE |
| | Max. Installation Tension | 1500 Newton |
| | Peripheral Strength | 1.0 ± 0.05 mm, FRP Rod |
| | Member | |
| | Inner Sheath | 1.8 mm (min),HDPE - Black |
| | Armoring | 0.150 mm, |
| | Outer Sheath | 1.5 mm (min.),HDPE - Black |

| | | |
|---|---|---|
| | Overall Cable Diameter | 11.5 ± 0.5 mm |
| | Cable Weight | 125.0 ± 15 kg/km |
| | | Approved Make : Preston 0r Equivalent. |
| | FO Patch Cable 1300nm_LC-LC | Multimode, FO Patch Cable 1300nm, Core Size 62.5µm, Clad Size 125µm Duplex,Insertaion loss<=0.2db,Ceramic Connectors Ferrules,Minimum 100 mating cycles,Operating Temp -40 to 80 deg C. Type of Material: Glass, Number of Fibers: 2(Rx)(Tx),Un armored Both End Connectors:LC-LC,outer Sheath Colour : Orange,Length - as per site requirements.<br>Multimode - Patch Cable Rugged |

BSES

# ERECTION, TESTING & COMMISIONING (ETC)

## SCHEME 1: LAYING OF 02 NOS 66KV 3CX300SQ.MM. XLPE CABLE FROM 220KV NAJAFGARAH GRID TO G-1 GRID SECTOR-16 DWARKA INCLUDING 01 NOS BAY. (ROUTE LENGTH -6500M)

| S. NO. | DESCRIPTION | UOM | QTY | BASIC (RS) | GST (RS) | UNIT LANDED (RS) | TOTAL LANDED COST (RS) |
|---|---|---|---|---|---|---|---|
| 1 | Digging of cable trench as per specification and drawings. Rate is inclusive of digging and backfilling. Measurement shall be as per actual depth excavated. For Dense Carpeted bituminous Road. | CUM | 7050 | | | | |
| 2 | Digging of joint pit suitable for 33/66 KV cable joint box and covering the joint box with sand and providing protection as per BRPL design. For Dense carpeted bituminous road. | CUM | 660 | | | | |
| 3 | Digging of test pits of required size (not less than 1/2 Mtr. Wide at site for identification of cable route). Relevant volume shall be deducted from quantities of same item of cable digging For Dense carpeted bituminous road/ CC Road | EA | 217 | | | | |
| 4 | Grouting of cable mounting structure with cement concrete having ratio 1:3:6 including fixing with gantry structure. Badarpur, cement and stone ballast shall be supplied by contractor. Suitable for mounting 33/66 KV cable. | EA | 2 | | | | |
| 5 | Removal of Malba including Loading/ Unloading on own vehicle. The payment shall be restricted to the quantity of sand laid. | CUM | 2385 | | | | |
| 6 | Laying of underground cable in trench, covering with RCC cable cover, covering with sand ,Sand cushion will be min 75mm below and 75mm above the cable, fixing of cable identification tags (9" X 4") at every 30 Mtrs, Laying of warning tape above 250mm of the docket, refilling the trench and ramming the surface & removal of malba if any, including watch and ward till charging of cable ( This activity includes only labour jobs ) for 66 KV three core cable Running Mtr | M | 13000 | | | | |
| 7 | Providing and Laying Sand cushioning for cable route as per BRPL specification and drawing. | CUM | 1160 | | | | |
| 8 | Fixing of Danger plates | EA | 8.00 | | | | |
| 9 | Fixing of Number plates | EA | 8.00 | | | | |
| 10 | Fixing of Phase plates | EA | 8.00 | | | | |
| 11 | Fixing of Circuit plates | EA | 8.00 | | | | |
| 12 | Installation of TAG,SFTY,RCTNGL;AL;MTLC | NOS | 1160 | | | | |

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|---|---|---|---|---|---|---|---|
| 13 | fixing of Cable Route/ Joint Marker as per approved drawing. For 33/ 66 KV cables. | EA | 152 | | | | |
| 14 | Watch & Ward Charges. | DAY | 90 | | | | |
| 15 | Crossing of roads by trench-less technology by laying of HDPE pipe excluding supply of pipe. Laying by HDD Machine Moling. Drilling and laying. 200mm dia. | M | 2400 | | | | |
| 16 | Crossing of roads by trench-less technology by laying of HDPE pipe excluding supply of pipe. Laying by Pneumatic Jack Hammer Road Cutting. Laying. 200mm dia. | M | 1200 | | | | |
| 17 | Laying of HDPE pipe for crossing small Nallas in the cable route or in the existing trenches | M | 3600 | | | | |
| 18 | Providing and laying in position specified grade of reinforced cement concrete excluding the cost of shuttering, centring, finishing and reinforcement-All work up to plinth level: 1:2:4 (1cement :2 coarse sand :4 graded stone agg.20mm nominal size.) | CUM | 20 | | | | |
| 19 | Making of civil goomitties around GI earthpipe as per standard design of BSES. Supply of necessary bricks, cement, badarpur, sand, C1 cover of size 1'x1' and providing the same at the top of goomitties. | EA | 15 | | | | |
| 20 | Charges for providing continuous steel barricade 1.2 mtr high including cost of all material plant consumables transport and labour for shifting placing painting and regular maintenance.40% qty for selected portion | M | 6500 | | | | |
| 21 | Mounting of 66KV,3x300 sq.mm. XLPE cable with cable end box on the steel structure and fixing it with suitable wooden cleats (wooden cleats shall be supplied by contractor) i/c. its jumpering with the isolator as required. | EA | 4 | | | | |
| 22 | Charges for carrying out Route survey and identification of underground utilities of various civic agencies before/ during execution of scheme involving cable laying work. Route length will be considered for payment. Route length will be specifically verified by DGM. | M | 6500 | | | | |
| 23 | Survey and submission of Ground penetration report for entire Route. | M | 6500 | | | | |
| 24 | Detail survey i/c. preparation of site plan & profile. | KM | 6.5 | | | | |
| 25 | Erection of electrical equipment Including supply of T & P, all consumable items such as welding rods, hacksaw blades etc and minor modification in support structure for fixing as required. For 66 kV LA's with or without surge counter | EA | 3 | | | | |
| 26 | Sringing and sagging of main bus and cover bus bar with ACSR Zebra conductor and Jumpering of various electrical equipment by ACSR Zebra conductor in between equipment to equipment of any length required and from bus bar to equipment of | M | 350.00 | | | | |

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| | any length required with the help of PG clamps, T connectors and other clamps. For 66 kV /33KV Yard | | | | | | |
| 27 | Excavation of trench below the ultimate good earth level in following type of soil including refilling after laying of earth mat riser, fixing of earth electrodes welding etc. For Soft soil | CUM | 215.00 | | | | |
| 28 | Laying of MS flat in the excavated trench including risers, equipment earthing, overlapping of MS flat at the joints by twice of its width and welding of over lapping and cross joints including supply of electrodes, red oxide/bitumin compound , paint etc. and Laying of GI earth strip for equipment earthing, along the wall, trench, cable trays etc including fabrication of supports/cleats and fixing with wall bolts, welding works, painting of earth strip and riser with red oxide paint/bitumin compound and final. **For 50X6 sqmm** | M | 892 | | | | |
| 29 | Installation of RCC Cable Cover | EA | 5596 | | | | |
| 30 | Installation of Warning Tape as per the Specification of BRPL | M | 5300 | | | | |
| 31 | Installation of single 66KV STRAIGHT THROUGH JOINTING KITS 3X300 SQMM XLPE with OFC kit | NOS | 43 | | | | |
| 32 | Installation of single 66KV END TERMINATION KITS - OUTDOOR 3X300 SQMM XLPE, with OFC kit | NOS | 2 | | | | |
| 33 | Installation of single 66KV END TERMINATION KITS - OUTDOOR 3X300 SQMM XLPE, with OFC kit (GIS KIT) | NOS | 2 | | | | |
| 34 | Installation, testing and commissioning of RFID active Electronic ball markers (for 33kV and 66kV joint) | EA | 43 | | | | |
| 35 | Installation, testing and commissioning of RFID passive Electronic ball markers (for 33kV and 66kV joint) | EA | 130 | | | | |
| 36 | laying of optical fibre cable | M | 2000 | | | | |
| 37 | Laying of 40mm dia HDPE Duct in open trench | M | 1890 | | | | |
| 38 | Splicing of 48F Optic Fiber Cable | EA | 4 | | | | |
| 39 | Installation of LIU (OFC) with wall | EA | 4 | | | | |
| 40 | Splicing Termination 48F Optical Fiber Cable at LIU | EA | 4 | | | | |
| 41 | installation of LDR | EA | 2 | | | | |
| 42 | Digging of earth pit up to depth of 10 ft. in-rocky/ semi rocky as per feasibility at site of embedding 600 x600mm earth plate with M.S Flat 50 x8 mm running the same through 3/4 " dia G.I. grouting pipe. Earth Plate to be covered by charcoal 200kg. And 10 | *EA* | *15* | | | | |
| 43 | Fabrication of MS structure as well as galvanised for different equipment like isolator, C.T.'s, P.T.'s, CVT, LA's etc, cable supporting structure including supply of nuts and bolts, consumables, welding electrode, | MT | 6.5 | | | | |

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| | hacksaw blades etc. excluding supply of steel. | | | | | | |
| 44 | Erection of MS as well as galvanised for different equipment like isolator, C.T.'s, P.T.'s, CVT, LA's etc, cable supporting structure including supply of nuts and bolts, consumables, welding electrode, hacksaw blades etc. excluding supply of steel. | MT | 11.5 | | | | |
| 45 | Painting of any M.S. Structure with one coat of Red oxide and two coats of AL. Paint ISI marked including supply of paint by contractor. | Kg | 6500 | | | | |
| 46 | Providing and laying in position specified grade of reinforced cement concrete excluding the cost of shuttering, centring, finishing and reinforcement-All work up to plinth level: **1:1.5:3** (1cement :1.5coarse sand :3graded stone agg.20mm nominal size.) | CUM | 20 | | | | |
| 47 | Excavation of trench below the ultimate good earth level in following type of soil including refilling after laying of earth mat riser, fixing of earth electrodes welding etc. **For Semi rocky/rocky soil with providing of good earth** | CUM | 240 | | | | |
| 48 | Laying, dressing, megger and continuity test of PVC, armoured control and auxiliary power cables in excavated trench/cable trays .**For 10CX2.5 sqmm, Cu** | M | 2000 | | | | |
| 49 | Laying, dressing, megger and continuity test of PVC, armoured control and auxiliary power cables in excavated trench/cable trays .**For 6/5CX2.5 sqmm, Cu** | M | 2000 | | | | |
| 50 | Erection of double compression gland including termination **For 10CX2.5 sqmm, Cu** | EA | 60 | | | | |
| 51 | Erection of double compression gland including termination **For 5CX2.5 sqmm, Cu** | EA | 60 | | | | |
| 52 | Erection testing and commissioning of electrical equipment Including supply of T & P, all consumable items such as welding rods, hacksaw blades etc and minor modification in support structure for fixing as required. **For 66 kV isolator without earth switch including testing and commissioning** | EA | 3 | | | | |
| 53 | Erection testing and commissioning of electrical equipment Including supply of T & P, all consumable items such as welding rods, hacksaw blades etc and minor modification in support structure for fixing as required. **For 66 kV isolator with one earth switch including testing and commissioning** | EA | 1 | | | | |
| 54 | Erection of electrical equipment Including supply of T & P, all consumable items such as welding rods, hacksaw blades etc and minor modification in support structure for fixing as required. **For 66 kV/33KV CVT** | EA | 3 | | | | |

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|---|---|---|---|---|---|---|---|
| 55 | Erection testing and commissioning of electrical equipment Including supply of T & P, all consumable items such as welding rods, hacksaw blades etc and minor modification in support structure for fixing as required. **For Bay Terminal/Marshalling Kiosk** | EA | 1 | | | | |
| 56 | Erection testing and commissioning of electrical equipment Including supply of T & P, all consumable items such as welding rods, hacksaw blades etc and minor modification in support structure for fixing as required. **For Control and relay panel for Transformer line Bus coupler Erection testing and commissioning 66 kV C & R panel** | EA | 1 | | | | |
| 57 | Erection testing and commissioning of electrical equipment Including supply of T & P, all consumable items such as welding rods, hacksaw blades etc and minor modification in support structure for fixing as required. **For 66 kV SF6 circuit breaker with mechanism and structure including testing and commissioning** | EA | 1 | | | | |
| 58 | Grouting of cable mounting structure with cement concrete having ratio 1:3:6 including fixing with gantry structure. Badarpur, cement and stone ballast shall be supplied by contractor. Suitable for mounting 33/66 KV cable. | EA | 2 | | | | |
| 59 | Sringing and sagging of screen wire 7/9 gauge including assembly and erection of hardware fitting and connecting earthing to the gantry structure by crimping of copper socket. For **66 kV/33 KV Yard** | M | 120 | | | | |
| 60 | Stringing of Double Tension String Insulator with double tension clamp **for twin Zebra conductor** | EA | 6 | | | | |
| 61 | Stringing of Single Tension String Insulator with single tension clamp **for single Zebra conductor** | EA | 6 | | | | |
| 62 | Stringing of Single Suspension String Insulator with double tension clamp **for twin Zebra conductor** | EA | 6 | | | | |
| 63 | Stringing of Single Suspension String Insulator with single tension clamp **for single Zebra conductor** | EA | 6 | | | | |
| 64 | Stringing of Bolted type 'T'/PG Connector suitable **for single Zebra conductor** | EA | 40 | | | | |
| 65 | Stringing of Rigid Spacer Clamp with tee – off suitable **for single Zebra conductor and double zebra to single zebra convertor.** | EA | 40 | | | | |
| 66 | Laying of MS flat in the excavated trench including risers, equipment earthing, overlapping of MS flat at the joints by twice of its width and welding of over lapping and cross joints including supply of electrodes, red oxide/ bitumin compound , paint etc. and Laying of GI earth strip for equipment earthing, along the wall, trench, cable trays | M | 300 | | | | |

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| | etc including fabrication of supports/cleats and fixing with wall bolts, welding works, painting of earth strip and riser with red oxide paint/bitumin compound and final. **For 40 mm dia MS Rod** | | | | | | |
| 67 | Scada Erection (Annexure- B, Part- B) | EA | 1 | | | | |
| 68 | Civil Charges (Annexure- C: Detailed BOQ Attached) | LS | 1 | | | | |
| 69 | **Making Truss on Najafgarah Nallah crossing) (Annexure -D)** | | 1 | | | | |
| 70 | VLF High Voltage test as per IEEE 400.2 | LS | 1 | | | | |
| 71 | VLF Tan Delta as per IEEE 400.2 | LS | 1 | | | | |
| 72 | VLF Partial Discharge as per IEEE 400.2 | LS | 1 | | | | |
| 73 | Sheath integrity test for each length of drum | LS | 1 | | | | |

BSES

## ANNEXURE -B PART B SCADA ERECTION: - DTL NZF - SCADA BOQ FOR BAY ADDITION WORKS

| S No | Services Description | Unit | Qty |
|---|---|---|---|
| 1 | Cable laying and tagging ( 16 core, 1.5 mm2) & Termination with Petty Materials Such as connectors,Lugs,Jacks,White Sleeves,Ferrules,etc… | mtr | 300 |
| 2 | Cable laying and tagging ( 2 core, 2.5 mm2) with Petty Materials Such as connectors,Lugs,Jacks,White Sleeves,Ferrules,etc… | mtr | 50 |
| 3 | Cable glanding and termination | Nos | 20 |
| 4 | Laying and termination of RS485 cable thru metal conduit/GI pipe with proper tagging,Glanding and dressing upto RTU panel) | Mtrs | 100 |
| 5 | Laying and termination of CAT-6 /FO Cables thru metal conduit/GI pipe with proper tagging ,Glanding and dressing upto RTU/Switch panel) | Mtrs | 411 |
| 6 | Material transportation from Multiple Sites | Nos | 2 |
| 7 | Installation of Switch Panel's/Ethernet Switches & LIU in RTU/CRP | Panel's | 4 |
| 8 | Cable Crimping Work+Supply of Jack with Ferrules (Whit Sleeve with Black Printed Ferrules) | No's | 40 |
| 9 | Cable Terminations with Suitable Insulated Lugs | No's | 100 |
| 10 | Miscellaneous Work(Cable Tray,Civil) | Lot | 1 |
| 11 | Installation, commissioning and integration of cards to the existing system | No's | 1 |
| 12 | Splicing of Optical Fibers | No's | 8 |

## ANNEXURE - C: CIVIL CHARGES

**Construction of new bay, power cable and ctrl cable trench at DTL NJF Grid including**

**1 LA Foundation 2 Set**

**2 ISO Foundation 2 Set**

**3 PT Foundation 1 Set**

**4 CB Foundation 1 No.**

**5 Tower Foundation 1 No.**

**6 Power Trench 30 Mtr**

**7 Ctrl cable Trench 20 Mtr**

**8 Yard development & Minor Miscellaneous work 1 Bay**

Detailed Estimate for above work is as below:

| S.NO | SERVICE DESCRIPTION | UNIT | QTY |
|---|---|---|---|
| 1 | Demolishing cement concrete manually/ by mechanical means including disposal of material within 50 meters lead as per direction of Engineer - in - charge. Nominal concrete 1:4:8 or leaner mix (i/c equivalent design mix) | CUM | 15.82 |
| 2 | Earth work in excavation by mechanical means (Hydraulic excavator) / manual means in foundation trenches or drains (not exceeding 1.5 m in width or 10 sqm on plan), including dressing of sides and ramming of bottoms, lift up to 1.5 m, including getting out the excavated soil and disposal of surplus excavated soil as directed, within a lead of 50 m - All kinds of soil. | CUM | 41.68 |
| 3 | Earth work in excavation by mechanical means hydraulic excavator/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including getting out and disposal of excavated earth lead up to 50 m and lift up to 1.5 m, as directed by Engineer-in-charge. All kinds of soil | CUM | 169.91 |
| 4 | Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m. | CUM | 63.48 |
| 5 | P/L cement concrete - all works upto plinth level: 1:4:8 (1 Cement: 4 coarse sand: 8 graded stone aggregate 40 mm nominal size). | CUM | 11.13 |
| 6 | P/L R.C.C. up to plinth level: 1:1.5:3 (1 cement: 1.5 coarse sand: 3 graded stone aggregate 20 mm nominal size) | CUM | 43.06 |
| 7 | Reinforced cement concrete work in walls (any thickness), including attached pilasters, buttresses, plinth and string courses, fillets, columns, pillars, piers, abutments, posts and struts etc. above plinth level up to floor five level, excluding cost of centering, shuttering, finishing and reinforcement: 1:1.5:3 (1 cement : 1.5 coarse sand(zone-III) : 3 graded stone aggregate 20 mm nominal size). | CUM | 17.27 |
| 8 | Centering and shuttering including strutting, propping etc. and removal of form for all heights: Foundations, footings, bases of columns, etc. for mass concrete | SQM | 112.37 |
| 9 | Centering and shuttering including strutting, propping etc. and removal of form for all heights: Walls (any thickness) including attached pilasters, buttresses, plinth and string courses etc. Sqm | SQM | 193.00 |
| 10 | Steel reinforcement for R.C.C. work including straightening, cutting, bending, placing in position and binding all complete up to plinth level. Cold twisted bars | KG | 5687.88 |
| 11 | 6 mm cement plaster 1:3 (1 cement: 3 fine sand) finished with a floating coat of neat cement and thick coat of Lime wash on top of walls when dry for bearing of R.C.C. slabs and beams. | SQM | 138.46 |
| 12 | Painting with synthetic enamel paint of approved brand and manufacture to give an even shade: Two or more coats on new work | SQM | 44.59 |
| 13 | Steel work in built up tubular (round, square or rectangular hollow tubes etc. trusses etc. including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer, including welding and bolted with special shaped washers etc complete: hot finished welded type tube | KG | 19.83 |
| 14 | Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level: 1:2:4 (1 cement: 2 coarse sand (zone-III): 4 graded stone aggregate 20 mm nominal size) | KG | 0.07 |
| 15 | Painting with Aluminium paint of approved brand and manufacture to give an even shade. Two or more coats on new work | SQM | 0.44 |
| 16 | Painting with Aluminium paint of approved brand and manufacture to give an even shade: One or more coats on old work | SQM | 2.00 |
| 17 | Brick work with common burnt clay F.P.S. (non-modular) bricks of class designation 7.5 in foundation and plinth in: Cement mortar 1:4 (1 cement: 4 coarse sand) | CUM | 5.21 |
| 18 | 12 mm cement plaster of mix: 1:4 (1 cement: 4 coarse sand) | SQM | 56.55 |
| 19 | 15 mm cement plaster on rough side of single or half brick wall of mix: 1:4 (1 cement: 4 coarse sand) | SQM | 7.50 |
| 20 | Neat cement punning. | SQM | 64.05 |

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| 21 | Cement concrete flooring 1:2:4 (1 cement: 2 coarse sand: 4 graded stone aggregate) finished with a floating coat of neat cement, including cement slurry, but excluding the cost of nosing of steps etc. complete. 40 mm thick with 20 mm nominal size stone aggregate | SQM | 48.00 |
| 22 | Demolishing brick work manually/ by mechanical means including stacking of serviceable material and disposal of unserviceable material within 50 meters lead as per direction of Engineer-In-Charge - in cement mortar | CUM | 3.60 |
| 23 | Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level: 1:5:10 (1 cement: 5 coarse sand (zone-III) derived from natural sources: 10 graded stone aggregate 40 mm nominal size derived from natural sources) | CUM | 28.05 |
| 24 | Disposal of building rubbish/ malba/ similar unserviceable, dismantled or waste materials by mechanical means, including loading, transporting, unloading to approved municipal dumping ground or as approved by Engineer-in-charge, beyond 50 m initial lead, for all leads including all lifts involved. | CUM | 189.98 |
| 25 | Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete. | KG | 3725.61 |
| 26 | Flat brick flooring with over burnt bricks on bed of 10 mm thick cement 1:6 (1 cement: 6 coarse sand) & filling the joints with same cement mortar | SQM | 280.46 |
| 27 | Supplying and spreading uniformly in yard of grid s/stn. blue stone aggregate 20 mm single size of good quality i/c loading, unloading for all leads & lifts complete, as per direction of Engineer in charge. | CUM | 28.05 |
| 28 | Demolishing flat brick flooring in cement mortar including stacking the serviceable material and disposal of unserviceable material within 50 m lead | SQM | 280.46 |

**ANNEXURE - D: FABRICATION AND ERECTION OF TRUSS OVER DRAIN AT NEAR KAKRAULA VILLAGE BRIDGE, NAJAFAGARH INCLUDING FOUNDATION**

| S.NO | SERVICE DESCRIPTION | UNIT | QTY |
|---|---|---|---|
| 1 | Earth work in excavation by mechanical means (Hydraulic excavator) / manual means over areas (exceeding 30cm in depth, 1.5m in width as well as 10 sqm on plan) including getting out and disposal of excavated earth, lead up to 50m and lift up to 1.5m,as directed by Engineer-in-Charge. All kinds of soil | CUM | 208.15 |
| 2 | Extra for every additional lift of 1.5 m or part thereof in excavation /banking excavated or stacked materials. All kinds of soil. | CUM | 102.31 |
| 3 | Providing and laying in position cement concrete of specified grade excluding the cost of centring and shuttering - All work up to plinth level : 1:4:8 (1 Cement : 4 coarse sand (zone-III) derived from natural sources : 8 graded stone aggregate 40 mm nominal size derived from natural sources). | CUM | 6.53 |
| 4 | Extra for laying concrete in or under foul positions. | CUM | 6.53 |
| 5 | Close timbering in case of shafts, wells, cesspits, manholes and the like including strutting, shoring and packing cavities (wherever required) etc. complete. (Measurements to be taken of the face area timbered). Depth not exceeding 1.5 m | SQM | 151.20 |
| 6 | Close timbering in case of shafts, wells, cesspits, manholes and the like including strutting, shoring and packing cavities (wherever required) etc. complete. (Measurements to be taken of the face area timbered). Depth exceeding 1.5 m but not exceeding 3 m | SQM | 151.20 |
| 7 | Close timbering in case of shafts, wells, cesspits, manholes and the like including strutting, shoring and packing cavities (wherever required) etc. complete. (Measurements to be taken of the face area timbered). Depth exceeding 3 m but not exceeding 4.5 m | SQM | 151.20 |
| 8 | Providing and laying in position specified grade of reinforced cement concrete, excluding the cost of centring, shuttering, finishing and reinforcement - All work up to plinth level : 1:1.5:3 (1 cement : 1.5 coarse sand (zone-III) derived from natural sources : 3 graded stone aggregate 20 mm nominal size derived from natural sources) | CUM | 43.20 |
| 9 | Reinforced cement concrete work in walls (any thickness), including attached pilasters, buttresses, plinth and string courses, fillets, columns, pillars, piers, abutments, posts and struts etc. above plinth level up to floor five level, excluding cost of centring, | CUM | 20.16 |

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| | shuttering, finishing and reinforcement : 1:1.5:3 (1 cement : 1.5 coarse sand(zone-III)derived from natural sources : 3 graded stone aggregate 20 mm nominal size derived from natural sources) | | |
| 10 | Steel reinforcement for R.C.C. work including straightening, cutting, bending, placing in position and binding all complete up to plinth level. Cold twisted bars | KG | 11,036.79 |
| 11 | Centring and shuttering including strutting, propping etc. and removal of form for : Foundations, footings, bases of columns, etc. for mass concrete | SQM | 98.28 |
| 12 | Centring and shuttering including strutting, propping etc. and removal of form for : Columns, Pillars, Piers, Abutments, Posts and Struts | SQM | 72.00 |
| 13 | Centring and shuttering including strutting, propping etc. and removal of form for : Walls (any thickness) including attached pilasters, butteresses, plinth and string courses etc. | SQM | 25.92 |
| 14 | 6 mm cement plaster of mix : 1:3 (1 cement: 3 fine sand) | SQM | 206.64 |
| 15 | Neat cement punning | SQM | 206.64 |
| 16 | Providing and fixing bolts including nuts and washers complete. | KG | 400.00 |
| 17 | Painting with synthetic enamel paint of approved brand and manufacture of required colour to give an even shade: Two or more coats on new work over an under coat of suitable shade with ordinary paint of approved brand and manufacture. | SQM | 1,183.16 |
| 18 | Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and for all lift. | CUM | 41.63 |
| 19 | Providing and laying in position cement concrete of specified grade excluding the cost of centring and shuttering - All work up to plinth level : 1:2:4 (1 cement : 2 coarse sand(zone-III) derived from natural sources : 4 graded stone aggregate 20 mm nominal size derived from natural sources) | CUM | 4.00 |
| 20 | Brick work with common burnt clay modular bricks of class designation 7.5 in foundation and plinth in: Cement Mortar 1:6 (1 cement: 6 coarse sand). | CUM | 4.27 |
| 21 | Boring, providing and installation bored cast-in-situ reinforced cement concrete piles of grade M-25 of specified diameter and length below the pile cap, to carry a safe working load not less than specified, excluding the cost of steel reinforcement but including the cost of boring with bentonite solution and temporary casing of appropriate length for setting out and removal of same and the length of the pile to be embedded in the pile cap etc. by percussion drilling using Direct mud circulation (DMC) or Bailer and chisel technique by tripod and mechanical Winch Machine all complete, including removal of excavated earth with all its lifts and leads (length of pile for payment shall be measured up to bottom of pile cap).<br>450 mm dia piles . | M | 180.00 |
| 22 | Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete. | KG | 51,651.34 |
| 23 | Steel work welded in built up sections/ framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer using structural steel etc. as required. In stringers, treads, landings etc. of stair cases, including use of chequered plate wherever required, all complete. | KG | 10,411.96 |
| 24 | Disposal of building rubbish/ malba/ similar unserviceable, dismantled or waste materials by mechanical means, including loading, transporting, unloading to approved municipal dumping ground or as approved by Engineer-in-charge, beyond 50 m initial lead, for all leads including all lifts involved. | CUM | 166.52 |
| 25 | Hiring charges for Hydra Crane for placing porta cabin | DAY | 16.00 |
| 26 | hiring charges for dewatering pump with operator with all required accessories | DAY | 90.00 |
| 27 | REVALID. & DESIGN CONSULTANCY | LS | 1.00 |

# PRICE BID (SUPPLY & SERVICES)

# Package No B2 –

# 33 kV Cables Infeeds

BSES

## SCHEME NO. 2

## Providing 33kV source comprising 2x3Cx400mm2 XLPE cable from 220kV Naraina to Mayapuri and Providing 33kV source comprising 2x3Cx400mm2 XLPE cable from A-43 Mayapuri to Metal forging.

## SUPPLY

| S. NO. | DESCRIPTION | UOM | QTY | BASIC (RS) | FREIGHT (RS) | GST (RS) | UNIT LANDED (RS) | TOTAL LANDED COST (RS) |
|---|---|---|---|---|---|---|---|---|
| 1 | CBL, PWR,OFC EMDED; 400MM2;3 C;33KV; AL;XLPE | M | 15000 | | | | | |
| 2 | KIT, JOINTG,STGT THRO; 33KV; 3CX400MM2;OFC | EA | 52 | | | | | |
| 3 | KIT, JOINTING, TERM; 33KV; 3X400MM2; HS;OD; RY, OFC | EA | 6 | | | | | |
| 4 | CHNL, STRCTL,ISMC100;100MM;50mm;7.7mm | MT | 2.5 | | | | | |
| 5 | ANGLE, STRCTL,75MM;75MM;6MM; IS2062 | MT | 1 | | | | | |
| 6 | ANGLE, STRCTL,65MM;65MM;6MM; MS | MT | 1 | | | | | |
| 7 | STRIP, MTLC, EARTHNG;50X6MM; MS GALVANIZED | KG | 2500 | | | | | |
| 8 | CKT BKR, VACM, OUTDOOR;36KV;1250A;3P | EA | 1 | | | | | |
| 9 | TRAFO, CURR, OUTDR;800/400/1/1/1/1A | EA | 3 | | | | | |
| 10 | TRAFO, POTENTIAL, OUTDR;33KV | NOS | 3 | | | | | |
| 11 | RD,ERTH,40MM;3000MM;BEAR MS | MT | 1.5 | | | | | |
| 12 | PANEL,CNTRL&RELAY,33KV,F/FEEDER LINE | EA | 1 | | | | | |
| 13 | ISOLATOR,ELEC,33KV;1250AMPS;3PH;W /ES (HORIZONTAL TYPE) | EA | 1 | | | | | |
| 14 | ISOLATOR,ELEC,33KV;1250A;3PH;W/O E SW (HORIZONTAL TYPE) | EA | 3 | | | | | |
| 15 | ARRSTR,ELEC,OUTDR ;33KV;10KA | EA | 9 | | | | | |
| 16 | CNDCTR,ACSR ZEBRA UNINSUL | M | 350 | | | | | |
| 17 | FTG,SGL SUSPN BOLTED;SGL ZEBRA | NOS | 6 | | | | | |
| 18 | FTG,SGL TENSION BOLTED;SGL ZEBRA | NOS | 6 | | | | | |
| 19 | SPCR,BUS BAR SPCR;FOR ACSR ZEBRA | EA | 18 | | | | | |
| 20 | INSUL DISC 11KV 120KN | EA | 36 | | | | | |
| 21 | P.G. CLAMP,F/ZEBRA CONDUCTOR | EA | 48 | | | | | |
| 22 | PNL,BAY MARSHALLING KIOSK | EA | 1 | | | | | |
| 23 | CBL,CNTRL,1.1KV;2.5MM2;CU;6;PVC | M | 2000 | | | | | |
| 24 | CBL,CNTRL,CNTRL;1.1KV;2.5MM2;CU;10 ;PVC | M | 2000 | | | | | |
| 25 | EXTNGSR,FIRE,CO2;22.5KG;CO2GS;43.5 KG | NOS | 2 | | | | | |
| 26 | RLY,NUMERICAL,220VDC,DISTANCE,MIC OMP543 | NOS | 2 | | | | | |
| 27 | Cable identification Tags , AL | EA | 904 | | | | | |

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|---|---|---|---|---|---|---|---|---|
| 28 | RCC Cable protection cover as per BRPL specification & drawing. (50 Thick 550 mm wide) | EA | 4361 | | | | | |
| 29 | Warning Tape | M | 4660 | | | | | |
| 30 | HDPE Pipes, PN 6 class PE 80 - 180mm dia | M | 10400 | | | | | |
| 31 | RFID Electronic Passive Ball Marker 3M Make | EA | 93 | | | | | |
| 32 | RFID Electronic Active Ball Marker 3M Make | EA | 52 | | | | | |
| 33 | RCC Coffin for joint as per the specification of BRPL/BYPL | EA | 52 | | | | | |
| 34 | HDPE Duct-40mm | M | 2000 | | | | | |
| 35 | Optical Fiber Cable (48 F ,36 nos single mode, G657A1+12 nos multi-mode OM2) | M | 2000 | | | | | |
| 36 | Rubber Mat 1000 mm wide (5 mtr. Length), 33 kV grade | EA | 15 | | | | | |
| 37 | Joint enclosure 48F Optic Fiber Cable (48 F, 36 nos single mode, G657A1+12 nos multi-mode OM2) | EA | 4 | | | | | |
| 38 | LIU | EA | 2 | | | | | |
| 39 | Danger plates | EA | 8 | | | | | |
| 40 | Number plates | EA | 8 | | | | | |
| 41 | Phase Plates | EA | 8 | | | | | |
| 42 | Circuit plates | EA | 8 | | | | | |
| 43 | Galvanized Nut & Bolts | KG | 250 | | | | | |
| 44 | Galvanized Tower/ Gantry structure Including Beam | KG | 550 | | | | | |
| 45 | Cable Route/Joint Marker as per approved drawing. For 33/66 KV cables. | EA | 175 | | | | | |
| 46 | Double compression Glands 10X2.5MM | EA | 60 | | | | | |
| 47 | Double compression Glands 5X 2.5MM | EA | 60 | | | | | |
| 48 | Scada Material (Annexure-B, Part -A) | EA | 1 | | | | | |
| 49 | Protection (Annexure- A) | EA | 1 | | | | | |

**ANNEXURE A: PROTECTION**

| S.No. | DESCRIPTION | UNIT | QUANTITY |
|---|---|---|---|
| 1 | Line Differential Relay P543-31RC6M0H98M | NOS | 1 |
| 2 | REF615, Dir.OC-EF Relay 5CT&3PT input,16BO-8BI | NOS | 1 |
| 3 | REF615, Dir.OC-EF Relay 5CT&3PT input,16BO-8BI | NOS | 1 |

**ANNEXURE– B PART- A: SCADA SUPPLY**

| S. NO. | BOQ | APPROVED MAKE | UNIT | QTY |
|---|---|---|---|---|
| 1 | 16 core, 1.5 mm2,multi strained copper cable, ARM FRLS 1.1KV HRPVC ,Application: digital signal feed back. Multistranded Copper,Dieelectric with stand 2.5 KV at 50 HZ for 5 Min. | KEI/POLYCAB | Mtrs | 250 |
| 2 | 2 core, 2.5 mm2, multi strained copper cable, ARM FRLS 1.1KV HRPVC ,Application:Auxilary Supply | KEI,PARASHIELD & POLYCAB | Mtrs | 50 |

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|---|---|---|---|---|
| 3 | Armored RS485,Twisted pair, 2 pairx 0.5 sqmm,Screened,24gauge Belden YJ70124 or equivalent. | BELDEN | Mtrs | 100 |
| 4 | Un Armored RS485,Twisted pair, 2 pairx 0.5 sqmm,Screened,24gauge Belden YJ70124 or equivalent. | BELDEN | Mtrs | 50 |
| 5 | Single compression Metal Glands 1 inch,Material : Brass/Stainless steel with nikel plating & Suitable for Industrial grade,Shall comply to IS 12943:1990/IEC 62444,shall withstand -60 deg to 200 deg,Heavy duty. | COMEX or Equivalent | Nos | 10 |
| 6 | Single compression Metal Glands 1/2 inch,Material : Brass/Stainless steel with nikel plating & Suitable for Industrial grade,Shall comply to IS 12943:1990/IEC 62444,shall withstand -60 deg to 200 deg,Heavy duty. | COMEX or Equivalent | Nos | 10 |
| 7 | Single Core - 10 Sqmm Cable for Panel Earthing | KEI,PARASHIELD & POLICAB | Mtrs | 50 |
| 8 | Lug - 10 Sqmm - Ring Type | STD Make | No's | 4 |
| 9 | SW,ENET,6 TX,2FX DUAL REDUNDANT<br>Aux Supply PS1 : 220V DC / PS2 : 48 V DC<br>Note - PSU of Switch will be decided during Technical Evaluation stage. | RUGGEDCOM/ HIRSCHMANN | NOS | 2 |
| 10 | Armored CAT-6 Cable | DLINK/BELDEN | Mtrs | 305 |
| 11 | CBL,FO,MULTIMODE;ARMD;WAVE LENGTH 1300NM | Finolex,preston or reputed make | Mtrs | 75 |
| 12 | CBL,FO,FO;MULTI MODE;LC-LC,LENGTH 3M | Finolex,preston or reputed make | Nos | 6 |
| 13 | BOX,ELEC,FIB LC MULTIMODE;12PORT;LIU | Preston,Phoenix or reputed make | Nos | 2 |
| 14 | CRD,CPU,2X ETH, 6X RS232-RS485SRL PORT | OEM-SYNERGY SYSTEM SOLUTIONS | NOS | 1 |
| 15 | Synergy Make Rack,19IN 4U HIGH RACK | OEM-SYNERGY SYSTEM SOLUTIONS | NOS | 1 |
| 16 | CRD,CPU,SGL ENDED DIGTL I/P 48VDC input-E70-DIA-002 | OEM-SYNERGY SYSTEM SOLUTIONS | NOS | 1 |
| 17 | Digital Output Cards | OEM-SYNERGY SYSTEM SOLUTIONS | NOS | 1 |
| 18 | CRD,CPU,PWR SPPLY MDL | OEM-SYNERGY SYSTEM SOLUTIONS | NOS | 2 |
| 19 | CRD,CPU,IO SCNR MDL | OEM-SYNERGY SYSTEM SOLUTIONS | NOS | 1 |
| 20 | Cables With Connector for DI,DO & AI Module | OEM-SYNERGY SYSTEM SOLUTIONS | NOS | 2 |
| 21 | DO Contactors/CMR with Internal Wirings | Paramount or Equivalent | No's | 10 |
| 22 | TIE,CABLE,LENGTH,250MM;4.2MM;PVC/NYLON | STD Make | PKT | 1 |
| 23 | TRAY,CBL,300MM:75MM:2.5MM:GI With Covers | STD MAKE | Mtrs | 20 |
| 24 | MFM - ACCORD MAKE<br>MULTI FUNCTION TRANSDUCER TYPE : MFM02<br>PTR : 1KV-999.9KV/50-550V AC<br>CTR : 1A-9999A/1A-5A<br>AUX.SUP:20-60V DC CLASS:0.2S,1KWH = 36000PULSES<br>SR.NO : 0620/2512 | ACCORD | No's | 9389.8 |

| **SCADA Materials Specs with Approved Makes** | | |
|---|---|---|
| **S No** | **Materials** | **Approved Makes with Specs** |
| 1 | 16 core, 1.5 mm2,multi strained copper cable, ARM FRLS 1.1KV HRPVC ,Application: digital signal feed back Multistranded Copper,Dieelectric | KEI & POLICAB<br>Voltage Grade :1100V,<br>Standard Applicable IS1554 P-1,<br>Conductor:<br>Material : Annelated Bare Copper as per Class-2 of IS 8130, |

| | | |
|---|---|---|
| | with stand 2.5 KV at 50 HZ for 5 Min. | Nominal Cross Sectional Area : 1.5 Sqmm,<br>Shape od Conductor : Stranded Non-Compacted Circular,<br>Nominal Diameter : 1.6 mm,<br>Max.DC Resistance at 20 deg - 12.10 Ohms/Km,<br>Approx AC Resistance at MAx.operating Temp 15.25 Ohms/Km,<br>Short Circuit Current for 1 sec - 0.16KA.<br>Max Conductor Temp ,<br>Rated - 85 deg.C , During Short Circuit - 160 Deg.C,<br>Insulation :<br>Extruded HR PVC Type-C as per IS5831 & Thickness - 0.8mm,<br>Core Identifications :<br>All cores shall have same base color with number printing in contrast colour.<br>Inner Sheath :<br>Material - Extruded HR PVC Type ST-2 as per IS 5831,<br>Thickness - 0.3 mm,Color-Black<br>Armour:<br>Material : Galvanised Steel Round Wire?Flat Strip as per IS 3975.<br>Nominal Dimension of armour : 4 x 0.8,Type : Strip,<br>Outer Sheath:<br>Material : Extruded FR LSH PVC Type ST-2 as per IS 5831,<br>Thickness - 1.40 mm,Color-Black<br>Cable Data:<br>Approximate Over all Dia of Cable 22.1 mm,Tolerance on Overall dia : +_2.0mm. |
| 2 | 2 core, 2.5 mm2, multi strained copper cable, ARM FRLS 1.1KV HRPVC ,Application:Auxilary Supply | KEI,PARASHIELD & POLICAB |
| 3 | Armored RS485,Twisted pair, 2 pairx 0.5 sqmm,Screened,24gauge Belden YJ70124 or equivalent. | Armored RS485,Twisted pair, 2 Pair, Screened, ,24gauge Belden YJ70124 or equivalent.<br>Material : Annealed Tin Copper.<br>No of Diameter of strand in conductor : 7 No's/0.30 mm,<br>Dia of Wire : 0.30 mm,<br>Resistance at 20 deg : 70.3 Ohms/KM<br>Material : High density Polyethylene.<br>Thickness of Insulation : 0.6 mm/0.5 mm for Un Armored<br>Elongation at Break : 150%(min)<br>Pairing : Each Pair has different colors.<br>HV Test at Room Temp : 2.0KV for 1 Minute.<br>Material of Screen : Aluminium Mylar Type.<br>Thickness of Tape : 30x40 Microns/30x50 Microns for Un Armored<br>Copper Breading : 90% ATC / 90% for Un Armored.<br>Armouring : Gslvanised steel Wire.<br>Outer Sheath : FRLS PVC<br>Thickness of Sheath : 1.24 mm./1 mm for Un Armored. |
| 4 | Single compression Metal Glands 1 inch & 1/2 Inch | Approved Make : COMEX<br>Gland I Inches Single Compression Gland, Material : Brass/Stainless steel with nikel plating & Suitable for Industrial grade,Shall comply to IS 12943:1990/IEC 62444,shall withstand - 60 deg to 200 deg,Heavy duty. Make : Comex or Equivalent. |
| 5 | GI CABLE TRAY :<br>Perforated GI Cable Trays CABLE TRAY – Length :2.5 Mtrs,Thickness-3mm,Depth :100MM,Width :300MM. | STD |
| 6 | SW,ENET,6 Ports,10/100BASE-TX RJ45,2 FO Ports with LC-LC ,Aux - PS1 48V DC & PS2 250 V DC DIN Rail Mounted.<br>Opertaing Temp -40 deg to 80 | RUGGEDCOM/HIRSCHMANN<br>The Ethernet/Fiber optic switches Should be a managed switch and are intended to be installed in the control room and shall be complaint to IEC-61850 electrical substation networks and IEEE 1613 standards. Provisions for RSTP/PRP Protocols should be provided on the same switch. |

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|---|---|---|
| | Deg.<br>Layer 2,Keema Certified. | Switch design should withstand for power substation automation applications that operate in extremely harsh environments (High and medium voltage S/Stn environments) and it also withstands vibration, electrical surges, fast transients, electrostatic discharge, and extreme temperatures and humidity.<br>Switch features and configuration should be easy to user interface and it must directly integrate with any other IEC-61850 devices.<br>Shall be managed type and have KEMA certifications for IEC 61850.<br>2Number FO Ports shall support Multimode fiber in 10/100 Mbps ports on an SFP (simple form factor pluggable), for ease of functionality and maintenance.<br>Hot Standby/Dual PSU & Redundancy in power source.<br>Link Failure contact alarm - Failure contact alarm shall be achieved by hardware contact that is activated when a link problem occurs.<br>Logs and alarms with Time Stamp - Statistics about link status alarms are to be stored with the accurate timestamp duly tracing all events.<br>Advanced security features - The switches shall support different user levels with different passwords, including the facility to work with different VLANs, following the 802.1Q standard, port security based on MAC addresses, possibility to disable unused ports, authentication protocols shall be provided.<br>High Speed Implementation of RSTP protocol- The switches shall support STP,PRP,Star and RSTP protocols, and shall facilitate for recovery and the fault recovery times shall be within 5 -10msec per switch, always fulfilling the RST protocol.<br>Time Synchronization to RTU/Server and Connected IED/BCU - The switch shall have an internal clock and shall be synchronized from a network SNTP/NTP server, so all time stamped events shall be with a reliable time reference.<br>Tools with License - Diagnostics tool, other necessary tools with a multi user license to be provided along with the switch.Mounting Options - Switch should be DIN Rail Mountable& Suitable Rack with MCB,T.B,Gland Plate & Internal Wiring to be consider for wall fixing.<br>Local USB port for emergency boot is Mandatory. Console Cable to be supplied along with Switch for Maintenance.<br>Opertaing Temp -40 deg to 80 Deg.<br>Network based distributed security by having a firewall on each port of the switch for all the standard Industrial protocol like IEC-61850 should be available.<br>The switch shall have the facility of Port mirroring and the user shall configure one port to replicate traffic flows of different ports, so the system administrator can monitor the incoming, outgoing, or all kinds of traffic that is going through the ports under study.<br>ITU-T G.8032 support for Ethernet Ring redundancy, ensuring fast failure detection is preferred.<br>The switches shall sustain the stringent levels in temperature range and electromagnetic immunity defined in the 61850-3, but also the advanced functional requirements defined for operation with other IEC-61850 devices.<br>The Switch should be certified on IEC-61850, functional & Environmental specifications by KEMA.<br>The switches shall have advanced security features to be implemented to avoid unauthorized access to the system Such as RADIUS/TACACS & VPN gateway support with IP Sec & SSH. |
| 7 | FO Patch Cable 1300nm_LC-LC | Approved Make : Preston 0r Equivalent.<br>Multimode, FO Patch Cable 1300nm, Core Size 62.5µm, Clad Size 125µm Duplex,Insertaion loss<=0.2db,Ceramic Connectors |

| | | |
|---|---|---|
| | Multimode - Patch Cable Non Rugged | Ferrules,Minimum 100 mating cycles,Operating Temp -40 to 80 deg C. Type of Material: Glass, Number of Fibers: 2(Rx)(Tx),Un armored Both End Connectors:LC-LC,outer Sheath Colour : Orange,Length - as per site requirements. |
| 8 | LIU 12 Ports MM LC Type Panel Mounted LIU BOX including LC Pigtails with adapter panel .EIA/TIA/IEC Complaint,Insertion loss < 0.1dB(for adapters) | Make - Preston or Equivalents<br>LIU 12 Ports MM LC Typ Panel Mounted LIU BOX including LC Pigtails with adapter panel .EIA/TIA/IEC Complaint,Insertion loss < 0.1dB(for adapters),No Of Ports - 12,Fiber Optic Connectors - LC Type. |
| 9 | Tech.Specifications of CAT-6 Cable | |
| | Description | Technical Data |
| | Approved Make | DLINK/BELDEN |
| | Electrical | |
| | Characteristic Impedance | 100 +/- 6Ohm, |
| | Conductor resistance | < 9.38 ohm / 100m, |
| | Operating Voltage | 72 Vdc, |
| | Dielectric Strength | 1.0kV dc or 0.75kV ac for 1 min, |
| | Insulation Resistance | 100 MOhm |
| | Velocity of propagation (NVP) | 69% |
| | Mechanical | |
| | Insulation thickness | 0.2mm nominal |
| | Insulation type | High Density Polyethylene |
| | Cable diameter | 6.1 mm nominal |
| | Conductor type | 23 AWG solid copper conductor for superior conductivity |
| | Jacket Material | FR-PVC |
| | Operating Temperature range | Range-20° to +70°C |
| | Color code | 1-2 white-orange stripe and Orange 4-5 white-Blue stripe and Blue 3-6 White-Green stripe and Green 7-8 White-Brown stripe and Brown<br>Issue: CAT6 |
| | | Meets TIA /EIA-568-C.2 requirements and comply with CAT-6<br>Compliant for 10/100/1000 Mbps bandwidth<br>Performance specification up to 250 MHz<br>UV resistance outer sheath<br>Inner Sheath Flame Retardant (IEC60332-1)<br>Suitable for Outdoor application,Fire resistant PVC jacket<br>Rugged Double sheath construction<br>RoHS Complaint<br>ECCS Tape armoring provides Excellent Mechanical protection, |
| 10 | Tech.Specifications of FO MM Cable | |
| | Parameters | Technical Data |
| | Make | PRESTON or Equivalent |
| | Characteristics | |
| | Cable Type | 6 Core Multi mode Cable |
| | Fiber Type | 62.5/125 mm |
| | Armoured /Unarmoured | Armoured |
| | Attenuation | ≤ 3.2 dB/km @850nm, ≤1.2 dB/km @1300nm |
| | Band Width | ≥200 MHz.km @850nm, ≥500 MHz.km @1300nm |
| | Core Diameter | 62.5 um ± 3 |
| | Core Cladding Concentricity Error | ≤ 1 µm |
| | Cladding Diameter | 125 ± 1 µm |
| | Cladding Non-circularity | ≤ 1 % |
| | Coating Diameter (Colored) | 250 ± 15 µm |
| | Mechanical Characteristics | |
| | Tensile Strength | 2670 N |
| | Crush Resistance | 2000 Newton |
| | Impact | 25 Nm |
| | Torsion | ± 180 º |
| | Min. Bending Radius | 80mm (temporary) 160mm (permanent) |

| | | |
|---|---|---|
| | Temp.Performance | |
| | Operating/ Installation | Temp -30 to +70°C |
| | Cable Construction Details | |
| | | Dimensions |
| | Parameters | |
| | No. of Fibres | 6 Color Bl Or Gr Br Sl Nt |
| | Number of Loose Tubes | 1 Color Nt |
| | Outer Cable Diameter | >=8.0 mm ± 0.5 |
| | Colour of Fiber | BLUE, WHITE, ORANGE, GREEN, BROWN & SLATE |
| | Max. Installation Tension | 1500 Newton |
| | Peripheral Strength | 1.0 ± 0.05 mm, FRP Rod |
| | Member | |
| | Inner Sheath | 1.8 mm (min),HDPE - Black |
| | Armoring | 0.150 mm, |
| | Outer Sheath | 1.5 mm (min.),HDPE - Black |
| | Overall Cable Diameter | 11.5 ± 0.5 mm |
| | Cable Weight | 125.0 ± 15 kg/km |
| | | Approved Make : Preston 0r Equivalent. |
| | FO Patch Cable 1300nm_LC-LC | Multimode, FO Patch Cable 1300nm, Core Size 62.5µm, Clad Size 125µm Duplex,Insertaion loss<=0.2db,Ceramic Connectors Ferrules,Minimum 100 mating cycles,Operating Temp -40 to 80 deg C. Type of Material: Glass, Number of Fibers: 2(Rx)(Tx),Un armored Both End Connectors:LC-LC,outer Sheath Colour : Orange,Length - as per site requirements. Multimode - Patch Cable Rugged |

BSES

# ERECTION, TESTING & COMMISIONING

**Scheme 2: Providing 33kV source comprising 2x3Cx400mm2 XLPE cable from 220kV Naraina to Mayapuri and Providing 33kV source comprising 2x3Cx400mm2 XLPE cable from A-43 Mayapuri to Metal forging.**

| S. NO. | DESCRIPTION | UOM | QTY | BASIC (RS) | GST (RS) | UNIT LANDED (RS) | TOTAL LANDED COST (RS) |
|---|---|---|---|---|---|---|---|
| 1 | Digging of cable trench as per specification and drawings. Rate is inclusive of digging and backfilling. Measurement shall be as per actual depth excavated. For Dense Carpeted bituminous Road. | CUM | 4152 | | | | |
| 2 | Digging of joint pit suitable for 33/66 KV cable joint box and covering the joint box with sand and providing protection as per BYPL/BRPL design. Dence carpet | CUM | 624 | | | | |
| 3 | Digging of test pits of required size (not less than 1/2 Mtr. Wide at site for identification of cable route). Relevant volume shall be deducted from quantities of same item of cable digging For Dense carpeted bituminous road / CC Road | EA | 250 | | | | |
| 4 | Removal of Malba including Loading / Unloading on own vehicle. The payment shall be restricted to the quantity of sand laid. | CUM | 949.2 | | | | |
| 5 | Laying of underground cable in trench, supply and fixing of cable identification tags (9" X 4") at every 30 Mtrs, refilling the trench and ramming the surface, including watch and ward till charging of cable ( This activity includes only labour jobs ) for 33 KV three core cable Running Mtr. | M | 15000 | | | | |
| 6 | Fixing of Cable identification Tags | EA | 904 | | | | |
| 7 | Providing and Laying Sand cushioning for cable route as per BRPL specification and drawing. | CUM | 791 | | | | |
| 8 | Laying Sand Cushioning for cable route as per BRPL specification, Sand cushion will be min 75mm below and 75mm above the cable, | CUM | 791 | | | | |
| 9 | Installation of RCC Cable Cover | EA | 4361 | | | | |
| 10 | Installation of Warning Tape as per the Specification of BRPL | M | 4660 | | | | |
| 11 | Crossing of roads by trench-less technology by laying of HDPE pipe excluding supply of pipe. Laying by HDD Machine Moling. Drilling and laying. 180mm dia. | M | 5600 | | | | |
| 12 | Crossing of roads by trench-less technology by laying of HDPE pipe excluding supply of pipe. Laying by Pneumatic Jack Hammer Road Cutting. laying. 180mm dia. | M | 2400 | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 13 | Laying of HDPE pipe for crossing small Nallas in the cable route or in the existing trenches 180mm dia. | M | 2400 | | | | |
| 14 | Installation, testing and commissioning of RFID active Electronic Ball Markers (for 33kV and 66kV joint) | EA | 52 | | | | |
| 15 | Installation, testing and commissioning of RFID passive Electronic Ball Markers (for 33kV and 66kV joint | EA | 94 | | | | |
| 16 | laying of optical fibre cable | M | 2000 | | | | |
| 17 | Laying of 40mm dia. HDPE Duct in open trench | M | 1600 | | | | |
| 18 | Laying of 40mm dia, HDPE Duct through trenchless method using HDD machine | M | 400 | | | | |
| 19 | Installation of LIU (48F) including Patch cord | EA | 2 | | | | |
| 20 | Fixing of Danger plates | EA | 8 | | | | |
| 21 | Fixing of number plates | EA | 8 | | | | |
| 22 | Fixing of Phase plates | EA | 8 | | | | |
| 23 | Fixing of circuit plates | EA | 8 | | | | |
| 24 | Watch & Ward Charges. | DAY | 180 | | | | |
| 25 | Making optical fibre end box (Splicing of 48F Optical Fiber Cable) | Nos | 4 | | | | |
| 26 | 33KV Joint.chrg St.Th.Joint 3C XLPE | EA | 52 | | | | |
| 27 | Mkng O/D,I/D End Trmintn Kit 33KV 3CX400 | EA | 6 | | | | |
| 28 | Survey and submission of Ground penetration | M | 7500 | | | | |
| 29 | fixing of Cable Route/Joint Marker as per approved drawing. For 33/66 KV cables. | EA | 175 | | | | |
| 30 | Providing and laying in position specified grade of reinforced cement concrete excluding the cost of shuttering, centring, finishing and reinforcement-All work up to plinth level: **1:2:4** (1cement :2 coarse sand :4 graded stone agg.20mm nominal size.) | CUM | 20 | | | | |
| 31 | Charges for providing continuous steel barricade 1.2 mtr. high including cost of all material plant consumables transport and labour for shifting placing painting and regular maintenance.40% qty for selected portion | M | 7500 | | | | |
| 32 | Charges for carrying out Route survey and identification of underground utilities of various civic agencies before/ during execution of scheme involving cable laying work. Route length will be considered for payment. Route length will be specifically verified by DGM. | M | 7500 | | | | |
| 33 | Fabrication MS structure for different equipment like isolator, C.T.'s, P.T.'s, CVT, LA's etc, cable supporting structure including supply of nuts and bolts, consumables, welding electrode, hacksaw blades etc. excluding supply of steel. | MT | 6.5 | | | | |
| 34 | Erection of MS as well as galvanised structure for different equipment like | MT | 6.5 | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | isolator, C.T.'s, P.T.'s, CVT, LA's, ISO etc, cable supporting structure, 33kV/66 kV GI gantry structure, Tower Structure i/c consumables, welding electrode, tack welding & hacksaw blades etc. | | | | | | |
| 35 | Painting of Fabrication MS Structure for diff.equip. | KG | 6500 | | | | |
| 36 | Erection of ground earthing with 40 mm dia, 3 mtr long, MS rod electrode, fabrication and fixing of clamps and test links, including supply of sand and charcoal. | EA | 10 | | | | |
| 37 | Erection of electrical equipment Including supply of T & P, all consumable items such as welding rods, hacksaw blades etc and minor modification in support structure for fixing as required. For 33 kV SF6 circuit breaker with mechanism and structure | EA | 1 | | | | |
| 38 | Erection of electrical equipment Including supply of T & P, all consumable items such as welding rods, hacksaw blades etc and minor modification in support structure for fixing as required. For 33 kV isolator with one earth switch | EA | 1 | | | | |
| 39 | Erection of electrical equipment Including supply of T & P, all consumable items such as welding rods, hacksaw blades etc and minor modification in support structure for fixing as required. For 33 kV isolator without earth switch | EA | 3 | | | | |
| 40 | Erection of electrical equipment Including supply of T & P, all consumable items such as welding rods, hacksaw blades etc and minor modification in support structure for fixing as required. For 33 kV LA's with/without surge counter | EA | 9 | | | | |
| 41 | Erection of electrical equipment Including supply of T & P, all consumable items such as welding rods, hacksaw blades etc and minor modification in support structure for fixing as required. For Bay Terminal/Marshalling Kiosk | EA | 1 | | | | |
| 42 | Erection of electrical equipment Including supply of T & P, all consumable items such as welding rods, hacksaw blades etc and minor modification in support structure for fixing as required. For CT/PT Junction Box | EA | 3 | | | | |
| 43 | Erection of electrical equipment Including supply of T & P, all consumable items such as welding rods, hacksaw blades etc and minor modification in support structure for fixing as required. For Control and relay panel for Transformer, line, Bus coupler.- 33 kV, C & R panel | EA | 1 | | | | |
| 44 | Erection of electrical equipment Including supply of T & P, all consumable items such as welding rods, hacksaw blades etc and minor modification in support structure for fixing as required. For 66 kV /33KV CT, any ratio | EA | 3 | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 45 | Erection of electrical equipment Including supply of T & P, all consumable items such as welding rods, hacksaw blades etc and minor modification in support structure for fixing as required. For 66 kV/33KV PT | EA | 3 | | | | |
| 46 | Stringing of Single Suspension String Insulator with double tension clamp for twin Zebra conductor | EA | 6 | | | | |
| 47 | Sringing and sagging of main bus and cover bus bar with ACSR Zebra conductor and Jumpering of various electrical equipment by ACSR Zebra conductor in between equipment to equipment of any length required and from bus bar to equipment of any length required with the help of PG clamps, T connectors and other clamps. For 66 kV /33KV Yard | M | 350 | | | | |
| 48 | Stringing of Rigid Spacer Clamp with tee – off suitable for single Zebra conductor and double zebra to single zebra convertor. | EA | 24 | | | | |
| 49 | Erection of MOM box for 33 and 66KV Insolator including welding, cutting etc. | EA | 5 | | | | |
| 50 | Stringing of Bolted type 'T'/PG Connector suitable for single Zebra conductor | EA | 40 | | | | |
| 51 | Laying, dressing, megger and continuity test of PVC, armoured control and auxiliary power cables in excavated trench/cable trays .**For 10CX2.5 sqmm, Cu** | M | 2000 | | | | |
| 52 | Laying, dressing, megger and continuity test of PVC, armoured control and auxiliary power cables in excavated trench/cable trays .**For 6/5CX2.5 sqmm, Cu** | M | 2000 | | | | |
| 53 | Erection of double compression gland including termination **For 10CX2.5 sqmm, Cu** | EA | 60 | | | | |
| 54 | Erection of double compression gland including termination **For 5CX2.5 sqmm, Cu** | EA | 60 | | | | |
| 55 | Laying of MS flat in the excavated trench including risers, equipment earthing, overlapping of MS flat at the joints by twice of its width and welding of over lapping and cross joints including supply of electrodes, red oxide/bitumin compound , paint etc. and Laying of GI earth strip for equipment earthing, along the wall, trench, cable trays etc including fabrication of supports/cleats and fixing with wall bolts, welding works, painting of earth strip and riser with red oxide paint/bitumin compound and final. **For 50X6 sqmm** | M | 893 | | | | |
| 56 | Excavation of trench below the ultimate good earth level in following type of soil including refilling after laying of earth mat riser, fixing of earth electrodes welding etc. **For Soft soil** | CUM | 90 | | | | |
| 57 | Digging of earth pit upto depth of 10 ft. in rocky/ semi rocky as per feasibility at site of embedding 600 x600mm earth plate with M.S Flat 50 x8 mm running the same through 3/4 " dia G.I. grouting pipe. Earth | EA | 15 | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Plate to be covered by charcoal 200kg. And 100 Kg. Sodium chloride in the earth pit and refilling etc. NOTE: Charcoal, common salt, earth plate, G.I. Pipe, MS flat, Badarpur, Cement and bricks to be supplied by the contractor | | | | | | |
| 58 | Making of civil goomitties around GI earthpipe as per standard design of BSES. Supply of necessary bricks, cement, badarpur, sand, C1 cover of size 1'x1' and providing the same at the top of goomitties. | EA | 15 | | | | |
| 59 | Grouting of cable mounting structure with cement concrete having ratio 1:3:6 including fixing with gantry structure. Badarpur, cement and stone ballast shall be supplied by contractor. **Suitable for mounting 33/66 KV cable.** | EA | 3 | | | | |
| 60 | Mounting of 33KV,3x400sq.mm. XLPE cable with cable end box on the steel structure and fixing it with suitable wooden cleats (wooden cleats shall be supplied by contractor) i/c.its jumpering with the isolator as required. | EA | 6 | | | | |
| 61 | Splicing of 48F Optic Fiber Cable | EA | 6 | | | | |
| 62 | Testing and Commissioning of LDR | EA | 2 | | | | |
| 63 | ETC of Fire Extinguisher and mat | LOT | 2 | | | | |
| 64 | Scada erection (Annexure- B, Part- B) | EA | 1 | | | | |
| 65 | Civil Charges (Annexure- C: Detailed BOQ Attached) | LS | 1 | | | | |
| 66 | VLF High Voltage test as per IEEE 400.2 | LS | 1 | | | | |
| 67 | VLF Tan Delta as per IEEE 400.2 | LS | 1 | | | | |
| 68 | VLF Partial Discharge as per IEEE 400.2 | LS | 1 | | | | |
| 69 | Sheath integrity test | LS | 1 | | | | |

BSES

| ANNEXURE -B: SCADA | | | |
|---|---|---|---|
| **PART B: SERVICE** | | | |
| **S.NO** | **SERVICE DESCRIPTION** | **UNIT** | **QTY** |
| 1 | Cable laying and tagging (16 core, 1.5 mm2) & Termination with Petty Materials Such as connectors, Lugs, Jacks, White Sleeves, Ferrules, etc. | M | 300 |
| 2 | Cable laying and tagging (2 core, 2.5 mm2) with Petty Materials Such as connectors, Lugs, Jacks, White Sleeves, Ferrules ,etc. | M | 50 |
| 3 | Cable glanding and termination | NOS | 20 |
| 4 | Laying and termination of RS485 cable thru metal conduit/GI pipe with proper tagging, Glanding and dressing up to RTU panel) | M | 150 |
| 5 | Laying and termination of CAT-6 / FO Cables thru metal conduit/GI pipe with proper tagging, Glanding and dressing up to RTU/ Switch panel) | M | 431 |
| 6 | Material transportation from Multiple Sites | NOS | 2 |
| 7 | Installation of Switch Panel's/ Ethernet Switches & LIU in RTU/CRP | Panel's | 4 |
| 8 | Cable Crimping Work+Supply of Jack with Ferrules (Whit Sleeve with Black Printed Ferrules) | NOS | 40 |
| 9 | Cable Terminations with Suitable Insulated Lugs | NOS | 100 |
| 10 | Miscellaneous Work (Cable Tray, Civil) | LOT | 1 |
| 11 | Installation, commissioning and integration of cards to the existing system | NOS | 1 |
| 12 | Splicing of Optical Fibers | NOS | 8 |

## ANNEXURE- C CIVIL WORKS FOR CONSTRUCTION OF FOUNDATION FOR BREAKER, CT, PT, ISOLATOR, LA, INCLUDING TRENCH YARD DEVELOPMENT etc.

| S. NO. | DESCRIPTION | UOM | QTY |
|---|---|---|---|
| 1 | Demolishing cement concrete manually/ by mechanical means including disposal of material within 50 metres lead as per direction of Engineer-In-Charge.<br>Nominal concrete 1:4:8 or leaner mix (i/c equivalent design mix) | CUM | 53.45 |
| 2 | Earth work in excavation by mechanical means (Hydraulic excavator) / manual means in foundation trenches or drains (not exceeding 1.5 m in width or 10 sqm on plan), including dressing of sides and ramming of bottoms, lift up to 1.5 m, including getting out the excavated soil and disposal of surplus excavated soil as directed, within a lead of 50 m - All kinds of soil. | CUM | 51.89 |
| 3 | Earth work in excavation by mechanical means hydraulic excavator/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including getting out and disposal of excavated earth lead up to 50 m and lift up to 1.5 m, as directed by Engineer-in-charge. All kinds of soil | CUM | 116.87 |
| 4 | Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m. | CUM | 50.63 |
| 5 | P/L cement concrete - all works up to plinth level: 1:4:8 (1 Cement: 4 coarse sand: 8 graded stone aggregate 40 mm nominal size). | CUM | 8.18 |
| 6 | P/L R.C.C. up to plinth level: 1:1.5:3 (1 cement: 1.5 coarse sand : 3 graded stone aggregate 20 mm nominal size) | CUM | 29.81 |
| 7 | Reinforced cement concrete work in walls (any thickness), including attached pilasters, buttresses, plinth and string courses, fillets, columns, pillars, piers, abutments, posts and struts etc. above plinth level up to floor five level, excluding cost of centring, shuttering, finishing and reinforcement : 1:1.5:3 | CUM | 9.62 |

| | | | |
|---|---|---|---|
| | (1 cement : 1.5 coarse sand(zone-III) : 3 graded stone aggregate 20 mm nominal size). | | |
| 8 | Centring and shuttering including strutting, propping etc. and removal of form for all heights: Foundations, footings, bases of columns, etc. for mass concrete | SQM | 90.95 |
| 9 | Centring and shuttering including strutting, propping etc. and removal of form for all heights : Walls (any thickness) including attached pilasters, butteresses, plinth and string courses etc. Sqm | SQM | 127 |
| 10 | Steel reinforcement for R.C.C. work including straightening, cutting, bending, placing in position and binding all complete up to plinth level. Cold twisted bars | KG | 3750.48 |
| 11 | 6 mm cement plaster 1:3 (1 cement: 3 fine sand) finished with a floating coat of neat cement and thick coat of Lime wash on top of walls when dry for bearing of R.C.C. slabs and beams. | SQM | 87.46 |
| 12 | Painting with synthetic enamel paint of approved brand and manufacture to give an even shade: Two or more coats on new work | SQM | 30.74 |
| 13 | Steel work in built up tubular (round, square or rectangular hollow tubes etc. trusses etc. including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer, including welding and bolted with special shaped washers etc complete: hot finished welded type tube | Kg | 19.83 |
| 14 | Providing and laying in position cement concrete of specified grade excluding the cost of centring and shuttering - All work up to plinth level: 1:2:4 (1 cement: 2 coarse sand (zone-III) : 4 graded stone aggregate 20 mm nominal size) | Kg | 0.07 |
| 15 | Painting with aluminium paint of approved brand and manufacture to give an even shade. Two or more coats on new work | SQM | 0.44 |
| 16 | Painting with aluminium paint of approved brand and manufacture to give an even shade: One or more coats on old work | SQM | 2 |
| 17 | Brick work with common burnt clay F.P.S. (non-modular) bricks of class designation 7.5 in foundation and plinth in: Cement mortar 1:4 (1 cement: 4 coarse sand) | cum | 16.25 |
| 18 | 12 mm cement plaster of mix: 1:4 (1 cement: 4 coarse sand) | SQM | 101.75 |
| 19 | 15 mm cement plaster on rough side of single or half brick wall of mix: 1:4 (1 cement: 4 coarse sand) | SQM | 7.5 |
| 20 | Neat cement punning. | SQM | 109.25 |
| 21 | Cement concrete flooring 1:2:4 (1 cement: 2 coarse sand: 4 graded stone aggregate) finished with a floating coat of neat cement, including cement slurry, but excluding the cost of nosing of steps etc. complete. | SQM | 30 |
| 22 | 40 mm thick with 20 mm nominal size stone aggregate | | |
| 23 | Demolishing brick work manually/ by mechanical means including stacking of serviceable material and disposal of unserviceable material within 50 metres lead as per direction of Engineer-In-Charge - in cement mortar | cum | 3.6 |
| 24 | Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level: 1:5:10 (1 cement: 5 coarse sand (zone-III) derived from natural sources: 10 graded stone aggregate 40 mm nominal size derived from natural sources) | Cum | 68.4 |
| 25 | Disposal of building rubbish/ malba/ similar unserviceable, dismantled or waste materials by mechanical means, including loading, transporting, unloading to approved municipal dumping ground or as approved by Engineer-In-Charge, beyond 50 m initial lead, for all leads including all lifts involved. | Cum | 229.9 |
| 26 | Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete. | KG | 2797.7 |
| 27 | Flat brick flooring with over burnt bricks on bed of 10 mm thick cement 1:6 (1 cement: 6 coarse sand) & filling the joints with same cement mortar | SQM | 683.96 |
| 28 | Supplying and spreading uniformly in yard of grid s/stn. blue stone aggregate 20 mm single size of good quality i/c loading, unloading for all leads & lifts complete, as per direction of Engineer in charge. | cum | 68.4 |

## SCHEME NO 3:

## Providing 2 nos. 33 KV circuits from upcoming 220/33KV DTL Dev Nagar substation to DLF mall & A-4 Paschim Vihar substations each by loop in loop out existing 33KV circuit.

### SUPPLY

| S. NO. | DESCRIPTION | UOM | QTY | BASIC (RS) | FREIGHT (RS) | GST (RS) | UNIT LANDED (RS) | TOTAL LANDED COST (RS) |
|---|---|---|---|---|---|---|---|---|
| 1 | CBL,PWR,400MM2;3C;33KV;AL;XLPE with Inbuilt Optical fiber cable | M | 24000 | | | | | |
| 2 | 33KV STRAIGHT THROUGH JOINTING KITS;3cx400; compatible with OFC | EA | 90 | | | | | |
| 3 | KIT CBL TERN OUT 33KV 3CX400MM2 HS XLPE; compatible with OFC | EA | 12 | | | | | |
| 4 | KIT,TERM,INDR;33KV;3CX400MM2;GIS PLG IN, compatible with OFC | EA | 4 | | | | | |
| 5 | CHANNEL,MOC:MS,SIZE:150X75X6MM | MT | 1 | | | | | |
| 6 | CHNL,STRCTL,ISMC100;100MM;50mm; 7.7mm | MT | 1 | | | | | |
| 7 | ANGLE,STRCTL,65MM;65MM;6MM;MS | MT | 1 | | | | | |
| 8 | FLAT,STRCTL,6MM;50MM;5500MM;MS | MT | 0.5 | | | | | |
| 9 | LINE DIFFERENTIAL RELAY P543 MAKE-SCHNEIDER. | NOS | 2 | | | | | |
| 10 | Box elect,33kv CBL, Junction box MS IP 56 | EA | 2 | | | | | |
| 11 | RCC Cable protection cover as per BRPL specification & drawing. (50 Thick 550 mm wide) | EA | 9000 | | | | | |
| 12 | HDPE pipes as per IS 4984,PN 6 class PE 80 - 180mm dia | M | 13200 | | | | | |
| 13 | warning tape per BSES Design specification (Width=150mm, Thickness=0.3u) | M | 5400 | | | | | |
| 14 | Danger plates. | EA | 4 | | | | | |
| 15 | Electronic Ball marker at every 50 meter -passive | EA | 120 | | | | | |
| 16 | Electronic Ball marker at every at every joint - active | EA | 90 | | | | | |
| 17 | Coffin for Joint | EA | 90 | | | | | |
| 18 | LIU 48/96F fully loaded for OFC including Patch cord | EA | 2 | | | | | |
| 19 | Optical Fiber Cable (48 F ,36 nos single mode, G657A1+12 nos multi-mode OM2) | M | 8000 | | | | | |
| 20 | Route Marker | EA | 120 | | | | | |
| 21 | Joint Marker | EA | 20 | | | | | |
| 22 | Misc. Item like Glands, luges, Nut & Bolts etc. | LS | 1 | | | | | |
| 23 | HDPE Duct | M | 8000 | | | | | |

## ERECTION,TESTING & COMMISIONING (ETC)

## Scheme 3: Providing 2 nos. 33 KV circuits from upcoming 220/33KV DTL Dev Nagar substation to DLF mall & A-4 Paschim Vihar substations each by loop in loop out existing 33KV circuit.

| S. NO. | DESCRIPTION | UOM | QTY | BASIC (RS) | GST (RS) | UNIT LANDED (RS) | TOTAL LANDED COST (RS) |
|---|---|---|---|---|---|---|---|
| 1 | Digging of cable trench as per specification and drawings. Rate is inclusive of digging and backfilling. Measurement shall be as per actual depth excavated. For Ordinary Bituminous/ C.C.Road. | CUM | 4050 | | | | |
| 2 | Digging of test pits of required size (not less than 1/2 Mtr. Wide at site for identification of cable route). Relevant volume shall be deducted from quantities of same item of cable digging For Ordinary bituminous road | EA | 200 | | | | |
| 3 | Removal of Malba including Loading / Unloading on own vehicle. The payment shall be restricted to the quantity of sand laid. | CUM | 1822.5 | | | | |
| 4 | Providing and Laying Sand cushioning for cable route as per BRPL specification and drawing. | CUM | 1134 | | | | |
| 5 | Laying of underground cable in trench, covering with RCC cable cover, covering with sand ,Sand cushion will be min 75mm below and 75mm above the cable, fixing of cable identification tags (9" X 4") at every 30 Mtrs, Laying of warning tape above 250mm of the docket, refilling the trench and ramming the surface & removal of malba if any, including watch and ward till charging of cable ( This activity includes only labour jobs ) for 33 KV cable Running Mtr. | M | 24000 | | | | |
| 6 | Crossing of roads by trench-less technology by laying of HDPE pipe excluding supply of pipe. Laying by HDD Machine Moling. Drilling and laying. 200mm dia. | M | 4000 | | | | |
| 7 | Laying of HDPE Pipe for crossing small Nallas in the cable route | M | 5200 | | | | |
| 8 | Providing and laying in position specified grade of reinforced cement concrete excluding the cost of shuttering, centring, finishing and reinforcement-All work up to plinth level: 1:2:4 (1cement :2 coarse sand: 4 graded stone agg.20mm nominal size.) | CUM | 95 | | | | |
| 9 | Fabrication of MS structure as well as galvanised for different equipment like isolator, C.T.'s, P.T.'s, CVT, LA's etc, cable supporting structure including supply of nuts and bolts, consumables, welding electrode, hacksaw blades etc. excluding supply of steel. | MT | 3.5 | | | | |
| 10 | Erection of MS as well as galvanised structure for different equipment like isolator, C.T.'s, P.T.'s, CVT, LA's, ISO etc, cable supporting structure, 33kV/66 kV GI gantry structure, Tower Structure i/c consumables, welding electrode, tack welding & hacksaw blades etc. | MT | 3.5 | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 11 | Painting of any M.S. Structure with one coat of Red oxide and two coats of AL. Paint ISI marked including supply of paint by contractor. | KG | 3500 | | | | |
| 12 | Digging of earth pit up to depth of 10 ft. in-rocky/ semi rocky as per feasibility at site of embedding 600 x600mm earth plate with M.S Flat 50 x8 mm running the same through 3/4 " dia G.I. grouting pipe. Earth Plate to be covered by charcoal 200kg. And 100 Kg. Sodium chloride in the earth pit and refilling etc. NOTE: Charcoal, common salt, earth plate, G.I. Pipe, MS flat, Badarpur, Cement and bricks to be supplied by the contractor | EA | 8 | | | | |
| 13 | Making of civil goomitties around GI earthpipe as per standard design of BSES. Supply of necessary bricks, cement, badarpur, sand, C1 cover of size 1'x1' and providing the same at the top of goomitties. | EA | 8 | | | | |
| 14 | Charges for providing continuous steel barricade 1.2 mtr high including cost of all material plant consumables transport and labour for shifting placing painting and regular maintenance.40% qty for selected portion | M | 5000 | | | | |
| 15 | Charges for carrying out Route survey and identification of underground utilities of various civic agencies before/ during execution of scheme involving cable laying work. Route length will be considered for payment. Route length will be specifically verified by DGM.(GPR) | M | 6000 | | | | |
| 16 | Crossing of roads by trench-less technology by laying of HDPE pipe excluding supply of pipe. Laying by Pneumatic Jack Hammer Road Cutting. laying. 200mm dia. | M | 4000 | | | | |
| 17 | Fixing of Danger plates. | EA | 4 | | | | |
| 18 | Electronic Ball marker at every 50 meter -passive | EA | 120 | | | | |
| 19 | Electronic Ball marker at every at every joint - active | EA | 90 | | | | |
| 20 | Fixing of Coffin for Joint | EA | 90 | | | | |
| 21 | Fixing of Route Marker | EA | 120 | | | | |
| 22 | fixing of joint marker | EA | 20 | | | | |
| 23 | ETC of Box elect,33kv CBL, Junction box MS IP 56 | EA | 2 | | | | |
| 24 | Installation of Outdoor type End Termination Kit Suitable for 33 kV 3X400 Sq.mm Cables including OFC termination/end seal (joint/ termination manufacturer will carry out this job) | EA | 12 | | | | |
| 25 | Installation of straight through joints for 33kv cables including OFC Termination/end seal (Joint/ termination manufacturer will carry out this job) | EA | 70 | | | | |
| 26 | laying of optical fibre cable | M | 8000 | | | | |
| 27 | Laying of 40mm dia. HDPE Duct in open trench | M | 8000 | | | | |
| 28 | Making optical fibre end box (Splicing of 48F Optical Fiber Cable) | Nos | 2 | | | | |
| 29 | Installation of LIU (48F) including Patch cord | EA | 2 | | | | |
| 30 | Sand (for both supplying and laying (D) | Cum | 1134 | | | | |
| 31 | Civil Charges (Annexure- B: Detailed BOQ Attached) | LS | 1 | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 32 | VLF High Voltage test as per IEEE 400.2 | LS | 1 | | | | |
| 33 | VLF Tan Delta as per IEEE 400.2 | LS | 1 | | | | |
| 34 | VLF Partial Discharge as per IEEE 400.2 | LS | 1 | | | | |
| 35 | Sheath integrity test for each length of drum | LS | 1 | | | | |

**ANNEXURE -B: CIVIL**
**INSTALLATION OF 02 NOS JUNCTION BOXES AT 220KV DTL DEV NAGAR SUBSTATION**
**POWER CABLE TRENCH (30 M) & JUNCTION BOX FOUNDATION (2 Nos)**

| S.NO | SERVICE DESCRIPTION | UNIT | QTY |
|---|---|---|---|
| 1 | Demolishing cement concrete manually/ by mechanical means including disposal of material within 50 metres lead as per direction of engineer in charge. Nominal concrete: 1:3:6 or richer mix (i/c equivalent design mix) | CUM | 2.60 |
| 2 | Earth work in excavation by mechanical means (hydraulic excavator)/ manual means in foundation trenches or drains (not exceeding 1.5 m in width or 10 sqm on plan) including dressing of sides and ramming of bottoms, lift up to 1.5 m, including getting out | CUM | 160.32 |
| 3 | Providing and laying in position cement concrete of specified grade excluding the cost of centring and shuttering - All work up to plinth level :1:4:8 (1 Cement : 4 coarse sand (zone-III) derived from natural sources: 8 graded stone aggregate 40 mm nominal. | CUM | 9.04 |
| 4 | Providing and laying in position specified grade of reinforced cement concrete, excluding the cost of centring, shuttering, finishing and reinforcement - All work up to plinth level: 1:1.5:3 (1 cement: 1.5 coarse sand (zone-III) derived from natural so | CUM | 45.87 |
| 5 | Steel reinforcement for R.C.C. work including straightening, cutting, bending, placing in position and binding all complete up to plinth level. cold twisted bars | KG | 5045.70 |
| 6 | Centring and shuttering including strutting, propping etc. and removal of form work for : Foundations, footings, bases of columns. | SQM | 24.32 |
| 7 | Centring and shuttering including strutting, propping etc. and removal of form for Walls (any thickness) including attached pilasters, butteresses, plinth and string courses etc. | SQM | 220.80 |
| 8 | 6mm cement plaster of mix: 1:3 (1 cement: 3 fine sand). | SQM | 141.20 |
| 9 | Neat cement punning | SQM | 141.20 |
| 10 | Cement concrete flooring 1:2:4 (1 cement: 2 coarse sand: 4 graded stone aggregate) finished with a floating coat of neat cement including cement slurry, but excluding the cost of nosing of steps etc. complete. 40 mm thick with 20 mm nominal size stone a | SQM | 65.80 |
| 11 | Structural steel work in single section fixed with or without connecting plate including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete. | KG | 993.68 |
| 12 | Welding by gas or electric plant including transportation of plant at site etc. complete | CUM | 2724.00 |
| 13 | Structural steel work riveted, bolted or welded in built up sections, trusses and framed work including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete. | KG | 3598.20 |
| 14 | Painting with synthetic enamel paint of approved brand and manufacture to give an even shade. Two or more coats on new work. | SQM | 145.06 |
| 15 | Filling available excavated earth (excluding rock) in trenches plinth, sides of foundations etc. in layers not exceeding 20 cm in depth: consolidating Earth deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m | CUM | 32.06 |
| 16 | Disposal of surplus earth by mechanical transport loading, unloading and stacking etc complete for all leads and lifts, | CUM | 128.26 |
| 17 | Disposal of building rubbish/ malba/ similar unserviceable, dismantled or waste materials by mechanical means, including loading, transporting, unloading to approved municipal dumping ground or as approved by Engineer-in-charge, beyond 50 m initial lead | CUM | 2.60 |

# VOLUME – III

# TECHNICAL SPECIFICATIONS

BSES

Date: 12.05.2026

AMENDMENT NOTE OF TECHNICAL SPECIFICATION FOR LAYING OF PVC/XLPE CABLES FOR 33kV and 66kV CABLE (SPECIFICATION NO – BSES-TS-168-CL-R0)

Following clauses along with descriptions of the technical specification BSES-TS-168-CL-R0 shall be read as amended as per remarks from and onward 12.05.2026:

| Sl no | Ref Clause | Ref page no | Descriptions | Remarks |
|---|---|---|---|---|
| 1 | Annexure-7 (11) | Page 43 of 49 | Cable drum shall be returnable and vendor shall take it back (by bye back process) from site at their own risk and cost. | Read as deleted |
| 2 | Annexure-7 (12) | Page 43 of 49 | Once cable lying complete of a drum, within two days empty drum shall be removed from site by bye back process. | Read as deleted |
| 3 | 3.22 | Page 18 of 49 | Jointing of cables | Add: OFC cable shall be tied with the joint (to enable temperature sensing in future whenever BRPL implements it) |

| Proposed by | Reviewed By | Approved by |
|---|---|---|
| 12/05/2026 | 12/5/26 | |
| Pronab Bairagi | Anupam Kumar | Deepti Sharma |

BSES Rajdhani Power Ltd

# CONSOLIDATED TECHNICAL REQUIREMENT

# FOR

# SUPPLY, ERECTION, TESTING & COMMISSIONING

# OF

# 66kV CABLE LAYING WORK

| Date | Revision | Pages |
|---|---|---|
| 08.05.2026 | R0 | 11 |

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| 1. | Laying of 66kV / 33kV / 11kV / 1.1 kV grade PVC / XLPE cables | |
| 2. | 66kV 3 Core cable (66kV, 3CX300 sqmm cable), | |
| 3. | 66kV Jointing Kit | |
| 4. | 66kV Termination Kit | |
| 5 | 33kV and 66kV LA | |
| 6 | ACSR Conductors | |
| 7 | RFID Active and Passive Markers | |
| 8 | Chemical Earthing | |
| 9 | GI and Earthing pipe, GI strip | |
| 10 | C wedge Connectors | |
| 11 | PPE Items | |
| 12 | 1.1kV Power and Control cable | |
| 13 | HDPE pipe | |
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## 1.00.00 GLOSSARY LIST

| S. No. | Abbreviation | Description |
|---|---|---|
| 1 | F.O. R. | Freight On Road |
| 2 | CT | Current Transformer |

| | | |
|---|---|---|
| 3 | PT | Potential Transformer |
| 4 | kV | Kilo Volts |
| 5 | MVAR | Mega Volt Amperes Reactive |
| 6 | MVA | Mega Volt Amperes |
| 7 | kVA | Kilo Volt Amperes |
| 8 | O&M | Operation and Maintenance |
| 9 | LOA | Letter of Award |
| 10 | FO | Fiber Optic |
| 11 | MCD | Municipal Corporation of Delhi |
| 12 | DDA | Delhi Development Authority |
| 13 | PWD | Public Works Department |
| 14 | U/G | Underground |
| 15 | HT | High Tension |
| 16 | ACSR | Aluminum Conductor Steel Reinforced |
| 17 | BOQ | Bill of Quantity |
| 18 | GA | General Arrangement |
| 19 | RCC | Reinforced Cement Concrete |
| 20 | CPRI | Central Power Research Institute |
| 21 | ERDA | Electrical Research and Development Association |
| 22 | CRP | Control &Relay Panel |
| 23 | T&P | Tools & Plant |
| 24 | IR | Insulation Resistance |
| 25 | OFC | Optical Fiber Cable |
| 26 | GAIL | Gas Authority of India Limited |
| 27 | IGL | Indraprastha Gas Limited |
| 28 | IOCL | Indian Oil Corporation Limited |
| 29 | DMRC | Delhi Metro Rail Corporation |
| 30 | PPE | Personal Protective Equipment |
| 31 | FRLS | Fire Retardant Low Smoke |
| 32 | GI | Galvanized Iron |
| 33 | GPR | Ground Penetration Radar |
| 34 | P/L | Providing and laying |
| 35 | P/F | Providing and fixing |
| 36 | TAC | Tariff Advisory Committee |
| 37 | IS | Indian Standard |
| 38 | IEC | International Electro technical Commission |

## 2.00.00 GENERAL DESIGN CRITERIA

2.01.00 General Service condition

a) Maximum ambient temperature (Degree C): 50

b) Minimum ambient temperature (Degree C): 0

c) Relative Humidity (%): 100

d) Maximum annual rainfall (mm): 750

e) Maximum wind pressure (Kg/Sq.m): 150

f) Maximum Altitude above mean sea level (Meters): 1000

g) Seismic level Zone IV as per IS 1893

h) Pollution Level: Heavy/Dry

2.02.00 Code and Standards

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

2.03.00 Scope and Services

| S.No. | Head | BRPL Scope | Contractor's Scope | Remarks |
|---|---|---|---|---|
| 1 | Road Cutting Permission | X | √ | Statutory fees will be borne by BRPL |
| 2 | Supply, Laying, testing and commissioning of 66kV cable , Cable Jointing , Cable termination including laying , testing and commissioning of OFC joint and OFC termination. | X | √ | NA |
| 3 | Supply, Laying, testing and commissioning of 33kV Bay consisting 33kV Circuit breaker, 33kV Isolator, 33kV CT & PT, 33kV LA, Bay marshalling kiosk etc. | X | √ | NA |
| 4 | Permissions from relevant External and Internal Agencies regarding Cable Laying and Commissioning (Traffic Police, GAIL, IGL, IOCL, PWD, CPWD, Pollution Control Board, DMRC, Electrical inspector etc.) | X | √ | Statutory fees will be borne by BRPL |
| 5 | Supply, Erection, Testing and commissioning of Equipments related to schemes like CT, CVT, CB, Isolator, LA etc. if any. | X | √ | As per specifications and Standards |
| 6 | Supply and Erection of structure for mounting equipments in the bay like structure for CT, CVT, CB, Isolator, LA etc. | X | √ | |
| 7 | GPR/Scanning of the whole route (before execution of project and after completion of project) shall be done and the same shall be submitted to BRPL.<br>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. |

| S.No. | Head | BRPL Scope | Contractor's Scope | Remarks |
|---|---|---|---|---|
| | HDD route depth shall be decided after submission of report | | | |
| 8 | • Drawing Submissions-before execution of project<br>• As built drawing submission- after completion of project | X | √ | NA |
| 9 | Engineering Approvals | √ | X | NA |
| 10 | Testing Equipments | X | √ | NA |
| 11 | Lighting Arrangement | X | √ | NA |
| 12 | Construction Power and Construction Water | X | √ | NA |
| 13 | Safety , Security and insurance of Manpower( Labour, Engineers, Supervisors etc) | X | √ | Labour should be provided with every safety gear like safety jacket, helmet etc. |
| 14 | Various Tools and Tackles related to Job | X | √ | NA |
| 15 | Transportation of Material and any other tender related work | X | √ | NA |
| 16 | Cleanliness around project site | X | √ | NA |
| 17 | Security and Safety of material until handing over the project to BRPL | X | √ | NA |
| 18 | Providing of Various Machines e.g Crane, Hydra, JCB, Hammer , Cutting Machine etc to complete the project | X | √ | NA |
| 19 | Providing of Trenchless Machine | X | √ | NA |
| 20 | Loading and Unloading of material at site including scrap returning to BRPL site | X | √ | NA |
| 21 | Electrical Inspector Clearance | X | √ | Statutory fees will be borne by BRPL |
| 22 | Providing of Continuous Steel Barricading with Mobile no of project supervisor, sufficient traffic marshal, becon light, Fluorescent tape, PPE etc. (Mobile no shall be clearly visible on the barricading) | X | √ | as per drawing enclosed with specification. |
| 23 | Permit to work requesting Agency in BRPL premises | X | √ | Permit Should be applied to Engineer In-charge prior to work through proper procedure |
| 24 | Permit to work issuing agency inside BRPL Premises | √ | X | NA |
| 25 | Temporary office and Material Store near work premises | X | √ | NA |

| S.No. | Head | BRPL Scope | Contractor's Scope | Remarks |
|---|---|---|---|---|
| 26 | Storage of all kind of Material required for project | X | √ | BRPL premises will not provide for any kind of material storage and issuance |
| 27 | 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 |
| 28 | Preparation, updation and submission of PERT chart fortnightly to track activities | X | √ | NA |
| 29 | 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 |
| 30 | 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 |
| 31 | Surface levelling, removal and disposal of excess earth (malwa) after back filling of trench. During execution excavated earth shall be covered with green mat to prevent dust pollution. Also regular Water Sprinkling is to be required at site. | X | √ | NA |
| 32 | Supply, installation, testing and commissioning of Active and Passive ball markers | X | √ | NA |
| 33 | Supply & installing of RCC cable route marker, RCC cable joint marker and RCC Coffin for joint. , RCC slab, warning tape etc. | X | √ | Shall be designed as per tender document |
| 34 | Cable Route Tracer and Marker-supply, testing and commissioning (as applicable) | X | √ | NA |
| 35 | Sheath Integrity test before Charging of 66kV Cable | X | √ | Mandatory |
| 36 | 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 | √ | |

| S.No. | Head | BRPL Scope | Contractor's Scope | Remarks |
|---|---|---|---|---|
| 37 | 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 |
| 38 | De-watering of pits | X | √ | Scope shall be covered as per execution team requirement. |
| 39 | Civil works | X | √ | Any kind of civil works related to the project |
| 40 | As built drawing | X | √ | Page size- A1, 4 sets (CES, TRL, P&C, with final bill) |
| 41 | Handling of non- standard drum length | X | √ | |
| 42 | Route survey, preparation of site plan and profile | X | √ | |
| 43 | Cross bonding design | X | √ | Based on offered cable design |
| 44 | ETC including supply of materials, design, consultancy etc of bridge/truss/structure for nallah crossing | X | √ | |
| 45 | SCADA | X | √ | Whole work |

**Special requirement**

1. All jointing Kit shall have “Mechanical Connector” and not “Crimping”.
2. All the joints shall be covered with RCC coffin. Coffin shall be filled with sand. Each coffin or nos. of coffin shall fully cover the joint. Drawing provided only for constructional purpose not showing complete length of coffin. Bidder has to consider coffin length or numbers such that the complete joint shall be covered.
3. Delivery of cable at site and all other associate equipments/accessories have to be aligned as per site requirement and progress.
4. All kind of structural steel shall be GI unless otherwise specified.
5. Make of all kind of materials shall be as per BRPL approved make list, no deviation shall be allowed from make list.

6. The 66kV, 3CX300 , cable is required with OFC embedded inside (OFC cable is of 48 fibre with 36 single mode and 12 multi mode). For OFC cable details please refer attached specification.
7. Depth of HDD shall be decided jointly after submission of GPR report
8. GIS kit shall be suitable for OFC embedded cable
9. Link cable for cross bonding shall be copper, 3.3KV, Size as Mentioned in BoQ

**3.00.00 PACKAGE**

3.01.00

**Package**

Laying of 02 nos 66kV 3Cx300sq.mm. XLPE cable from 220KV Najafgarah Grid to G-1 Grid sector-16 dwarka including 01 nos Bay.(Route Length -6500M)

3.02.00 In-feed route map (attached below)

**4.00.00 TECHNICAL SPECIFICATION**

Please refer individual Technical Specification

**5.00.00 SCHEDULES**

**SCHEDULE -1**
**TECHNICAL DEVIATION FROM THE SPECIFICATION**
(This shall be part of Technical bid)

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

| Sl no | Specification cl no | Deviation | Benefit to BRPL |
|---|---|---|---|
| | | | |

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

| Sl no | Items Description | Approved Make |
|---|---|---|
| 1 | 33kV outdoor Circuit Breaker | • ABB Ltd.<br>• Siemens Ltd.<br>• GE<br>• CGPISL |
| 2 | 33kV Isolator | • ABB LIMITED. |

| | | |
|---|---|---|
| | | • SIEMENS LIMITED.<br>• CROMPTON GREAVES LIMITED. |
| 3 | 33kV Lightning arrester | • ALSTOM<br>• OBLUM ELECTRICAL INDUSTRIES PVT. LIMITED.<br>• LAMCO INDUSTRIES PVT. LIMITED.<br>• ABB LIMITED<br>• CROMPTON GREAVES LIMITED.<br>• ELECTROLYTE<br>• RAYCHEM |
| 4 | 33kV Control and Relay Panel | • ABB LIMITED.<br>• SCHNEIDER ELECTRIC LIMITED.<br>• SIEMENS LIMITED. |
| 5 | 33kV outdoor CT and PT | • CROMPTON GREAVES LIMITED<br>• KAPCO ELECTRIC PVT. LIMITED<br>• MEHRU ELECTRICAL & MECHANICAL ENGINEERS P LIMITED<br>• GE<br>• BHEL<br>• ABB Ltd. |
| 6 | 33 kV/66kV Jointing and Termination KIT | • Raychem<br>• 3M |
| 7 | HDPE Pipes | • Flow well<br>• Tirupati<br>• Narendra Polyplast<br>• Flexi flow<br>• Shivam Irrigation Works Pvt. Ltd. (Shivano)<br>• Safal Polymer pvt ltd<br>• Jindal Sanitations pvt ltd<br>• Rajshree Technoplast pvt ltd. |
| 8 | Chemical Earthing | • JMV<br>• Pragati<br>• True Power<br>• Genius Protection<br>• Axis Electrical component |
| 9 | 33Kv/66kV Jointing and Termination KIT | • Raychem<br>• 3M |
| 10 | LDR (Line differential relay)<br>Laying of cable 33 kV 2RX3CX400 SQMM from 220 kV Lodhi Road to NDSE Substation (Route Length- 5500 mtr)<br>) | Make- Schneider<br><br>Model-<br><br>For NDSE with 50 V DC<br><br>P54321RULM0K68M<br><br>For Lodhi Road 220 V DC<br><br>P54331RULM0K68M |

| | | |
|---|---|---|
| 11 | LDR (Line differential relay)<br>Laying of 02 Nos 33kV 3CX400 sq.mm. XLPE cable from 220 kV RK Puram to R.K.Puram-1 Grid substation. | Make: Schnider / Equivalent in Alstom<br><br>Model:<br><br>RKP-1 Grid side –<br><br>P54321RUHM0K68M -1 No for 50V DC<br><br>220kV DTL RK Puram Grid side-<br><br>b) P54331RUHM0K68M -1 No for 220V DC |
| 12 | LDR for other projects | Bidders to take make and model details from BRPL before submission of price bid. |

BSES Rajdhani Power Ltd

## Route Map, SLD and Layout

**Package**

Laying of 02 nos 66kV 3Cx300sq.mm. XLPE cable from 220KV Najafgarah Grid to G-1 Grid sector-16 dwarka including 01 nos Bay.(Route Length -6500M)

BSES Rajdhani Power Ltd

# CONSOLIDATED TECHNICAL REQUIREMENT

# FOR

# SUPPLY, ERECTION, TESTING & COMMISSIONING

# OF

# 33kV source comprising 2x3Cx400mm2 XLPE cable from 220kV Naraina to Mayapuri and Providing 33kV source comprising 2x3Cx400mm2 XLPE cable from A-43 Mayapuri to Metal forging.

| Date | Revision | Pages |
|---|---|---|
| 21.04.2026 | R0 | |

**33kV source comprising 2x3Cx400mm2 XLPE cable from 220kV Naraina to Mayapuri and Providing 33kV source comprising 2x3Cx400mm2 XLPE cable from A-43 Mayapuri to Metal forging.**

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| 3.01.00 | **Project:**<br><br>33kV source comprising 2x3Cx400mm2 XLPE cable from 220k<br>Naraina to Mayapuri and Providing 33kV source comprisir<br>2x3Cx400mm2 XLPE cable from A-43 Mayapuri to Metal forgin | |
| **4.00.00** | **TECHNICAL SPECIFICATION** | 7 |
| 1. | Laying of 66kV / 33kV / 11kV / 1.1 kV grade PVC / XLPE cables | |
| 2. | 33kV 3 Core cable (33kV 3CX400 sqmm cable) | |
| 3. | 33kV /11kV Jointing Kit | |
| 4. | 33kV /11kV Termination Kit | |
| 5 | 33kV and 66kV LA- not provided/not required | |
| 6 | ACSR Conductors- not provided/not required | |
| 7 | RFID Active and Passive Markers | |
| 8 | Chemical Earthing- not provided/not required | |
| 9 | GI and Earthing pipe, GI strip | |
| 10 | C wedge Connectors- not provided/not required | |
| 11 | PPE Items | |
| 12 | 1.1kV Power and Control cable- not provided/not required | |
| 13 | HDPE pipe | |
| 14 | Hardware RCC items & Steel items | |
| 15 | 48 Fibre OFC cable | |
| **5.00.00** | **SCHEDULES** | 8 |
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| Schedule-II | Make of Major items | |
| **6.00.00** | **Infeed route map, SLD and Layout** | 10 |


## 1.00.00 GLOSSARY LIST

| S. No. | Abbreviation | Description |
|---|---|---|
| 1 | F.O. R. | Freight On Road |
| 2 | CT | Current Transformer |

**33kV source comprising 2x3Cx400mm2 XLPE cable from 220kV Naraina to Mayapuri and Providing 33kV source comprising 2x3Cx400mm2 XLPE cable from A-43 Mayapuri to Metal forging.**

| | | |
|---|---|---|
| 3 | PT | Potential Transformer |
| 4 | kV | Kilo Volts |
| 5 | MVAR | Mega Volt Amperes Reactive |
| 6 | MVA | Mega Volt Amperes |
| 7 | kVA | Kilo Volt Amperes |
| 8 | O&M | Operation and Maintenance |
| 9 | LOA | Letter of Award |
| 10 | FO | Fiber Optic |
| 11 | MCD | Municipal Corporation of Delhi |
| 12 | DDA | Delhi Development Authority |
| 13 | PWD | Public Works Department |
| 14 | U/G | Underground |
| 15 | HT | High Tension |
| 16 | ACSR | Aluminum Conductor Steel Reinforced |
| 17 | BOQ | Bill of Quantity |
| 18 | GA | General Arrangement |
| 19 | RCC | Reinforced Cement Concrete |
| 20 | CPRI | Central Power Research Institute |
| 21 | ERDA | Electrical Research and Development Association |
| 22 | CRP | Control &Relay Panel |
| 23 | T&P | Tools & Plant |
| 24 | IR | Insulation Resistance |
| 25 | OFC | Optical Fiber Cable |
| 26 | GAIL | Gas Authority of India Limited |
| 27 | IGL | Indraprastha Gas Limited |
| 28 | IOCL | Indian Oil Corporation Limited |
| 29 | DMRC | Delhi Metro Rail Corporation |
| 30 | PPE | Personal Protective Equipment |
| 31 | FRLS | Fire Retardant Low Smoke |
| 32 | GI | Galvanized Iron |
| 33 | GPR | Ground Penetration Radar |
| 34 | P/L | Providing and laying |
| 35 | P/F | Providing and fixing |
| 36 | TAC | Tariff Advisory Committee |
| 37 | IS | Indian Standard |
| 38 | IEC | International Electro technical Commission |

## 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

**33kV source comprising 2x3Cx400mm2 XLPE cable from 220kV Naraina to Mayapuri and Providing 33kV source comprising 2x3Cx400mm2 XLPE cable from A-43 Mayapuri to Metal forging.**

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 amendment Indian Standards or International Standards. Refer respective equipments specification for applicable standards.

2.03.00 Scope and Services

| S.No. | Head | BRPL Scope | Contractor's Scope | Remarks |
|---|---|---|---|---|
| 1 | Road Cutting Permission | X | √ | Statutory fees will be borne by BRPL |
| 2 | Supply, Laying, testing and commissioning of 66kV cable , Cable Jointing , Cable termination including laying , testing and commissioning of OFC joint and OFC termination. | X | X | NA |
| 3 | Supply, Laying, testing and commissioning of 33kV Bay consisting 33kV Circuit breaker, 33kV Isolator, 33kV CT & PT, 33kV LA, Bay marshalling kiosk etc. | X | √ | NA |
| 4 | Permissions from relevant External and Internal Agencies regarding Cable Laying and Commissioning (Traffic Police, GAIL, IGL, IOCL, PWD, CPWD, Pollution Control Board, DMRC, Electrical inspector etc.) | X | √ | Statutory fees will be borne by BRPL |
| 5 | Supply, Erection, Testing and commissioning of Equipments related to schemes like CT, CVT, CB, Isolator, LA etc. if any. | X | √ | As per specifications and Standards |
| 6 | Supply and Erection of structure for mounting equipments in the bay like structure for CT, CVT, CB, Isolator, LA etc. | X | √ | |

**33kV source comprising 2x3Cx400mm2 XLPE cable from 220kV Naraina to Mayapuri and Providing 33kV source comprising 2x3Cx400mm2 XLPE cable from A-43 Mayapuri to Metal forging.**

| S.No. | Head | BRPL Scope | Contractor's Scope | Remarks |
|---|---|---|---|---|
| 7 | GPR/Scanning of the whole route (before execution of project and after completion of project) shall be done and the same shall be submitted to BRPL.<br>The report shall be submitted within 15 days after the issue of LOI<br>HDD route depth shall be decided after submission of report | X | √ | |
| 8 | • Drawing Submissions-before execution of project<br>• As built drawing submission- after completion of project | X | √ | NA |
| 9 | Engineering Approvals | √ | X | NA |
| 10 | Testing Equipments | X | √ | NA |
| 11 | Lighting Arrangement | X | √ | NA |
| 12 | Construction Power and Construction Water | X | √ | NA |
| 13 | Safety , Security and insurance of Manpower( Labour, Engineers, Supervisors etc) | X | √ | Labour should be provided with every safety gear like safety jacket, helmet etc. |
| 14 | Various Tools and Tackles related to Job | X | √ | NA |
| 15 | Transportation of Material and any other tender related work | X | √ | NA |
| 16 | Cleanliness around project site | X | √ | NA |
| 17 | Security and Safety of material until handing over the project to BRPL | X | √ | NA |
| 18 | Providing of Various Machines e.g Crane, Hydra, JCB, Hammer , Cutting Machine etc to complete the project | X | √ | NA |
| 19 | Providing of Trenchless Machine | X | √ | NA |
| 20 | Loading and Unloading of material at site including scrap returning to BRPL site | X | √ | NA |
| 21 | Electrical Inspector Clearance | X | √ | Statutory fees will be borne by BRPL |
| 22 | Providing of Continuous Steel Barricading with Mobile no of project supervisor, sufficient traffic marshal, becon light, Fluorescent tape, PPE etc. (Mobile no shall be clearly visible on the barricading) | X | √ | (Each plate- Height- 1.5 mtr and Length-1.5 Mtr minimum) |

**33kV source comprising 2x3Cx400mm2 XLPE cable from 220kV Naraina to Mayapuri and Providing 33kV source comprising 2x3Cx400mm2 XLPE cable from A-43 Mayapuri to Metal forging.**

| S.No. | Head | BRPL Scope | Contractor's Scope | Remarks |
|---|---|---|---|---|
| 23 | Permit to work requesting Agency in BRPL premises | X | √ | Permit Should be applied to Engineer In-charge prior to work through proper procedure |
| 24 | Permit to work issuing agency inside BRPL Premises | √ | X | NA |
| 25 | Temporary office and Material Store near work premises | X | √ | NA |
| 26 | Storage of all kind of Material required for project | X | √ | BRPL premises will not provide for any kind of material storage and issuance |
| 27 | 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 |
| 28 | Preparation, up-dation and submission of PERT chart fortnightly to track activities | X | √ | NA |
| 29 | 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 |
| 30 | 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 |
| 31 | Surface levelling, removal and disposal of excess earth (malwa) after back filling of trench. During execution excavated earth shall be covered with green mat to prevent dust pollution. Also regular Water Sprinkling is to be required at site. | X | √ | NA |
| 32 | Supply, installation, testing and commissioning of Active and Passive ball markers | X | √ | NA |
| 33 | Supply & installing of RCC cable route marker, RCC cable joint marker and RCC Coffin for joint. , RCC slab, warning tape etc. | X | √ | Shall be designed as per tender document |

**33kV source comprising 2x3Cx400mm2 XLPE cable from 220kV Naraina to Mayapuri and Providing 33kV source comprising 2x3Cx400mm2 XLPE cable from A-43 Mayapuri to Metal forging.**

| S.No. | Head | BRPL Scope | Contractor's Scope | Remarks |
|---|---|---|---|---|
| 34 | Cable Route Tracer and Marker-supply, testing and commissioning (as applicable) | X | √ | NA |
| 35 | Sheath Integrity test before Charging of 66kV Cable | X | √ | Mandatory |
| 36 | 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 | √ | |
| 37 | 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 |
| 38 | De-watering of pits | X | √ | Scope shall be covered as per execution team requirement. |
| 39 | Civil works | X | √ | Any kind of civil works related to the project |
| 40 | As built drawing | X | √ | Page size- A1, 4 sets (CES, TRL, P&C, with final bill) |
| 41 | Handling of non- standard drum length | X | √ | |
| 42 | Route survey, preparation of site plan and profile | X | √ | |
| 43 | Cross bonding design | X | √ | Based on offered cable design |
| 44 | ETC including supply of materials, design, consultancy etc of bridge/truss/structure for nallah crossing | X | √ | |
| 45 | SCADA | X | √ | Whole work if any |

**Special requirement**

**33kV source comprising 2x3Cx400mm2 XLPE cable from 220kV Naraina to Mayapuri and Providing 33kV source comprising 2x3Cx400mm2 XLPE cable from A-43 Mayapuri to Metal forging.**

1. All jointing Kit shall have “Mechanical Connector” and not “Crimping”.
2. All the joints shall be covered with RCC coffin. Coffin shall be filled with sand. Each coffin or nos. of coffin shall fully cover the joint. Drawing provided only for constructional purpose not showing complete length of coffin. Bidder has to consider coffin length or numbers such that the complete joint shall be covered. Covering of one cable joint by one coffin or by multiple pieces coffins shall be considered as one no coffin in BOQ.
3. Delivery of cable at site and all other associate equipments/accessories have to be aligned as per site requirement and progress.
4. All kind of structural steel shall be GI unless otherwise specified.
5. Make of all kind of materials shall be as per BRPL approved make list, no deviation shall be allowed from make list.
6. The 33kV 3Cx400 sqmm is required with OFC embedded inside (OFC cable is of 48 fibre with 36 single mode and 12 multi mode). For OFC cable details please refer attached specification. All cable joint/termination kits shall be with OFC kit
7. Depth of HDD shall be decided jointly after submission of GPR report
8. GIS kit shall be suitable for OFC embedded cable if required
9. Link cable for cross bonding shall be copper, 3.3KV, Size as Mentioned in BoQ

**3.00.00 PACKAGE**

Project: **33kV source comprising 2x3Cx400mm2 XLPE cable from 220kV Naraina to Mayapuri and Providing 33kV source comprising 2x3Cx400mm2 XLPE cable from A-43 Mayapuri to Metal forging.**

3.02.00 In-feed route map (attached below)

**4.00.00 TECHNICAL SPECIFICATION**

Please refer individual Technical Specification

**5.00.00 SCHEDULES**

**33kV source comprising 2x3Cx400mm2 XLPE cable from 220kV Naraina to Mayapuri and Providing 33kV source comprising 2x3Cx400mm2 XLPE cable from A-43 Mayapuri to Metal forging.**

## SCHEDULE -1
## TECHNICAL DEVIATION FROM THE SPECIFICATION

(This shall be part of Technical bid)

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

| Sl no | Specification cl no | Deviation | Proposal | Benefit to BRP |
|---|---|---|---|---|
| | | | | |

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

| Sl no | Items Description | Approved Make |
|---|---|---|
| 1 | 33kV outdoor Circuit Breaker | • ABB Ltd.<br>• Siemens Ltd.<br>• GE<br>• CGPISL |
| 2 | 33kV Isolator | • ABB LIMITED.<br>• SIEMENS LIMITED.<br>• CROMPTON GREAVES LIMITED. |
| 3 | 33kV Lightning arrester | • ALSTOM<br>• OBLUM ELECTRICAL INDUSTRIES PVT. LIMITED.<br>• LAMCO INDUSTRIES PVT. LIMITED.<br>• ABB LIMITED<br>• CROMPTON GREAVES LIMITED.<br>• ELECTROLYTE<br>• RAYCHEM |
| 4 | 33kV Control and Relay Panel | • ABB LIMITED.<br>• SCHNEIDER ELECTRIC LIMITED.<br>• SIEMENS LIMITED. |
| 5 | 33kV outdoor CT and PT | • CROMPTON GREAVES LIMITED<br>• KAPCO ELECTRIC PVT. LIMITED<br>• MEHRU ELECTRICAL & MECHANICAL ENGINEERS P LIMITED<br>• GE<br>• BHEL<br>• ABB Ltd. |
| 6 | 33 kV/66kV Jointing and Termination KIT | • Raychem<br>• 3M |
| 7 | HDPE Pipes (PN6, PE80) | • Flow well<br>• Tirupati<br>• Narendra Polyplast<br>• Flexi flow |

**33kV source comprising 2x3Cx400mm2 XLPE cable from 220kV Naraina to Mayapuri and Providing 33kV source comprising 2x3Cx400mm2 XLPE cable from A-43 Mayapuri to Metal forging.**

| | | |
|---|---|---|
| | | • Shivam Irrigation Works Pvt. Ltd. (Shivano)<br>• Safal Polymer pvt ltd<br>• Jindal Sanitations pvt ltd<br>• Rajshree Technoplast pvt ltd. |
| 8 | Chemical Earthing | • JMV<br>• Pragati<br>• True Power<br>• Genius Protection<br>• Axis Electrical component |
| 9 | 33Kv/66kV Jointing and Termination KIT | • Raychem<br>• 3M |
| 10 | LDR<br>(RLY,NUMERICAL, 220VDC, ,DISTANCE ,MICOMP543 | • Make- Schneider<br>•<br>• Model- Shall be specified separately<br>• (Bidders to take make and model details from BRPL before submission of price bid) |
| 11 | LDR | Not applicable |
| 12 | LDR for other projects | Not applicable |

BSES Rajdhani Power Ltd

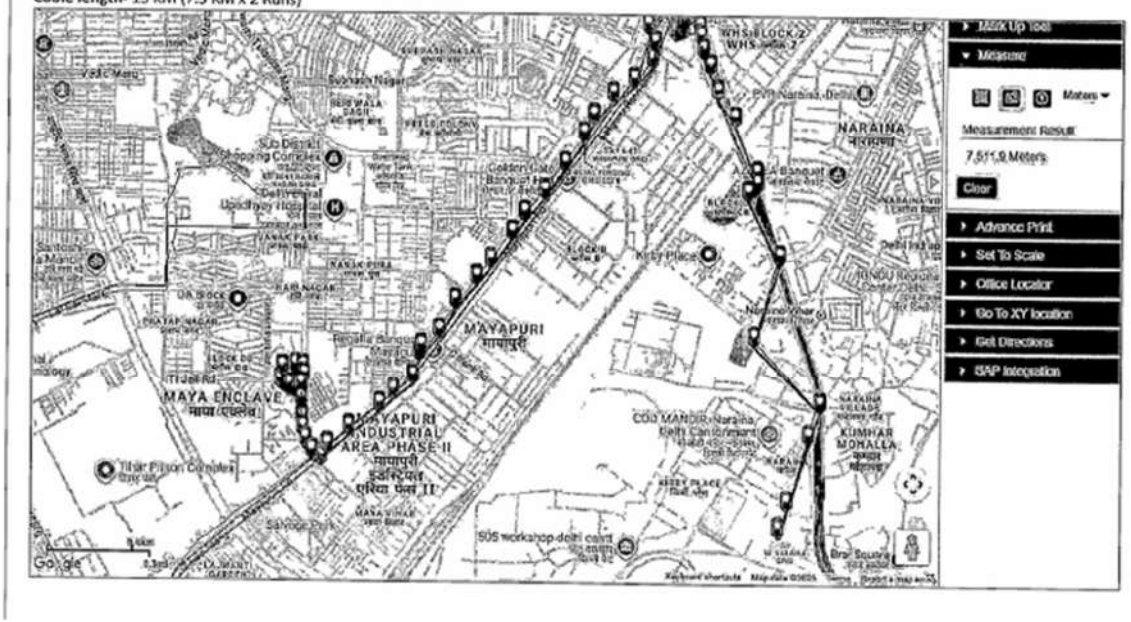
## Route Map, SLD and Layout

**Project: 33kV source comprising 2x3Cx400mm2 XLPE cable from 220kV Naraina to Mayapuri and Providing 33kV source comprising 2x3Cx400mm2 XLPE cable from A-43 Mayapuri to Metal forging.**

:

**ROUTE MAP:**

**1.** 2x3Cx400 sq.mm XLPE cable from 220kV DTL Naraina to 33kV Mayapuri,
**Route length-** 7.5 KM
**Cable length-** 15 KM (7.5 KM x 2 Runs)

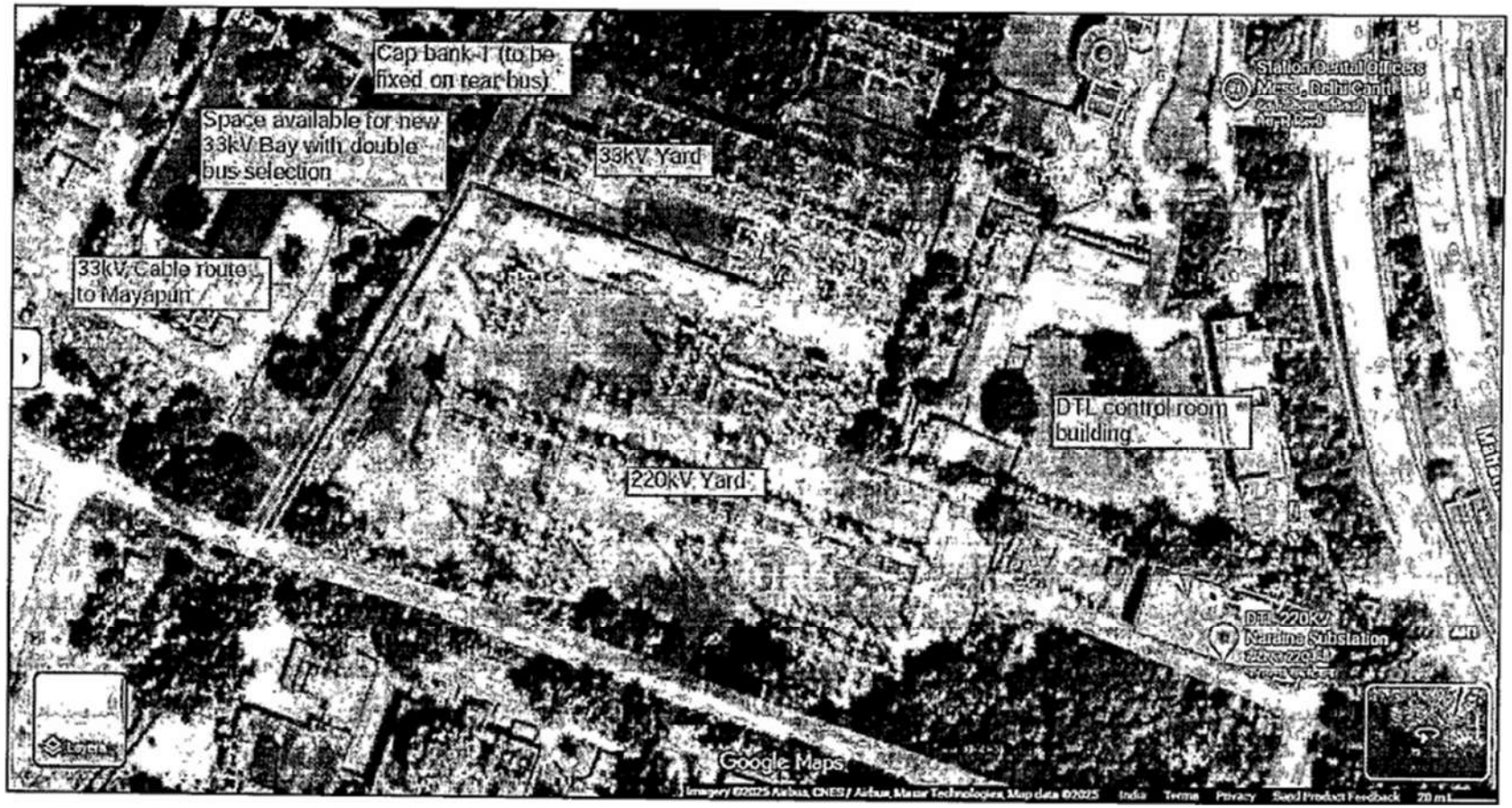


BSES Rajdhani Power Ltd

**33kV source comprising 2x3Cx400mm2 XLPE cable from 220kV Naraina to Mayapuri and Providing 33kV source comprising 2x3Cx400mm2 XLPE cable from A-43 Mayapuri to Metal forging.**

Date: 13.02.2020

## 220kV NARAINA GRID LAYOUT



BSES Rajdhani Power Ltd

# CONSOLIDATED TECHNICAL REQUIREMENT

# FOR

# SUPPLY, ERECTION, TESTING & COMMISSIONING

# OF

# 2 nos. 33 KV circuits from upcoming 220/33KV DTL Dev Nagar substation to DLF mall & A-4 Paschim Vihar substations each by loop in loop out existing 33KV circuit

| Date | Revision | Pages |
|---|---|---|
| 12.05.2026 | R0 | 11 |

**Index**


| S. No | Title | Page no |
|---|---|---|
| 1.00.00 | GLOSSARY LIST | 3 |

2 nos. 33 KV circuits from upcoming 220/33KV DTL Dev Nagar substation to DLF mall & A-4 Paschim Vihar substations each by loop in loop out existing 33KV circuit


| | | |
|---|---|---|
| **2.00.00** | **GENERAL DESIGN CRITERIA** | 4 |
| **3.00.00** | **PACKAGE** | 7 |
| 3.01.00 | **Project:**<br><br>2 nos. 33 KV circuits from upcoming 220/33KV DTL Dev Nag substation to DLF mall & A-4 Paschim Vihar substations each by lo in loop out existing 33KV circuit<br>. | |
| **4.00.00** | **TECHNICAL SPECIFICATION** | 7 |
| 1. | Laying of 66kV / 33kV / 11kV / 1.1 kV grade PVC / XLPE cables | |
| 2. | 33kV 3 Core cable (33kV 3CX400 sqmm cable) | |
| 3. | 33kV /11kV Jointing Kit | |
| 4. | 33kV /11kV Termination Kit | |
| 5 | 33kV and 66kV LA- not provided/not required | |
| 6 | ACSR Conductors- not provided/not required | |
| 7 | RFID Active and Passive Markers | |
| 8 | Chemical Earthing- not provided/not required | |
| 9 | GI and Earthing pipe, GI strip | |
| 10 | C wedge Connectors- not provided/not required | |
| 11 | PPE Items | |
| 12 | 1.1kV Power and Control cable- not provided/not required | |
| 13 | HDPE pipe | |
| 14 | Hardware RCC items & Steel items | |
| 15 | 48 Fibre OFC cable | |
| **5.00.00** | **SCHEDULES** | 8 |
| Schedule-I | Deviation from Specification | |
| Schedule-II | Make of Major items | |
| **6.00.00** | **Infeed route map, SLD and Layout** | 10 |


## 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 |

2 nos. 33 KV circuits from upcoming 220/33KV DTL Dev Nagar substation to DLF mall & A-4 Paschim Vihar substations each by loop in loop out existing 33KV circuit

| | | |
|---|---|---|
| 7 | kVA | Kilo Volt Amperes |
| 8 | O&M | Operation and Maintenance |
| 9 | LOA | Letter of Award |
| 10 | FO | Fiber Optic |
| 11 | MCD | Municipal Corporation of Delhi |
| 12 | DDA | Delhi Development Authority |
| 13 | PWD | Public Works Department |
| 14 | U/G | Underground |
| 15 | HT | High Tension |
| 16 | ACSR | Aluminum Conductor Steel Reinforced |
| 17 | BOQ | Bill of Quantity |
| 18 | GA | General Arrangement |
| 19 | RCC | Reinforced Cement Concrete |
| 20 | CPRI | Central Power Research Institute |
| 21 | ERDA | Electrical Research and Development Association |
| 22 | CRP | Control &Relay Panel |
| 23 | T&P | Tools & Plant |
| 24 | IR | Insulation Resistance |
| 25 | OFC | Optical Fiber Cable |
| 26 | GAIL | Gas Authority of India Limited |
| 27 | IGL | Indraprastha Gas Limited |
| 28 | IOCL | Indian Oil Corporation Limited |
| 29 | DMRC | Delhi Metro Rail Corporation |
| 30 | PPE | Personal Protective Equipment |
| 31 | FRLS | Fire Retardant Low Smoke |
| 32 | GI | Galvanized Iron |
| 33 | GPR | Ground Penetration Radar |
| 34 | P/L | Providing and laying |
| 35 | P/F | Providing and fixing |
| 36 | TAC | Tariff Advisory Committee |
| 37 | IS | Indian Standard |
| 38 | IEC | International Electro technical Commission |

## 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

2 nos. 33 KV circuits from upcoming 220/33KV DTL Dev Nagar substation to DLF mall & A-4 Paschim Vihar substations each by loop in loop out existing 33KV circuit

g) Seismic level Zone IV as per IS 1893

h) Pollution Level: Heavy/Dry

2.02.00 Code and Standards

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

2.03.00 Scope and Services

| S.No. | Head | BRPL Scope | Contractor's Scope | Remarks |
|---|---|---|---|---|
| 1 | Road Cutting Permission | X | √ | Statutory fees will be borne by BRPL |
| 2 | Supply, Laying, testing and commissioning of 66kV cable , Cable Jointing , Cable termination including laying , testing and commissioning of OFC joint and OFC termination. | X | X | NA |
| 3 | Supply, Laying, testing and commissioning of 33kV Bay consisting 33kV Circuit breaker, 33kV Isolator, 33kV CT & PT, 33kV LA, Bay marshalling kiosk etc. | X | √ | NA |
| 4 | Permissions from relevant External and Internal Agencies regarding Cable Laying and Commissioning (Traffic Police, GAIL, IGL, IOCL, PWD, CPWD, Pollution Control Board, DMRC, Electrical inspector etc.) | X | √ | Statutory fees will be borne by BRPL |
| 5 | Supply, Erection, Testing and commissioning of Equipments related to schemes like CT, CVT, CB, Isolator, LA etc. if any. | X | √ | As per specifications and Standards |
| 6 | Supply and Erection of structure for mounting equipments in the bay like structure for CT, CVT, CB, Isolator, LA etc. | X | √ | |
| 7 | GPR/Scanning of the whole route (before execution of project and after completion of project) shall be done and the same shall be submitted to BRPL.<br>The report shall be submitted within 15 days after the issue of LOI<br>HDD route depth shall be decided after submission of report | X | √ | |

2 nos. 33 KV circuits from upcoming 220/33KV DTL Dev Nagar substation to DLF mall & A-4 Paschim Vihar substations each by loop in loop out existing 33KV circuit

| S.No. | Head | BRPL Scope | Contractor's Scope | Remarks |
|---|---|---|---|---|
| 8 | • Drawing Submissions-before execution of project<br>• As built drawing submission- after completion of project | X | √ | NA |
| 9 | Engineering Approvals | √ | X | NA |
| 10 | Testing Equipments | X | √ | NA |
| 11 | Lighting Arrangement | X | √ | NA |
| 12 | Construction Power and Construction Water | X | √ | NA |
| 13 | Safety , Security and insurance of Manpower( Labour, Engineers, Supervisors etc) | X | √ | Labour should be provided with every safety gear like safety jacket, helmet etc. |
| 14 | Various Tools and Tackles related to Job | X | √ | NA |
| 15 | Transportation of Material and any other tender related work | X | √ | NA |
| 16 | Cleanliness around project site | X | √ | NA |
| 17 | Security and Safety of material until handing over the project to BRPL | X | √ | NA |
| 18 | Providing of Various Machines e.g Crane, Hydra, JCB, Hammer , Cutting Machine etc to complete the project | X | √ | NA |
| 19 | Providing of Trenchless Machine | X | √ | NA |
| 20 | Loading and Unloading of material at site including scrap returning to BRPL site | X | √ | NA |
| 21 | Electrical Inspector Clearance | X | √ | Statutory fees will be borne by BRPL |
| 22 | Providing of Continuous Steel Barricading with Mobile no of project supervisor, sufficient traffic marshal, becon light, Fluorescent tape, PPE etc. (Mobile no shall be clearly visible on the barricading) | X | √ | (Each plate- Height- 1.5 mtr and Length-1.5 Mtr minimum) |
| 23 | Permit to work requesting Agency in BRPL premises | X | √ | Permit Should be applied to Engineer In-charge prior to work through proper procedure |
| 24 | Permit to work issuing agency inside BRPL Premises | √ | X | NA |
| 25 | Temporary office and Material Store near work premises | X | √ | NA |

2 nos. 33 KV circuits from upcoming 220/33KV DTL Dev Nagar substation to DLF mall & A-4 Paschim Vihar substations each by loop in loop out existing 33KV circuit

| S.No. | Head | BRPL Scope | Contractor's Scope | Remarks |
|---|---|---|---|---|
| 26 | Storage of all kind of Material required for project | X | √ | BRPL premises will not provide for any kind of material storage and issuance |
| 27 | 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 |
| 28 | Preparation, up-dation and submission of PERT chart fortnightly to track activities | X | √ | NA |
| 29 | 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 |
| 30 | 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 |
| 31 | Surface levelling, removal and disposal of excess earth (malwa) after back filling of trench. During execution excavated earth shall be covered with green mat to prevent dust pollution. Also regular Water Sprinkling is to be required at site. | X | √ | NA |
| 32 | Supply, installation, testing and commissioning of Active and Passive ball markers | X | √ | NA |
| 33 | Supply & installing of RCC cable route marker, RCC cable joint marker and RCC Coffin for joint. , RCC slab, warning tape etc. | X | √ | Shall be designed as per tender document |
| 34 | Cable Route Tracer and Marker-supply, testing and commissioning (as applicable) | X | √ | NA |
| 35 | Sheath Integrity test before Charging of 66kV Cable | X | √ | Mandatory |
| 36 | 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 | √ | |

2 nos. 33 KV circuits from upcoming 220/33KV DTL Dev Nagar substation to DLF mall & A-4 Paschim Vihar substations each by loop in loop out existing 33KV circuit

| S.No. | Head | BRPL Scope | Contractor's Scope | Remarks |
|---|---|---|---|---|
| 37 | 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 |
| 38 | De-watering of pits | X | √ | Scope shall be covered as per execution team requirement. |
| 39 | Civil works | X | √ | Any kind of civil works related to the project |
| 40 | As built drawing | X | √ | Page size- A1, 4 sets (CES, TRL, P&C, with final bill) |
| 41 | Handling of non- standard drum length | X | √ | |
| 42 | Route survey, preparation of site plan and profile | X | √ | |
| 43 | Cross bonding design | X | √ | Based on offered cable design |
| 44 | ETC including supply of materials, design, consultancy etc of bridge/truss/structure for nallah crossing | X | √ | |
| 45 | SCADA | X | √ | Whole work if any |

**Special requirement**

1. All jointing Kit shall have “Mechanical Connector” and not “Crimping”.
2. All the joints shall be covered with RCC coffin. Coffin shall be filled with sand. Each coffin or nos. of coffin shall fully cover the joint. Drawing provided only for constructional purpose not showing complete length of coffin. Bidder has to consider coffin length or numbers such that the complete joint shall be covered. Covering of one cable joint by one coffin or by multiple pieces coffins shall be considered as one no coffin in BOQ.
3. Delivery of cable at site and all other associate equipments/accessories have to be aligned as per site requirement and progress.
4. All kind of structural steel shall be GI unless otherwise specified.

2 nos. 33 KV circuits from upcoming 220/33KV DTL Dev Nagar substation to DLF mall & A-4 Paschim Vihar substations each by loop in loop out existing 33KV circuit

5. Make of all kind of materials shall be as per BRPL approved make list, no deviation shall be allowed from make list.
6. The 33kV 3Cx400 sqmm is required with OFC embedded inside (OFC cable is of 48 fibre with 36 single mode and 12 multi mode). For OFC cable details please refer attached specification. All cable joint/termination kits shall be with OFC kit
7. Depth of HDD shall be decided jointly after submission of GPR report
8. GIS kit shall be suitable for OFC embedded cable if required
9. Link cable for cross bonding shall be copper, 3.3KV, Size as Mentioned in BoQ

**3.00.00 PACKAGE**

Project: 2 nos. 33 KV circuits from upcoming 220/33KV DTL Dev Nagar substation to DLF mall & A-4 Paschim Vihar substations each by loop in loop out existing 33KV circuit

3.02.00 In-feed route map (attached below)

**4.00.00 TECHNICAL SPECIFICATION**

Please refer individual Technical Specification

**5.00.00 SCHEDULES**

**SCHEDULE -1**
**TECHNICAL DEVIATION FROM THE SPECIFICATION**
(This shall be part of Technical bid)

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

| Sl no | Specification cl no | Deviation | Proposal | Benefit to BRP |
|---|---|---|---|---|
| | | | | |

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

2 nos. 33 KV circuits from upcoming 220/33KV DTL Dev Nagar substation to DLF mall & A-4 Paschim Vihar substations each by loop in loop out existing 33KV circuit

| Sl no | Items Description | Approved Make |
|---|---|---|
| 1 | 33kV outdoor Circuit Breaker | • ABB Ltd.<br>• Siemens Ltd.<br>• GE<br>• CGPISL |
| 2 | 33kV Isolator | • ABB LIMITED.<br>• SIEMENS LIMITED.<br>• CROMPTON GREAVES LIMITED. |
| 3 | 33kV Lightning arrester | • ALSTOM<br>• OBLUM ELECTRICAL INDUSTRIES PVT. LIMITED.<br>• LAMCO INDUSTRIES PVT. LIMITED.<br>• ABB LIMITED<br>• CROMPTON GREAVES LIMITED.<br>• ELECTROLYTE<br>• RAYCHEM |
| 4 | 33kV Control and Relay Panel | • ABB LIMITED.<br>• SCHNEIDER ELECTRIC LIMITED.<br>• SIEMENS LIMITED. |
| 5 | 33kV outdoor CT and PT | • CROMPTON GREAVES LIMITED<br>• KAPCO ELECTRIC PVT. LIMITED<br>• MEHRU ELECTRICAL & MECHANICAL ENGINEERS P LIMITED<br>• GE<br>• BHEL<br>• ABB Ltd. |
| 6 | 33 kV/66kV Jointing and Termination KIT | • Raychem<br>• 3M |
| 7 | HDPE Pipes (PN6, PE80) | • Flow well<br>• Tirupati<br>• Narendra Polyplast<br>• Flexi flow<br>• Shivam Irrigation Works Pvt. Ltd. (Shivano)<br>• Safal Polymer pvt ltd<br>• Jindal Sanitations pvt ltd<br>• Rajshree Technoplast pvt ltd. |
| 8 | Chemical Earthing | • JMV<br>• Pragati<br>• True Power<br>• Genius Protection<br>• Axis Electrical component |
| 9 | 33Kv/66kV Jointing and Termination KIT | • Raychem<br>• 3M |
| 10 | LDR (RLY,NUMERICAL, 220VDC, ,DISTANCE ,MICOMP543 | • Make- Schneider<br>•<br>• Model- Shall be specified separately<br>• (Bidders to take make and model details from BRPL before submission of price bid) |

2 nos. 33 KV circuits from upcoming 220/33KV DTL Dev Nagar substation to DLF mall & A-4 Paschim Vihar substations each by loop in loop out existing 33KV circuit

| | | |
|---|---|---|
| | | |
| 11 | LDR | Not applicable |
| 12 | LDR for other projects | Not applicable |

BSES Rajdhani Power Ltd

## Route Map, SLD and Layout

**Project: 33**2 nos. 33 KV circuits from upcoming 220/33KV DTL Dev Nagar substation to DLF mall & A-4 Paschim Vihar substations each by loop in loop out existing 33KV circuit.



BSES

# Technical Specification

## for

## 33 kV 3Cx400 sq mm cable

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

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

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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.<br>Part 3: Tests on bunched wires or cables. |
| IEC 60502 - 2 | Power cables for rated voltages from 6 kV (Um = 7.2 kV) up to 30 kV (Um = 36 kV) |
| IEC 60811<br>Pts 1 through 5 | Common test methods for insulating and sheathing materials of electric cables. |
| IEC 885<br>Pts 1 through 3 | Electric test methods for electric cables. |
| IEC 28 | International Standard of Resistance for Copper |
| IEC 332 | Test on Electric Cables under fire conditions |

## 2.0.0 Cable Construction Features

This Specification generally covers following types / sizes of XLPE H. T. Cables used in BSES network in Delhi Discom area, mostly under-ground (buried, with chances of flooding by water) or for laying on racks, in ducts, trenches, conduits, and so on.

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

Cable Code:

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

(N.A. - Not applicable for Specification)

| | | |
|---|---|---|
| - | (with Copper conductor) | (N.A.) |
| A | Aluminium conductor | |
| --- | --- | --- |
| 2X | XLPE insulation | |
| --- | --- | --- |
| W | Steel round Wire armour | (N.A.) |
| W W | Double steel round Wire armour | (N.A.) |
| Wa | Non-magnetic round Wire armour | |
| F | Steel formed wire (strip) armour | |
| FF | Double steel formed wire (strip) armour | (N.A.) |
| Fa | Non-magnetic formed wire (strip) armour | (N.A.) |
| - | (“un-armoured” or without armour) | (N.A.) |
| --- | --- | --- |
| Y | PVC outer sheath | |

| Sr. No. | Description | Conductor Material | Cable Code |
|---|---|---|---|
| 1. | 33 kV, 3C x 400 sq. mm. | Al | A 2X W Y |

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

| | | |
|---|---|---|
| 2.1.1 | **Conductor** | a) Electrolytic Grade Stranded Aluminium Conductor<br>b) Grade: H2 as per IS: 8130 / 1984 (For Al)<br>c) Stranded, compacted and circular in shape |

| | | |
|---|---|---|
| | | d) Class 2<br>e) "Longitudinal Water-Blocking Arrangement" (or water-tight construction or water barrier protection) shall be provided within the Conductor by water swelling yarns/tapes in the interstices of the conductor. The fiber/yarn shall turn into jelly/swell, when in contact with water making the conductor water tight as per IEC 60502-2<br>f) Semi-conducting water blocking tapes shall be applied over the conductor, suitable for continuous operating conductor temperature of 90 deg C.<br>g) All detailed constructional features shall be shown in the cross-sectional drawing. |
| | | |
| 2.1.2 | **Conductor Screen** | Extruded semi-conducting material.<br>(Also refer Cl. 2.1.3.)<br>(Tapes are not acceptable) |
| | | |
| 2.1.3 | **Insulation** | a) Extruded XLPE (Cross-Linked Poly-Ethylene) Insulation, with water-tree retardant (WTR) property<br>b) The required compound used shall be from BSES-approved sub-vendors and not from any other (refer Annexure – C).<br>c) Uniform thickness of insulation shall be within the permissible values as per IEC Standards; eccentricity check shall be carried out to ensure this.<br>d) Insulation Color : natural |
| | | |
| 2.1.4 | **Insulation Screen** | a) Freely-strippable semi-conducting screen, which should not require application of heat for its removal. |

| | | |
|---|---|---|
| | | (Refer Cl. 2.1.3.)<br>b) Text "Do not Heat - Freely Strippable" to be printed on insulation screen (at every 600 mm interval).<br>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.<br>d) Compound used shall be suitable for the operating temperature of the Cable and shall be compatible with the insulation used. |
| | | |
| 2.1.5 | **XLPE Process** | |
| 2.1.5.1 | 33 KV | Dry Cure and Dry Cooling process only. |
| 2.1.5.2 | Extrusion | The Conductor Screen, Insulation and Insulation Screen shall be extruded simultaneously, in a Single One-Time Process (i.e. as a triple-head extrusion) to ensure homogeneity of layers over the conductor, and absence of voids. |
| 2.1.5.3 | Make of Compounds for Insulation and Semi-conducting | Any deviation from Approved Makes mentioned in Annexure-C shall not be acceptable, unless the deviation has been specifically approved by BSES, prior to sourcing the compounds and taking up manufacturing of cable. |
| | | |
| 2.1.6 | **Water-Swellable Tape** | a) Semi-Conducting Water-Sellable Tape shall be provided, under the copper tape, on each core.<br>b) Nominal thickness : 0.3 mm<br>c) Weight: 118 gm / sq. m apprx.<br>d) Swell height: ≥ 12 mm in 1 min.<br>e) Compatible to strippable / non-strippable semi-con, over which it is applied. |
| | | |
| 2.1.7 | **Core Identification** | a) For 3-core cables, cores shall be identified by coloured strips (Red, Yellow, Blue), applied |

| | | |
|---|---|---|
| | | helically / longitudinally below the copper tape.<br>The coloured strips shall carry the name of manufacturer permanently printed at 1 meter intervals; this is to provide additional identification of manufacturer of the cable. |
| | | |
| 2.1.8 | **Copper Tape** | Copper Tape of minimum thickness 0.1 mm shall be applied helically over the layer formed after application of insulation screen, water-swellable tape and identification strip.<br>Zero Negative tolerance in thickness of copper tape |
| | | |
| 2.1.9 | **Filler** | a) All interstices, including center interstices shall be filled by PP filler.<br>b) PP Filler shall be non-hygroscopic, not having any effect on other compounds used, stable at cable temperatures, etc.<br>c) PVC filler is not acceptable.<br>d) Filler is not applicable for single-core cables. |
| | | |
| 2.1.10 | **Binder Tape** | As per manufacturer's standard |
| | | |
| 2.1.11 | **Inner Sheath** | Extruded Inner Sheath of Black PVC type ST-2<br>(IS 5831) |
| | | |
| 2.1.12 | **Armour** | a) For 3-core Cables :<br>Galvanised Steel round wire armour<br>b) Minimum area of coverage of armouring shall be 90 % (min.). At any time, the gap between any two adjacent armour wires shall not be more than the diameter of wire.<br>c) Zero negative tolerance is for :<br>• Diameter of armour wire |
| | | |

| | | |
|---|---|---|
| 2.1.13 | **Binder Tape** | Rubberised cotton tape |
| | | |
| 2.1.14 | **Outer Sheath** | a) Extruded outer sheath of PVC (ST-2 as per IS 5831) with termite-repellant and anti-rodent properties. Color - Blue<br>(Outer Sheath shall be FRLS-type, if chosen by purchaser.) |
| | | 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. |
| | | c) The Outer Sheath shall be embossed as well as laser printed with following minimum text at a interval of 1 mtr:<br>1. The voltage designation<br>2. Type of construction / cable code (e.g. A2XWY)<br>3. Manufacturer's Name and Trade-mark<br>4. Number of cores and nominal cross-sectional area of conductor<br>5. Name of buyer / purchaser,<br>6. Month & Year of manufacturing<br>7. IS reference, i.e. IS : 7098<br>8. Batch No. / Lot No.<br>(For traceability purpose, in case of any, in case of any manufacturing defect or otherwise arising in the cable in future.)<br>9. Purchase Order Number & date<br>10. Word ' FRLSH ', in case the cable is of FRLSH type.<br>Note:<br>o Drum no and Progressive length marking |

| | | |
|---|---|---|
| | | shall be provided by Laser printing at every meter with proper contrast in colouring<br>• Progressive (sequential) length marking of cable shall be at every meter, starting from zero for every drum |
| | | |
| | | |
| 2.1.15 | **Pulling-eye Assembly** and **Sealing-end Cap** (for Cables) | a) A cable pulling-eye assembly Drg. No. MISC/E/4-1131/1699 (see Annexure-F) shall be provided at the loose end (outer end) of the cable on each drum. Sealing material shall be filled in inside the spaces / gaps between the pulling-eye assembly and cable outer sheath. Further, a heat-shrinkable sleeve shall be provided over the pulling-eye assembly and outer sheath of cable.<br>b) Other end (inner end) of the cable shall be sealed as per MISC/E/4-1131/1698 (see Annexure-E.) One PVC cap with Polyurethane compound shall be provided as primary sealing and heat-shrink end-cap shall form a secondary sealing over the PVC cap. |
| | | |
| 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 | <u>1) To Qualify in Tender:</u><br>Cables must be of type tested quality. Type Test Reports shall be submitted for the type, size and voltage rating of cable offered in the bid.<br>For participation in the tender Type Test report shall be submitted from CPRI/ERDA only and shall not be more than 5 years old from the date of tender. If the report is more than 5 years and |

| | | |
|---|---|---|
| | | but less than 10 years old than bidder to submit undertaking that there is no design changes from the Type test conducted.<br>2) Type Test Required After Award of PO:<br>Type test on one cable drum of each type/rating from any lot shall be conducted at CPRI/ERDA on sample basis as per relevant IS/IEC. Sample shall be sealed by BSES during inspection of cable. This type test is applicable subject to BSES requirement and cost shall be borne by BSES. |
| | b) BSES QAP (Typical) | In general, all tests mentioned in the BSES QAP (Characteristics – Typical) mentioned in Annexure-G shall be included in the Routine Tests, Type Tests and Acceptance Tests stated above. |
| | c) Routine Tests | 1. Measurement of Electrical Resistance<br>2. HV Test with power frequency AC voltage<br>3. PD test<br>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).<br>5. Impulse voltage test of one drum<br>6. Armour coverage measurement<br>7. Physical test-Dimensions of each and every layer and components.<br>Test results from the above tests must appear in the documents forwarded by the vendor for Inspection call / waiver. |
| | d) Inspection | 1. The Buyer reserves the right to witness all tests specified on completed cables.<br>2. The Buyer reserves the right to inspect cables at Sellers works at any time prior to dispatch, to verify compliance with the specifications.<br>3. In-process (stage inspection) and final |

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

| | | |
|---|---|---|
| | | the Purchaser.<br>**Note :**<br>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. |
| | | |
| 5.0.0 | **Drawing, Data and Manuals** | a) Refer Annexure-A regarding Document Submission.<br>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. |
| | | |
| 5.0.1 | Documents to be submitted along with bid | The vendor shall submit :<br>a) Cross-sectional drawing<br>b) GTP (all data to appear)<br>c) Type Test certificates<br>d) Dimensional drawing for pulling eye<br>e) Fault Level Calculation for armour and copper tape screen<br>f) Complete Cable Catalogue and Manual<br>g) Armour Coverage Calculation |
| | | |
| 5.0.2 | Documents after award of contract | Within 15 days, the seller has to submit four sets of above-mentioned drawings, along with one soft copy |

| | | |
|---|---|---|
| | | for buyer's approval. |
| | | |
| 5.0.3 | Final As-Built Drawings | One soft copy of all documents, including type & routine test certificates. |
| | | |
| 6.0.0 | **Drum length & tolerance** | Cable length per drum |
| 6.0.1 | a) 33 KV, Three core | a) 300 mtr +/- 5 % |
| 6.0.2 | Overall tolerance | - 2 % for the total cable length for the entire order. |
| 6.0.3 | Short length of cables | Manufacturer shall take prior approval from Purchaser for any supply of short length cables.<br><br>For 33 KV, cables, minimum acceptable short length cable can be 150 meter In any case, manufacturer shall not put two cable pieces of different short lengths in same cable drum. |
| | | |
| 7.0.0 | **Packing, Shipping, Handling & Storage** | |
| | a) Packing | 1. Both the ends of the cables shall be properly sealed to prevent any deterioration of the cable, due to ingress of water, etc.<br>2. Cable inner end (starting end) shall project, outside the completely wound cable, by sufficient length enabling verify cable details, including the initial length marking.<br>3. 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.<br>4. Before putting on wooden planks, protective covers (thick plastic sheets, etc.) shall be secured over the wound cable, to avoid any abrasion by wooden planks, over the outer sheath of the cable. Alternatively PP sheets can |

| | | |
|---|---|---|
| | | be put as protective covers.<br>5. After providing the protective covers, the cable drums shall be finally closed by wooden planks (with saddles), without leaving any gaps between the planks; i.e. 100 % covering shall be ensured. |
| | b) Drum Identification Markings: | 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.<br>1. Drum identification number<br>2. Cable voltage grade<br>3. Cable code (e.g. A2XWY, etc.)<br>4. Number of cores and cross sectional area<br>5. Cable quantity, i.e. cable length (metre)<br>6. Purchase order number & date<br>7. SAP item code<br>8. Total weight of cable and drum (kg)<br>9. Manufacturer's Name<br>10. Buyer's name<br>11. Month & Year of Manufacturing<br>12. Direction of rotation of drum<br>13. Cable length final end-markings<br>(i.e., reading at the inner end and reading at the outer end, just before packing, shall be marked on the drum.) |
| | c) Shipping information | The seller shall give complete shipping information concerning the weight, size of each package |
| | d) Transit damage | The seller shall be responsible for any transit damage due to improper packing. |
| | e) Type of Drum | Non Returnable Steel drums, as per relevant IS / IEC.<br>(Steel drums shall be with M.S. spindle plate with nut-bolts) |
| | f) Cable Drum handling | The drums shall be with M.S. spindle plate (with nut- |

| | | |
|---|---|---|
| | | bolts) of adequate size to suit the spindle rods, normally required for handling the drums, according to expected weight of the cable drums. |
| | | |
| 8.0.0 | **Quality Assurance Plan (QAP)** | |
| 8.0.1 | Vendor's QAP | Manufacturer shall submit QAP in line with BSES QAP format (Annexure-G) for purchaser's approval. |
| 8.0.2 | Inspection Points | To be mutually identified and agreed upon in QAP. |
| | | |
| 9.0.0 | **Progress Reporting** | |
| 9.0.1 | Outline Document | To be submitted for purchaser's approval for outline of programmes for production, stage-inspection, testing, final inspection, packing, dispatch and documentation. |
| 9.0.2 | Detailed Progress Report | To be submitted to Purchaser once a month containing:<br>i) Progress on material procurement<br>ii) Progress on fabrication (as applicable)<br>iii) Progress on assembly (as applicable)<br>iv) Progress on internal stage-inspection<br>v) Reason for any delay in total programme<br>vi) Details of test failures, if any, during manufacturing stages.<br>vii) Progress on final box-up Constraints / Forward Path |
| | | |
| 10.0.0 | **Deviation** | a) Deviations from this specification are only acceptable, where the Seller has listed in his quotation the requirements he cannot, or does not, wish to comply with, and the Buyer has accepted, in writing, the deviations before the order is placed.<br>b) In the absence of any list of deviation, it will be |

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

**Annexure – A**

## Scope, Documentation and Delivery schedule

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

a. All documents/drawings shall be provided in soft copy only in returnable Pen drives
b. Language of the documents shall be English only.
c. Incomplete submission shall be liable for rejection.
d. Document check sheet compliance shall be the first sheet for each submission stage i.e. Technical bid, Drawing Approval, Pre Dispatch, Pre closure
e. No submission is acceptable without check list compliance.
f. Deficient/ improper document/ drawing submission shall be liable for rejection.
g. Order of documents shall be strictly as per the check list.
h. Any document not included in the below table but necessary for detailed engineering shall be deemed to be included in bidder's scope

| S.No. | Detail of Document | For Tender | For Approval/Review | Final Submission |
|---|---|---|---|---|
| 1 | Guaranteed Technical Particulars (GTP) | Required | Required | Required |
| 2 | Deviation Sheet, if any | Required | Required | Required |
| 3 | Detailed cross sectional drawing of cable and drum | Required | Required | Required |
| 4 | Installation Instructions | | Required | Required |
| 5 | Manual/Catalogue | Required | Required | Required |
| 6 | Cable de-rating factors | | Required | Required |
| 7 | Type test reports of offered type and rating of cable | Required | Required | Required |
| 8 | BIS certificate | Required | | |
| 9 | Make of Raw Materials | Required | Required | Required |
| 10 | Inspection and test reports, carried out in manufacturer's works | | | Required |
| 11 | Routine Test Certificates | | | Required |
| 12 | Test certificates of all the raw materials | | | Required |

**Annexure - B**

**GUARANTEED TECHNICAL PARTICULARS**
**(GTP)**

**Note:**

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

| Sr. No. | Description | Buyer's requirement | Unit | Seller's Data |
|---|---|---|---|---|
| | | | | |
| 1.0 | Purchase Req. No. | - | | |
| 2.0 | Guarantee Period (Min.) | 60 Months (from date of commissioning) / 66 Months (from date of receipt at purchaser's store) whichever is earlier | | |
| 3.0 | Applicable IS / IEC Standard followed by vendor | IS 7098 Part-2 / IEC 60502-2 | | |
| 4.0 | Make | - | | |
| 5.0 | **Type** | | | |
| | a) 33 kV, 3c x 400 sq. mm. | A2XWY | | |
| | | | | |
| 6.0 | **Voltage Grade** | | | |
| | a) 33 kV, 3c | 19 / 33 | kV | |
| | | | | |
| 7.0 | Maximum Conductor temperature | | | |
| A | Continuous | 90 | deg. C | |
| B | Short time | 250 | deg. C | |
| | | | | |
| 8.0 | **Conductor** | | | |
| | | | | |
| A | Material and Grade | As per Cl. 2.1.1 | | |
| B | Size | As shown under 5.0 above | | |
| C | Wires in each conductor | As per Table 2 of IS 8130 | Nos. | |
| D | Conductor Shape | As per Cl. 2.1.1 | | |

Technical Specification for 33 kV 3Cx400 sq mm cable

| | | | | |
|---|---|---|---|---|
| E | Dia. of wires in each conductor before compaction | Manufacturer Standard | mm | |
| F | Diameter over conductor | | mm | |
| G | Maximum Conductor resistance at 20 ° C | | | |
| | c) 33 kV, 3c x 400 sq. mm. | 0.0778 | ohm/km | |
| H | Longitudinal Water Blocking Arrangement within conductor | Is it provided and shown in the cross-sectional drawing? (Yes / No) | | |
| I | Semiconducting water blocking tape over conductor | Yes/No | | |
| J | Short circuit current-carrying capacity of conductor | | kA for 1 sec. | |
| | | | | |
| 9.0 | **Conductor Screen** (inner semi-con) | | | |
| A | Material & type | As per Cl. 2.1.2 | | |
| B | Thickness (min) | 0.50 | mm | |
| C | Diameter over conductor screen | | mm | |
| D | Make and grade of semi-conducting compound | | | |
| | | | | |
| 10.0 | **Insulation** | | | |
| A | Insulation Material | As per Cl. 2.1.3 | | |
| B | Nominal thickness | | | |
| | | | | |
| | 33 kV, 3c | 8.8 | mm | |
| | | | | |
| C | Minimum thickness | | | |
| | | | | |
| | b) 33 kV, 3c | 7.82 | mm | |
| | | | | |
| D | Diameter over Insulation (Approx.) | | mm | |
| E | Make and grade of Insulation compound | | | |
| F | Eccentricity | As per IEC standards | % | |
| G | Water-tree retardant property | Required | | |
| | | | | |
| 11A. | **Insulation Screen** (outer semi-con) | | | |
| a. | i) Thickness of freely strippable Semi conducting screen | 0.50 | mm | |
| | ii) Make and grade of semi-conducting compound | | | |
| | iii) Printing | As per Cl. No. 2.1.4 (Yes / No) | | |
| | iv) Ovality of the core | As per IEC Standards | % | |

Technical Specification for 33 kV 3Cx400 sq mm cable

| | | | | |
|---|---|---|---|---|
| b. | Diameter over Insulation Screen (apprx.) | | mm | |
| | | | | |
| 11B. | **Water-Swellable Tape** (if required by Purchaser) | | | |
| | a) Thickness<br>b) Weight<br>c) Swell height<br>d) Compatible to strippable / non-strippable semi-con, over which it is applied.<br>e) Make & Grade<br>f) Pre-slitted packed tapes from sub-vendors approved by BSES | a) 0.3 mm<br>b) 118 gm / sq. m<br>c) ≥ 12 mm in 1 min.<br>d) Yes / No<br><br>e) Pl. state<br>f) Yes / No | | |
| | | | | |
| 11C. | **Cable Core identification**<br><br>a) By coloured strips over cores applied helically / longitudinally<br>b) Manufacturer's name shall be permanently printed on the strips, at close intervals. | | | |
| | | | | |
| 11D. | **Copper Tape** | | | |
| | i) Dimensions | a) Thickness : 0.1 +/- 5 %<br>b) Width : 50 mm<br><br>C) Overlap: 20%<br><br>d) No Negative tolerance on thickness of copper tape | Mm | |
| | ii) Fault current-carrying capacity of copper tape | Manufacturer's Standard (Calculation sheet shall be attached) | … kA for … sec. | |
| | | | | |
| 11E. | Diameter over laid up core (apprx.) | | mm | |
| | | | | |
| 12.0 | **Filler** (Material and type) | As per Cl. 2.1.9 (Specify no. & size of filler at center & core interstices) | | |

| | | | | |
|---|---|---|---|---|
| | a) 33 kV, 3c x 400 sq. mm. | | | |
| | | | | |
| 12A.0 | **Binder Tape** | over laid-up cores | | |
| | | | | |
| 13.0 | **Inner Sheath** | | | |
| | | | | |
| A | Material and type | As per Cl. 2.1.11 | | |
| B | Minimum thickness | | | |
| | a) 33 kV, 3c x 400 sq. mm. | 0.7 | mm | |
| | | | | |
| C | Approx. dia. over inner sheath | | mm | |
| | | | | |
| 14.0 | **Armour** | | | |
| A | Material | | | |
| | 33 kV, 3Cx400 | G. I. Round wire | No. | |
| B | Armour – GI round wire<br>a) Minimum Dia of wire<br><br>b) Number of wire (min.) | a) 4.00 (zero negative tolerance)<br>b) As per manufacturer calulation | mm<br><br>nos. | |
| C | Approx. Equivalent Area | | sq. mm. | |
| D | Area covered by armour | Min. 90 %<br>Calculation shall be attached. | % | |
| E | Dia. over armour - apprx. | | Mm | |
| F | Fault current carrying capacity of armour | Calculation sheet shall be attached. | … kA for … sec. | |
| | | | | |
| 15.0 | **Outer Sheath** | | | |
| A | Material and type | As per Cl. 2.1.14 | | |
| B | Thickness (min.) | ** As per Table-5 of IS 7098 Part-2 | | |
| | a) 33 kV, 3c x 400 sq. mm. | ** | mm | |
| C | Color | Blue | | |
| D | Embossing (details as per Cl. 2.1.14) | Yes / No | | |
| E | FRLS Properties | As per customer's requirement | | |
| | | | | |
| 16.0 | Approx. overall diameter | | mm | |
| | | | | |
| 17.0 | Standard drum length with tolerance | | | |
| | a) 33 kV, 3c x 400 sq. mm. | 300 +/- 5% | meters | |
| | | | | |
| 17A | Overall order tolerance | - 2 % for the total | | |

| | | | | |
|---|---|---|---|---|
| | | cable length for the entire order. | | |
| | | | | |
| 18.0 | **Cable Drum** | | | |
| a. | Type of drum | Steel (Specify the relevant IS / IEC followed for drum design) | | |
| b. | Markings on the drum (as per Cl. 7.0.0) | On both faces | | |
| | | | | |
| 18A.0 | **Cross-Sectional Drawing** (ref. Cl. 5.0.0) | Is drawing submitted, showing every feature of constructions? (Yes / No) | | |
| | | | | |
| 19.0 | **a. Sealing-end Cap (provided at both ends)** | Yes/No Is manufacturer's / Sub-Vendor's drawing submitted? (Yes / No) | | |
| | **b. Cable pulling eye at one end and Sealing end cap at other end** | Yes/No Is manufacturer's / Sub-Vendor's drawing submitted? (Yes / No) | | |
| 20.0 | **Weights** | | | |
| | *a)* Net weight of cable (apprx.) | | kg / km | |
| | b) Weight of empty drum | 300 mtr | Kg | |
| | c) Weight of Cable with drum | 300 mtr | kg | |
| | d)Drum size | 300 mtr | mm | |
| | e)Drawing of Drum | Required | -- | |
| | | | | |
| 21.0 | Continuous current rating for standard I. S. condition laid Direct | | | |
| | a) In ground 30° C | | Amp | |
| | b) In duct 30° C | | Amp | |
| | c) In air 40° C | | Amp | |
| | | | | |
| 22.0 | (not used) | | | |
| | | | | |
| 23.0 | Electrical Parameters at Maximum Operating temperature: | | | |
| A | AC Resistance | | ohm / km | |
| B | Reactance at 50 c/s | | ohm / km | |
| C | Impedance | | ohm / km | |
| D | Zero sequence impedance | | ohm / km | |
| E | Positive sequence | | ohm / km | |

Technical Specification for 33 kV 3Cx400 sq mm cable

| | | | | |
|---|---|---|---|---|
| | impedance | | | |
| F | Negative sequence impedance | | ohm / km | |
| G | Capacitance | | micro-farad / km | |
| H | Conductance | | Amperes per volts | |
| I | Inductive susceptance | | mho | |
| J | Capacitive susceptance | | ohms | |
| | | | | |
| 24.0 | Recommended minimum bending radius | 15 x O. D. | mm | |
| | | | | |
| 25.0 | De-rating factor for following Ambient Temperatures : | Ground / Air | | |
| | a) At 30° C | | | |
| | b) At 35° C | | | |
| | c) At 40° C | | | |
| | d) At 45° C | | | |
| | e) At 50° C | | | |
| | | | | |
| 26.0 | Group factor for following numbers of cables laid : | Touching Trefoil | | |
| | a) 3 Nos. | | | |
| | b) 4 Nos. | | | |
| | c) 5 Nos. | | | |
| | d) 6 Nos. | | | |
| | | | | |
| 27.0 | Recommended pressure for laying cable using power winch | 30 N / mm2 | N / sq. mm. | |
| | | | | |
| 28.0 | Process of Cross-linking of Polyethylene | | | |
| | a) 33 kV, 3c x400 | Dry Cure and Dry Cooling process only | | |
| | | | | |
| 29.0 | **Type test** (TTR - Type Test Report) | Is copy of latest valid TTR for respective sizes enclosed? (Yes / No) | | |
| | | | | |
| 30.0 | **Quality Assurance Plan** (QAP) | Is QAP Format (Annexure-F), duly filled in and enclosed? (Yes / No) | | |
| | | | | |

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

**Annexure - C**

**List of Sub-Vendors**

**for critical items**

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

| Ser. No. | Raw Materials | | Name of the Suppliers |
|---|---|---|---|
| | | | |
| 1. | XLPE Compound | 1 | Dow Chemicals , U.S.A. |
| | | 2 | Borealis , Sweden |
| | | 3 | Hanwha , South Korea |
| | | | |
| 2. | Semi-Conducting Compound | 1 | Dow Chemicals, U.S.A. |
| | | 2 | Borealis , Sweden |
| | | 3 | Hanwha , South Korea |
| | | | |
| 3. | Conductor Water-Blocking tapes / yarn / powder | 1 | Lantor |
| | | 2 | Geca |
| | | 3 | Miracle |
| | | 4 | Scapa |
| | | 5 | Sneham International |
| | | | |
| 4. | Water-Swellable Tapes (Pre-slitted) | 1 | Lantor |
| | | 2 | Geca |
| | | 3 | Miracle |
| | | 4 | Scapa |
| | | 5 | Sneham International |
| | | | |
| 5. | Aluminium Rod | 1 | Bharat Aluminium Co. Ltd. (BALCO) |
| | | 2 | Hindustan Aluminium Co. Ltd. (HINDALCO) |
| | | 3 | National Aluminium Co. Ltd. (NALCO) |
| | | 4 | Vedanta (Sesa Sterlite) |
| | | | |

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

**Annexure - D**

**Service Conditions**

(Atmospheric / Soil conditions at Site)

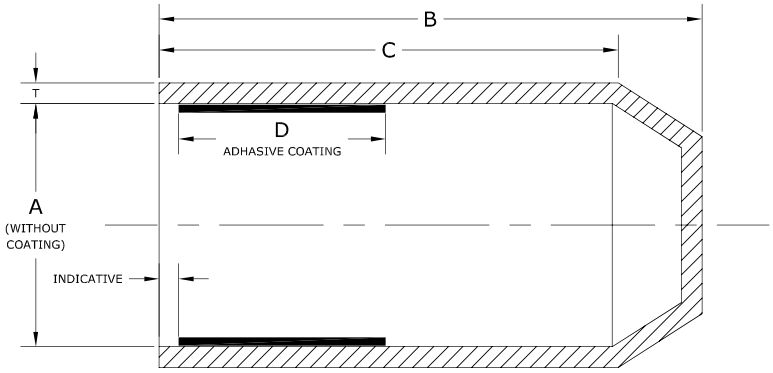
| A. | **Delhi** | |
|---|---|---|
| a) | Average grade atmospheric condition | Heavily polluted, dry |
| b) | Average grade soil condition | |
| c) | Maximum altitude above sea level | 1000 M |
| d) | Air temperature Ambient | i) Highest : 50 deg C<br>ii) Average : 40 deg C<br>iii) Minimum : 0 deg C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

# ANNEXURE E

## DIMENSIONS

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

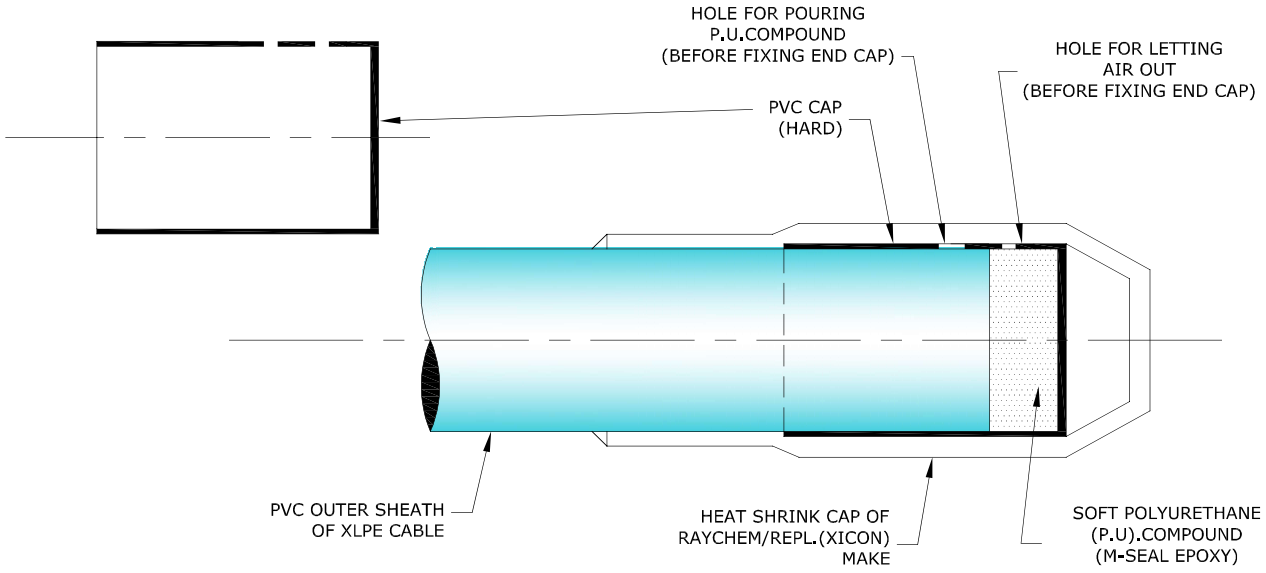
EXP - Expanded (as supplied), REC - Recovered freely, LC - Longitudinal Change,T - Wall Thickness, EC - End Cap




END CAP
(AS SUPPLIED)
SECTIONAL VIEW

## MATERIAL SPECIFICATIONS

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




END CAP
(AFTER HEAT SHRINKING OVER THE CABLE END)

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

BSES

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

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

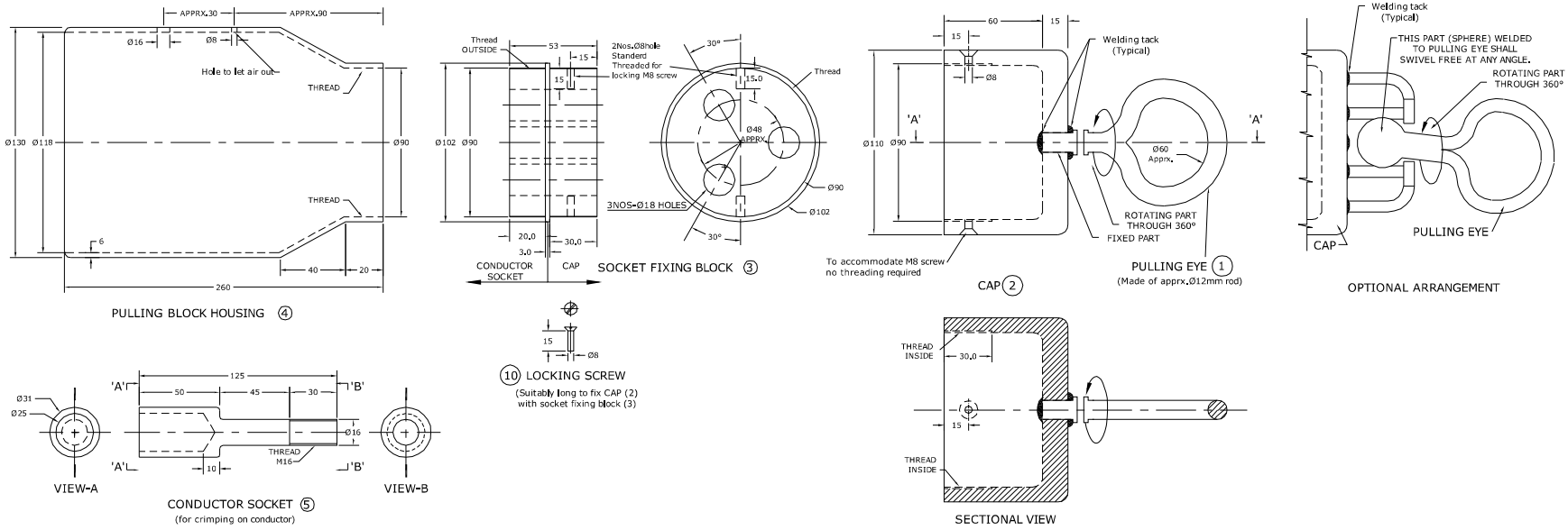
END SEALING CAP
(FOR XLPE CABLE)

DRAWN BY: | CHECKED BY: | APPROVED BY:

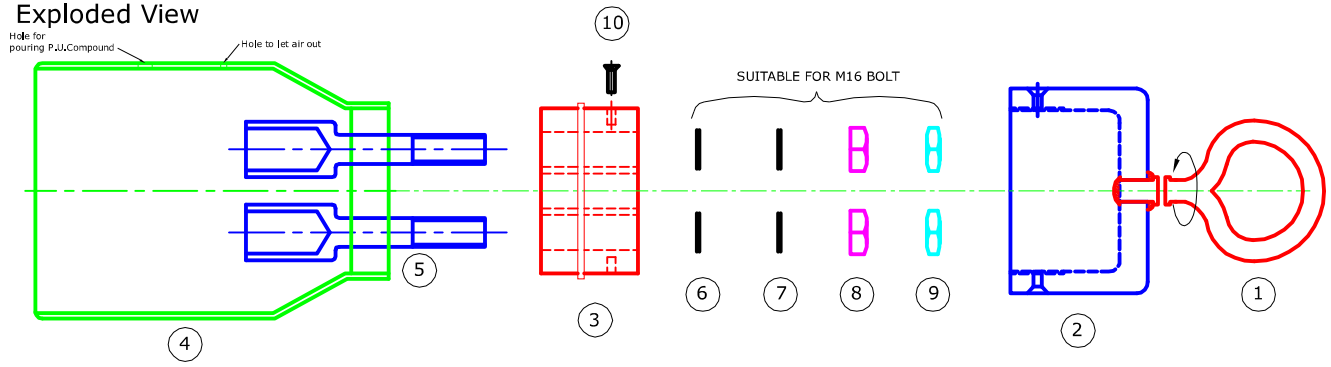
REVISIONS

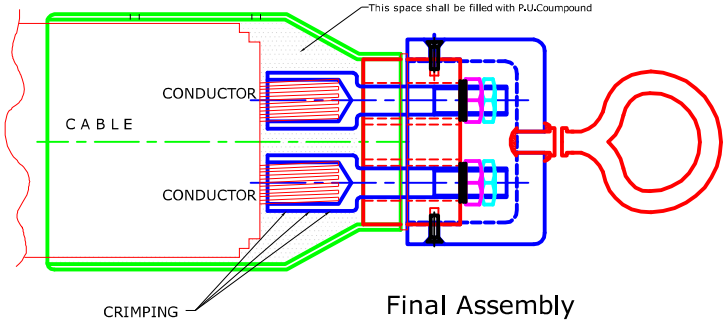
Addl V.P.

# ANNEXURE F




## Exploded View




Final Assembly

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.

| NO. | DISCRIPTION | QTY. | MATERIAL |
|---|---|---|---|
| 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 |

BSES

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

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

CABLE PULLING EYE ASSEMBLY (TYPICAL)

DRAWN BY: | CHECKED BY: | APPROVED BY:

REVISIONS

Addl V.P.

## ANNEXURE G: QUALITY ASSURANCE PLAN (QAP)

## FOR 33 & 66 kV EHV CABLES

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

BSES

# ANNEXURE G: QUALITY ASSURANCE PLAN (QAP)

## FOR 33 & 66 kV EHV CABLES

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

BSES

# ANNEXURE G: QUALITY ASSURANCE PLAN (QAP)

## FOR 33 & 66 kV EHV CABLES

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

## ANNEXURE G: QUALITY ASSURANCE PLAN (QAP)

### FOR 33 & 66 kV EHV CABLES

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

## ANNEXURE G: QUALITY ASSURANCE PLAN (QAP)

## FOR 33 & 66 kV EHV CABLES

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

# ANNEXURE G: QUALITY ASSURANCE PLAN (QAP)

## FOR 33 & 66 kV EHV CABLES

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

## ANNEXURE G: QUALITY ASSURANCE PLAN (QAP)

## FOR 33 & 66 kV EHV CABLES

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

## ANNEXURE G: QUALITY ASSURANCE PLAN (QAP)

### FOR 33 & 66 kV EHV CABLES

| S. NO. | COMPONENT & OPERATION | CHARACTERISTICS | CLASS | TYPE OF CHECK | QUANTUM OF CHECK | REFERENCE DOCUMENT | ACCEPTANCE NORMS | FORMAT OF RECORD | AGENCY | | | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | SV | MFR | BSES | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| | **Legend : SV : Sub-Vendor of Cable Manufacturer, MFR : Cable Manufacturer, MPS : Material Purchase Specification,** | | | | | | | | | | | |
| | **P : Perform, W : Witness, V : Verification** | | | | | | | | | | | |

**Note**

1. Checks specified above for Raw Material, In-Process and Final Inspection shall be as relevant to the specific cable construction.
2. Number of samples shall be selected as per Factory Standard/Agreement wherever 'sample' is indicated for extent of check.
3. Plant standards shall be followed in case Technical Data Sheet does not include requirements for characteristics to be checked.
4. BSES may witness Raw material and in process inspection in addition to Routine/Acceptance tests at any time/stage of manufacturing.
5. BSES's Inspector may randomly select a cable drum for type testing at vendor's works.
6. For each of the offered lot for inspection, BSES may randomly select one cable drum for testing of end cap "Destructive testing" to verify adhesion of sealing cap to cable outer sheath. .
7. All factory Type Tests shall be Witnessed by BSES

## Annexure- H

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

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

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

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

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

## Annexure-I: Deviation Format

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

# Technical Specification

For

## 66kV, 3CX300 sq mm Cable

## Specification no – BSES-TS-39-3C66-R0

| | | |
|---|---|---|
| Rev. | | 0 |
| No. of Pages | | 30 |
| Date | | 25 Apr 2022 |
| Prepared by | Gautam Deka/ Pronab Bairagi | 25/04/22 |
| | Abhishek Vashistha | |
| Reviewed by | Puneet Duggal | |
| | Amit Tomar | 25/04/22 |
| Approved by | Gaurav Sharma | |
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**1.0 Scope**

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

**2.0 Applicable Standard**

The equipment covered by this specification shall unless otherwise stated, be designed, manufactured and tested in accordance with latest revisions of relevant Indian Standards /IEC and shall conform to the regulations of local statutory authorities.

**Indian Standards**

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| IS 7098 (Part-3)-1993 | Specification for Cross-linked polyethylene insulated PVC sheathed Cables Part: 3 - For working voltages from 66 kV upto and including 220 kV |
| IS 8130-2013 | Specification for Conductor for insulated electric cables & flexible Cords |
| IS 5831-1984 | Specification for PVC insulation and sheath of electric Cables |
| IS : 3975 -1999 | Mild steel wires, formed wires and tapes for Armouring of Cables |
| IS: 5216 | Guide for Safety procedures and practices in electric works |
| IS: 10418-1982 | Specification for Drums for Electric Cables |

**IEC Standards**

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|---|---|
| IEC-60228: 2004 | Conductor for insulated cables |
| IEC-60502 (Part-2): 2005 | Power cables with extruded insulation and their accessories for rated voltages for rated voltages from 6 kV (Um = 7,2 kV) up to 30 kV (Um= 36 kV) |
| IEC-60811: 1990 | Test methods for insulations and sheaths of electric cables and cords. |
| IEC 60840: 2004 | Power cables with extruded insulation and their accessories. Test methods and requirements. |

**3.0 Cable Design Features**

| S.NO | DESRIPTION | REQUIREMENT |
|---|---|---|
| 3.1 | Manufacturing process | The cable shall be manufactured by "Triple head extrusion process". The conductor screen, Insulation & Insulation screen shall all be extruded in tandem to ensure homogeneity and reduction of voids, in the insulation and the screening system of the cable, whereby enhancing the life of the cable.<br><br>The cable shall be strictly manufactured by "**Dry Cured and Dry-Cooled**" process. |
| 3.2 | Conductor | Electrolytic grade Aluminum conductor shall H2 grade, class-2 in accordance with IS 8130/IEC 228. The shape of conductor shall |

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| | | be compacted, stranded, and circular. |
| 3.3 | Longitudinal water sealing of conductor | Shall be achieved by water swelling yarns/tapes in the interstices of the conductor. The fiber/yarn shall turn into jelly/swell, when in contact with water making the conductor water tight as per IEC 60502-2. |
| 3.4 | Semi conducting water blocking tape | Semi-conducting water blocking tapes shall be applied over the conductor, suitable for continuous operating conductor temperature of 90 deg C. |
| 3.5 | Conductor Screen | The conductor screen shall consist of extruded semi conducting compound which shall be fully compatible with the conductor and extruded insulation.<br><br>Outer surface of semiconductor screen shall be super smooth, and firmly bonded to the overlaying insulation.<br><br>The minimum Thickness of conductor screen shall be 0.8 mm |
| 3.6 | Insulation | The extruded XLPE insulation shall TREE-RETARDANT and of very high degree of purity with nominal thickness of 11 mm. The minimum thickness at any point shall not be less or more than 10% of the nominal value. Percentage eccentricity of the insulation shall not be more than 10%.<br><br>The insulation properties shall be stable under Thermal conditions arising out of continuous operation at conductor temperature of 90 deg C rising momentarily to 250 Deg C under short circuit conditions. |
| 3.7 | Insulation Screen | The insulation screen shall consist of extruded semi conducting Compound which shall be fully compatible with extruded insulation. Insulation screen shall be firmly bonded to the insulation<br><br>The minimum Thickness of insulation screen shall be 0.8 mm |
| 3.8 | Make of insulation and semi conducting screen | TR-XLPE of Dow/Borealis/Hanwa (any deviation to above shall not be acceptable unless and until it has been specially approved by BSES prior to sourcing of compounds and manufacturing of cable). |
| 3.9 | Core | The ovality of the core shall not be more than 5%. |
| 3.10 | Inner Longitudinal water sealing bedding | Semi-conducting water swellable tapes shall be applied over the extruded semi-conducting core screening.<br><br>Nominal Thickness of the Swellable Tape = 0.3 mm<br>The swell speed shall be greater 12mm/minute |
| 3.11 | Metallic Screen | The metallic Screen shall consist of a layer of annealed copper tape of minimum 0.1mm thickness and shall be applied over the semi-conducting water-swellable tape with minimum 10% overlap. |

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| 3.12 | Inner Longitudinal water sealing bedding (2nd layer) | Semi-conducting water swellable tapes shall be applied over the metallic screen again with a minimum overlap of 10 %.<br><br>Nominal Thickness of the Swellable Tape = 0.3 mm<br>The swell speed shall be greater 12mm/minute |
| 3.13 | Core Identification | Cores shall be identified by coloured strips (Red, Yellow, Blue), applied helically / longitudinally over the copper tape.<br><br>The coloured strips shall carry the name of manufacturer permanently printed at close intervals; this is to provide additional identification of manufacturer of the cable. |
| 3.14 | Optical Fiber Cable (as one of the fillers) | Clause deleted |
| 3.15 | Fillers | Fillers used in 3-Core cables shall be of PP Fillers grade along with sufficient water blocking yarn to make it water tight construction. |
| 3.16 | Laying up of Cores | All the 3-Core, along with Fillers, water-blocking yarn shall be laid in the suitable right hand lay. |
| 3.17 | Inner Sheath | Extruded PE ST7 confirming to requirements of IEC 60502-2 with latest amendments.<br><br>The minimum thickness of the inner sheath shall be 1.5 mm.<br><br>A non-conducting water blocking tape with approx. 10% overlap shall be applied over the inner sheath. |
| 3.18 | Armour | The armour shall be of galvanized round steel wires of minimum 4 mm dia complying the requirements of IS 3975:1999 with latest |

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| | | amendments.<br><br>The armour wires shall be applied with minimum 90% coverage.<br><br>The joints in the armour round wires shall be made by brazing or welding and the surface irregularities shall be removed. A joint in the wire shall be at least 300 mm from the nearest joint in any other armour wire in the completed cable.<br><br>The short circuit capacity of armour shall be 26.3 kA for 3 second. |
| 3.19 | Binder Tape | Rubberized cotton tape shall be wrapped with approx. 10% overlap over armour |
| 3.20 | Outer Sheath | The outer sheath shall consist of extruded black colored HDPE type ST 7 as per IEC 60502-2 with anti termite protection. The minimum thickness shall be 3 mm at any point.<br>Semi conductive layer either extruded or graphite coating shall be provided over the Outer Sheath. |
| 3.21 | Cable Rating | The cable size shall be suitable to carry rated load current on 66 kV continuously without exceeding the maximum conductor temperature of 90 deg. C. |
| 3.22 | Drum Length | 300m ± 5 % (short lengths not acceptable except the last length and minimum acceptable short length shall be 100m). The Overall tolerance - 2 % for the total cable length of the entire order<br><br>Manufacturer shall not be allowed to put two cable pieces of different short length in same cable drum. |
| 3.23 | Embossing | The extruded outer sheath shall be embossed with meter marking at interval of 1 metre. The ”A” end meter marking and “Z” end meter marking and the drum lengths shall be printed on the drum flange along with other markings. The outer sheath shall also be embossed with (min.)<br>a) Voltage designation<br>b) Type of construction/cable code (i.e. A2XCEW2Y)<br>c) Number of core and nominal cross sectional area.<br>d) Type of cable “Electric Cable”.<br>e) Manufacturers name & trade mark<br>f) Name of buyer (e.g. BSES)<br>g) Month & year of manufacturing<br>h) Batch no / Lot no. and Drum no<br>i) Sequential length marking.<br>j) Purchase Order Number and Date<br>Progressive length marking shall start from zero for each drum. |
| 3.24 | Joints and Terminations | The 3-Core Joints and Terminations to be used with the cable shall be with proven design and fully type tested as per IS 60840.<br><br>The Joints and Terminations match or exceed all technical performance parameters of the specified cable. |

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| | | The Joints and Terminations would be either Heat Shrink, Cold-Shrink or Pre-moulded type. |

**4.0 Quality Assurance**

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| 4.1 | Vendor quality plan | To be submitted for purchaser approval |
| 4.2 | Inspection points | To be mutually identified & agreed in quality plan |

**5.0 Inspection & testing**

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| 5.1 | Routine test | Each drum length of cable shall be subjected to the following tests |
| | | - Measurement of the electrical resistance of the conductor shall be carried out as per the provisions of Clause 10.5 of IEC 60840/ IS 10810 part 5 The measurement shall be made on the conductors of each cable length. The D.C. resistance of the conductor at 20 deg. C shall not exceed the maximum value specified in IEC 60228 / IS 8130. |
| | | - High voltage test as per clause 9.3 of IEC-60840/ 20.17 of IS 7098(Part-3):1993 |
| | | - Partial discharge test shall be carried out as per clause 9.2 of IEC Publication No.60840/20.10 of IS 7098(Part-3):1993 |
| | | - Measurement of capacitance as per clause 10.10 of IEC60840/ 20.18 of IS 7098(Part-3):1993 |
| | | Impulse voltage test of one drum and Physical dimension of each and every layer along with component. |
| | | - Test on the outer jacket as per Clause 3 of IEC 60229 |
| 5.2 | Type test | The cable and the associated accessories like Joints and Terminations of same voltage, design and number of cores shall be of Type Tested from CPRI/ERDA as per IEC 60840:2004 /IS7098-III:1993 with latest amendments .<br><br>Type test report (from CPRI/ERDA only) of not more than five (5) years old shall be submitted for the same type, size and voltage rating of the cable offered, along with the bid. |
| | | All type tests shall be carried out in accordance with Clause 12 of IEC-60840 / Clause 19.1 of IS 7098-III and in accordance with the sequence prescribed therein. |
| 5.3 | Short Circuit Test of Armour | The bidder shall furnish short circuit test report of 26.3 kA for 3 seconds from CPRI/ERDA for the same voltage, size and design |

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| | | of cable.<br>This short circuit test shall be preceded and succeeded by high voltage, Partial Discharge, Armour Resistance and Conductor Resistance Test. Test report shall not be more than five (5) years old. |
| 5.3 | Acceptance Tests | Shall be conducted as per IEC: 60840: 2004 / IS: 7098-III: 1993 and approved QA plan for each lot of cable. |
| 5.4 | Special Tests | The following tests shall be carried out as special tests |
| | | Conductor examination as per Clause 10.4 of IEC-60840 for conformance of IEC 60228/IS 8130. |
| | | Measurement of thickness of insulation as per Clause 10.6 of IEC- 60840 and Clause 8 of IEC-60811-1-1./ IS 10810 part 6 |
| | | Measurement of thickness and overall dimensions of sheath as per Clause 8 of IEC-60811-1-1./ IS 10810 part 6 |
| | | Measurement of dimensions of Armour as per Clause 10.7 of IEC-60840/IS 10810 part 36 |
| | | Measurement of external diameter as per Clause 8.3 of IEC-60811-1-1 |
| | | Hot set test for TR-XLPE insulation as per Clause 10.9 of IEC-60840/ IS 10810 Part 30 |
| | | Degree of cross-linking as per ASTM D 2768-01, void and contamination as per 20.1 of IS 7098 (Part-3), abrasion resistance as per BS 7835 |
| | | Sheath Integrity Test |
| 5.5 | Inspection | The buyer reserves the right to witness all tests specified on completed cables |
| | | The buyer reserves the right to inspect cables at the Seller's works at any time prior dispatch, to verify compliance with the specifications. |
| | | In-process and final inspection call intimation shall be given in advance to purchaser. |
| | | In the event of any discrepancy in the test reports i.e test reports not acceptable or any type tests(including special / assitional tests,if any) not carried out , same shall be carried out without any cost implication to BSES before dispatch of cable. |
| 5.6 | Test certificates | Three sets of complete test certificates shall be submitted along with the dispatch documents. |

**6.0 Drawings, Data & manuals**

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| 6.1 | To be submitted along with bid | The seller has to submit: |
| | | a) Cross sectional drawing of cable. |
| | | b) Completely filled GTP |
| | | c) Type test certificates |
| | | d) Dimensional drawing for pulling eye |
| | | e) Fault level calculation |
| | | f) Complete cable catalogue and manual |
| | | g) Armour Coverage Calculations |
| | | f) Short Circuit Test Certificate |
| 6.2 | | Within 15 days, the seller has to submit four sets of above mentioned drawings along with one soft copy for buyer's approval. |
| 6.3 | Submittals required prior to dispatch | a) Inspection and test reports, carried out in manufacturer's works (R) |
| | | b) Test certificates of all bought out items. |
| 6.4 | Drawing and document sizes | Standard size paper A0, A1, A2, A3, A4 |
| 6.5 | No. of drwgs. / Documents required at different stages | As per Annexure – A |

**7.0 Shipping, Handling and Site support**

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| 7.1 | Packing | The cable shall be wound on non-returnable steel drums of suitable size of minimum hub diameter of 15D (where D is the overall diameter of the cable) and packed conforming to international standards. The drum shall be fully enclosed by suitable packing preferably PP sheeting. Cable shall have sea worthy packing in case cables are dispatched by shipping lines. |
| 7.2 | Pulling eye & sealing of Cable ends | A cable pulling eye shall be provided at "Z" end of cable on each drum. Suitable fillings/putty shall be used for sealing gap between outer sheath and pulling eye. Heat shrinkable sleeves with the pulling eye shall also be provided. The pulling eye shall be directly connected to the conductor and be capable to withstand a tensile load of 30N / sq mm of conductor area. The "A" end of the cable shall be sealed with heat shrinkable cap. Drawing of the pulling eye shall be submitted along with the bid for review. |
| 7.3 | Drum identification label | The following information shall be marked on the drum: |
| | | - Drum identification number. |
| | | - Trade name or trade mark; if any |
| | | - Name of manufacturer and buyer |
| | | - Nominal sectional area of the conductor of the cable |
| | | - Type of cable and voltage for which it is suitable |

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| | | - Length of the cable on the drum, with “A” end and “Z” end markings. |
| | | - Purchase order number with SAP item code. |
| | | - Year and month of manufacturing. |
| | | - Direction of rotation of drum (an arrow) and |
| | | - Net weight of cable in drum and gross weight of cable with drum. |
| | | - Batch no or Lot no. |
| 7.4 | Shipping | The seller shall give complete shipping information concerning the gross weight, size of each packing. |
| 7.5 | Handling & Storage | Manufacturer instruction shall be followed. Detail handling & storage instruction sheet / manual needs to be furnished before commencement of supply. |
| 7.6 | Transit damage | The seller shall be responsible for any transit damage due to improper packing. |

**8.0 Progress reporting**

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| 8.1 | Outline Document | To be submitted for purchaser approval for outline of production, inspection, testing, packing, dispatch, documentation programmer. |
| 8.2 | Detailed Progress report | To be submitted to Purchaser once a month containing<br>a) Progress on material procurement.<br>b) Progress on internal stage inspection<br>c) Reason for any delay in total program<br>d) Details of test failures if any in manufacturing stages<br>e) Progress on final box up.<br>f) Constraints / forward path |

**9.0 Deviations**

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| 9.0 | Deviation from the Specification. | Deviations from this Specification shall be stated in writing with the tender by reference to the Specification clause/GTP/Drawing and a description of the alternative offer. In absence of such a statement, it will be assumed by the Buyer that the Seller complies fully with this specification. |

<u>Type Test Required After Award of PO:</u>

Type test on one cable drum of each type/rating from any lot shall be conducted at CPRI/ERDA on sample basis as per relevant IS/IEC. Sample shall be sealed by BSES during inspection of cable. This type test is applicable subject to BSES requirement and cost shall be borne by BSES

**Annexure – A**

## Scope, Documentation and Delivery schedule

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

a. All documents/drawings shall be provided in soft copy only in returnable Pen drives
b. Language of the documents shall be English only.
c. Incomplete submission shall be liable for rejection.
d. Document check sheet compliance shall be the first sheet for each submission stage i.e. Technical bid, Drawing Approval, Pre Dispatch, Pre closure
e. No submission is acceptable without check list compliance.
f. Deficient/ improper document/ drawing submission shall be liable for rejection.
g. Order of documents shall be strictly as per the check list.
h. Any document not included in the below table but necessary for detailed engineering shall be deemed to be included in bidder's scope

| S.No. | Detail of Document | For Tender | For Approval/Review | Final Submission |
|---|---|---|---|---|
| 1 | Guaranteed Technical Particulars (GTP) | Required | Required | Required |
| 2 | Deviation Sheet, if any | Required | Required | Required |
| 3 | Detailed cross sectional drawing of cable and drum | Required | Required | Required |
| 4 | Installation Instructions | | Required | Required |
| 5 | Manual/Catalogue | Required | Required | Required |
| 6 | Cable de-rating factors | | Required | Required |
| 7 | Type test reports of offered type and rating of cable | Required | Required | Required |
| 8 | BIS certificate | Required | | |
| 9 | Make of Raw Materials | Required | Required | Required |
| 10 | Inspection and test reports, carried out in manufacturer's works | | | Required |
| 11 | Routine Test Certificates | | | Required |
| 12 | Test certificates of all the raw materials | | | Required |

**Annexure – B: Service Conditions**

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| 1.0.0 | Delhi Atmospheric conditions | |
| a) | Average grade atmosphere : | Heavily polluted, dry |
| b) | Maximum altitude above sea Level | 1000 M |
| c) | Ambient Air temperature | Highest 50 deg C, Average 40 deg C |
| d) | Minimum ambient air Temperature | Deg C |
| e) | Relative Humidity | 90 % Max |
| f) | Thermal Resistivity of Soil | 150 Deg.C cm/W |
| g) | Seismic Zone | 4 |
| h) | Rainfall | 750 mm concentrated in four months |

**Annexure – C: Guaranteed Technical Particulars (Data by Supplier)**

| Sr. | Description | Unit | Data specified by the purchaser | Data to be filled by the manufacturer |
|---|---|---|---|---|
| 1 | Name of manufacturer | | | |
| 2 | Country of manufacturer | | | |
| 3 | Type of cable | | | |
| 4 | Standard according to which cable is manufactured | | | |
| 5 | Rated voltage | kV | 38/66 | |
| 6 | Highest system voltage | kV | 72.5 | |
| 7 | System frequency | Hz | 50 | |
| 8 | No of phases per circuit | Nos | 3 | |
| 9 | System earthing | | Solidly Grounded | |
| 10 | Rated short time current of Conductor | kA | | |
| 11 | Rated short time current of Armour | kA | 26.3 for 3 sec | |
| 12 | Rated short time current of metal screen | kA | | |
| 13 | Rated short time current of armour and screen | kA | | |
| 14 | Duration of short circuit current | Sec | 1 | |
| 15 | Impulse withstand voltage 1.2/50 micro sec wave | kVp | 325 | |
| 16 | Power frequency withstand Voltage | kV(rms) | 95 for 30 minutes | |
| 17 | Conductor | | | |
| a | Nominal cross sectional area | sqmm | 300 | |
| b | Type class of conductor. | | Compacted Stranded Circular | |
| C | Material of conductor | | Aluminum | |
| D | Flexibility class of conductor | | Class -2 | |
| E | Minimum numbers of strands | Nos | | |
| F | Diameter of strands before compaction. (nominal / Minimum) | Mm / mm | | |
| G | Material of longitudinal water sealing filling of conductor | | | |
| 18 | Details of semi conducting tape over the conductor | | | |
| 19 | Conductor Screen | | | |
| a | Material and type | | | |
| b | Minimum thickness | mm | 0.8 | |
| | Make and grade of semi conducting compound. | | | |
| 20 | Insulation | | | |

| | | | | |
|---|---|---|---|---|
| | Material of Insulation | | TR-XLPE | |
| | Nominal thickness | Mm | 11 | |
| | Minimum thickness | | 9.9 | |
| | Make and grade of insulation Compound | | | |
| | Maximum dielectric stress at the conductor surface | kV/mm | | |
| 21 | Insulation screen | | | |
| a | Material and type | | | |
| b | Minimum thickness | mm | 0.8 | |
| c | Make and grade of semi conducting compound. | | | |
| 22 | Inner water swellable semi conducting tape | | | |
| a | Nominal thickness | mm | 0.3 | |
| b | Minimum swell height in one minute. | mm | 12 mm in one Minute | |
| c | Overlap | % | 10 min | |
| 23 | Min thickness of copper tape | mm | 0.1 | |
| a | width of copper tape | mm | | |
| b | Overlap of copper tape | % | 10 min | |
| 24 | outer water swellable semiconducting tape | | | |
| a | Nominal thickness | mm | 0.3 | |
| b | Minimum swell height in one minute. | mm | 12 mm in one Minute | |
| c | Overlap | % | 10 min | |
| 25 | Nominal diameter over Laying up | mm | | |
| 26 a | Removed | Yes/No<br><br>No.<br><br>No. | | |
| 26 b | No. & Material of balance fillers | No./material | / PE ST 7 | |
| 27 | No. of water blocking yarns and denier | No./material | | |
| 28 | Material of the inner sheath | | PE ST 7 | |
| 29 | Method of Extrusion | mm | Sleeve/Tube | |
| 30 | Minimum thickness of inner sheath | mm | 1.5 | |
| 31 | Nominal diameter over inner Sheath | mm | | |
| 32 | Non conducting water blocking tape over inner sheath | | | |

| | | | | |
|---|---|---|---|---|
| a | Nominal thickness | mm | 0.3 | |
| b | Overlap | % | 10 min | |
| 33 | Armour | | | |
| | Nominal Diameter | mm | 4 | |
| | No. of wires | | | |
| | Armour coverage | | | |
| | Area of Armour | | | |
| | Short circuit capacity of Armour | kA/3 sec | 26.3 | |
| | Binder tape over Armour | | RC tape | |
| 34 | Outer jacket | | | |
| | Material and type | | HDPE type ST 7 | |
| | Minimum thickness | mm | 3 | |
| | Colour | | Black | |
| 35 | Semiconducting coating outer jacket | Extruded/Graphite coating | | |
| 36 | AC test voltage at works for insulation. | kV(rms) | 95 | |
| 37 | DC test voltage for outer jacket | kV(DC) | 25 | |
| 38 | Overall dia of completed single core cable | mm | | |
| 39 | Weight per metre of complete Cable | kg/m | | |
| 40 | Short circuit capacities with maximum conductor temperature of 250Deg C : (conductor temperature of 90 Deg C at the commencement of short circuit)<br>0.5 second duration<br>1 second duration<br>2 second duration<br>3 second duration | kA | | |
| 41 | Minimum radius of bend round:<br>which cable can be laid<br>a) Direct burial in ground<br>b) In ducts | mm | | |
| 42 | Maximum D.C .resistance of: conductor per KM at 20 deg. C | Ohm/km | 0.100 | |
| 43 | Maximum AC resistance of: conductor per KM at 90 deg. C | Ohm | | |
| 44 | Equivalent star reactance per KM:<br>of 3 phase circuit at 50 Hz | Ohm | | |
| | Maximum electrostatic capacitance :<br>Per KM of cable | pf | | |
| 45 | Maximum continuous current carrying : | Amp | | |

| | | | | |
|---|---|---|---|---|
| | Capacity per circuit when laid in ground as per the following parameters<br>-Maximum continuous conductor temperature of 90Deg C<br>-Maximum conductor temperature during short circuit of 250 Deg C<br>-Ground temperature of 30 Deg C<br>-Soil resistivity of 150 DegCcm/<br>Watt<br>-Depth of laying of 150cm | | | |
| 46 | Maximum continuous current carrying :<br>Capacity per cable when laid in air with ambient temperature of<br>40DegC and other parameters as per Sl no 49 | Amp | | |
| 47 | Rating factors for ambient air temperature attached(Yes/No) | | | |
| 48 | Rating factors for ground temperature attached(Yes/No) | | | |
| 49 | Rating factors for phase spacing in flat formation attached(Yes/No) | | | |
| 50 | Rating factors for grouping of cable laid in ground in horizontal<br>formation attached(Yes/No) | | | |
| 51 | Rating factors for grouping of cable laid in ground in tri-foil touching formation attached(Yes/No) | | | |
| 52 | Rating factors for thermal resistivity of soil attached(Yes/No) | | | |
| 53 | Rating factors for depth of laying attached(Yes/No) | | | |
| 54 | Max. power factor of charging KVA of :<br>cable when laid direct in the ground at normal voltage frequency at conductor temperature at 90Deg .C | | | |
| 55 | Max. dielectric power loss of cable per : | Watt/km | | |

| | | | | |
|---|---|---|---|---|
| | KM of 3 phase circuit laid direct in ground at normal voltage, frequency and maximum conductor temperature of 90 Deg C | | | |
| 56 | Impedance per KM of 3 phase circuit : at 50 C/s and maximum conductor temperature. a) Positive and negative sequence b) Zero sequence | Ohm | | |
| 57 | Standard drum length of cable | Metres | 300 +/- 5% (short lengths not acceptable except the last length | |
| 58 | The overall quantity tolerance | -2 % | | |
| 59 | Cable to be wound on non returnable steel drum. | Yes / no | Yes | |
| 60 | Normal delivery length | Metres | | |
| 61 | Cable pulling Eye to be provided at “Z” end | | | |
| 62 | Tensile load withstand capacity for pulling eye | | 30 N / sqmm | |
| 63 | Approximate shipping weight for the normal deliver length with the drum size (flange dia. in mm and width in mm): | kg | | |
| 64 | Drum size ( Flange dia X flange width X hub dia) | | | |
| 65 | Embossing details on outer jacket | | | |
| 66 | Sequential marking at every meter. | | Provided | |
| 67 | Process of cross linking of polyethylene. | | | |
| 68 | Removed | | | |

**Annexure -** D

**List of Sub-Vendors**

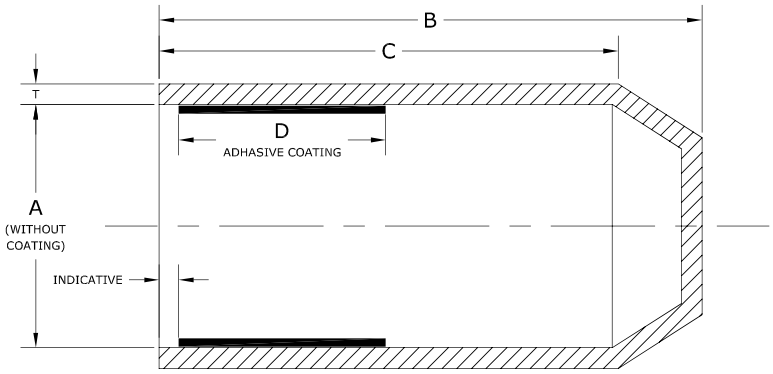
| Ser. No. | Raw Materials | | Name of the Suppliers |
|---|---|---|---|
| | | | |
| 1. | XLPE Compound | 1 | Dow Chemicals , U.S.A. |
| | | 2 | Borealis , Sweden |
| | | 3 | Hanwha , South Korea |
| | | | |
| 2. | Semi-Conducting Compound | 1 | Dow Chemicals, U.S.A. |
| | | 2 | Borealis , Sweden |
| | | 3 | Hanwha , South Korea |
| | | | |
| 3. | Conductor Water-Blocking tapes / yarn / powder | 1 | Lantor |
| | | 2 | Geca |
| | | 3 | Miracle |
| | | 4 | Scapa |
| | | 5 | Sneham International |
| | | | |
| 4. | Water-Swellable Tapes (Pre-slitted) | 1 | Lantor |
| | | 2 | Geca |
| | | 3 | Miracle |
| | | 4 | Scapa |
| | | 5 | Sneham International |
| | | | |
| 5. | Aluminium Rod | 1 | Bharat Aluminium Co. Ltd. (BALCO) |
| | | 2 | Hindustan Aluminium Co. Ltd. (HINDALCO) |
| | | 3 | National Aluminium Co. Ltd. (NALCO) |
| | | 4 | Vedanta (Sesa Sterlite) |
| | | | |
| 6. | Copper Tape | 1 | Aggarwal Metal |
| | | 2 | Indian Smelting |
| | | 3 | Luvata Swedan |

| | | | |
|---|---|---|---|
| | | 4 | Outokumpu Copper Strip AB, Swedan |
| | | | |
| 7 | Galvanized Steel Wires / Strips | 1 | Tata |
| | | 2 | Balaji |
| | | 3 | Systematic |
| | | 4 | Mica Wires Pvt Ltd. |
| | | 5 | Bansal Industries |
| | | | |
| 8 | PVC Compound | 1 | Kalpana |
| | | 2 | Universal |
| | | 3 | SCJ Plastic |
| | | 4 | Sriram Polytech |
| | | 5 | Shri Ram Vinyl, Kota |
| | | | |
| 9 | P. P. Fillers | 1 | Vijoy Polymers |
| | | 2 | Yash Polymers |
| | | 3 | AVSL Industries |
| | | | |
| 10 | Core Identification Tape | 1 | AVSL Industries |
| | | 2 | Yash Polymer |
| | | 3 | Vijoy Polymers |
| | | | |
| 11 | PE Compound | 1 | Borealis |
| | | 2 | Shakun |
| | | 3 | Kalpana |

## 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 |

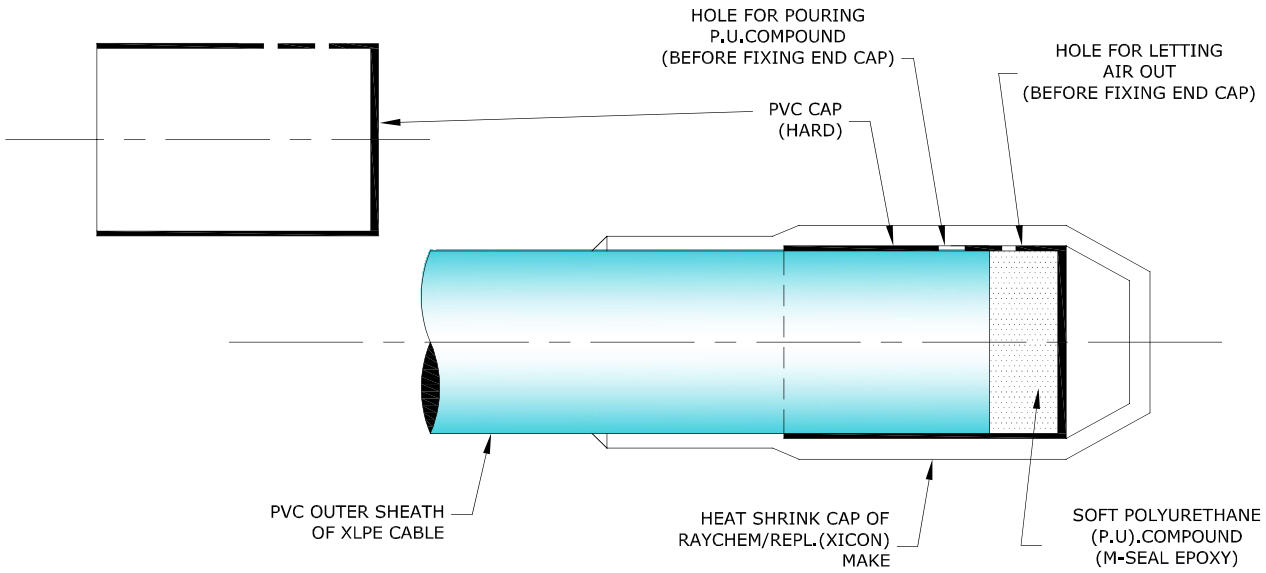
EXP - Expanded (as supplied), REC - Recovered freely, LC - Longitudinal Change,T - Wall Thickness, EC - End Cap




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 |
| 6 | **Thermal Test** | | | |
| **B** | Thermal Ageing (120°C for 500 hrs) | | | |
| 1 | Tensile Strength | Type | 8 N/sqmm (min) | ASTM D-412 / ISO 37 |
| 2 | Ultimate Elongation | Type | 200% (min) | ASTM D-412 / ISO 37 |
| **C** | **Electrical Properties** | | | |
| 1 | Volume Resistivity | Type | $10^{12}$ ohm-cm. (min) | ASTM D-257 / IEC 93 |
| 2 | Dielectrical Strength | Type | 10 kV/mm. (min) | ASTM D-149 / IEC 243 |
| 3 | Dielectric Constant | Type | 5 (max) | ASTM D-150 / IEC 250 |




END CAP
(AFTER HEAT SHRINKING OVER THE CABLE END)

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

BSES

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

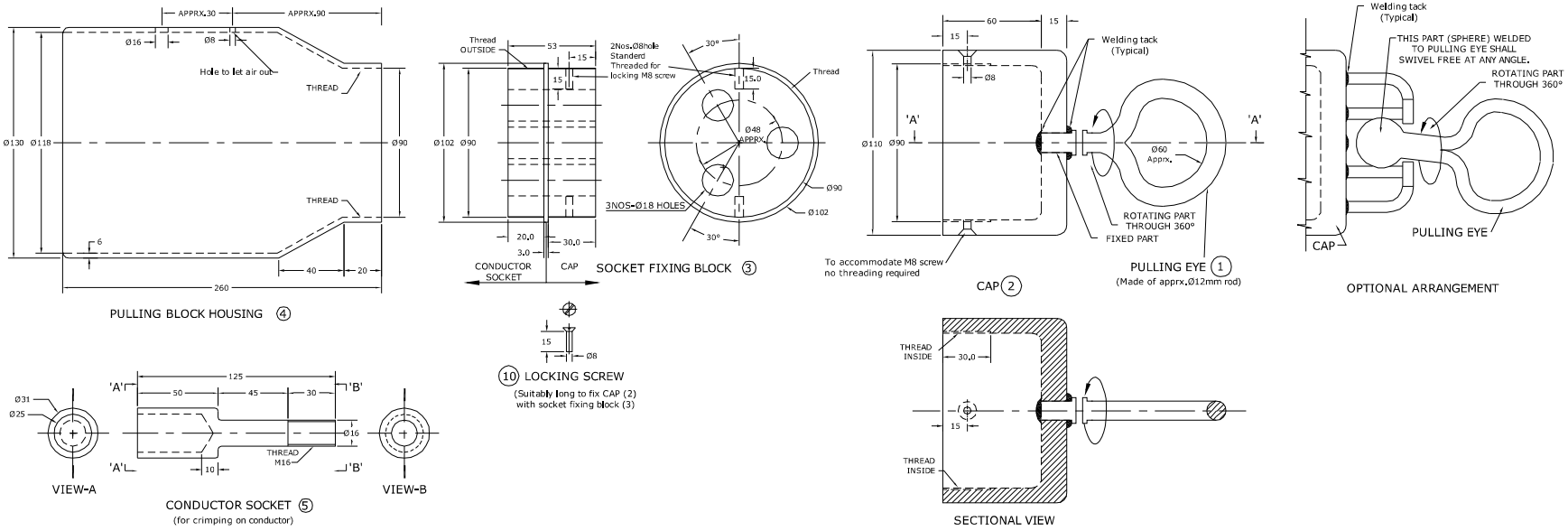
SCALE :NOT TO SCALE | DATE: 09-05-2011

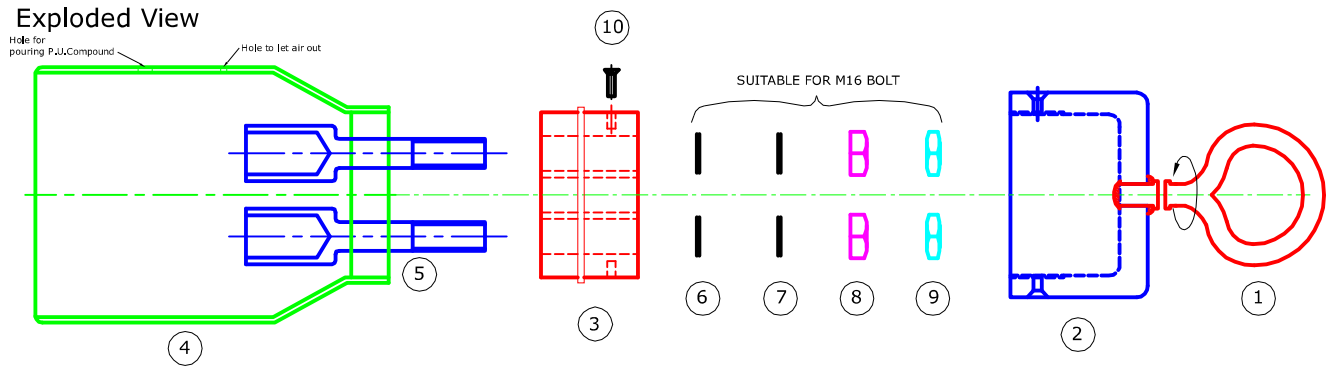
END SEALING CAP
(FOR XLPE CABLE)

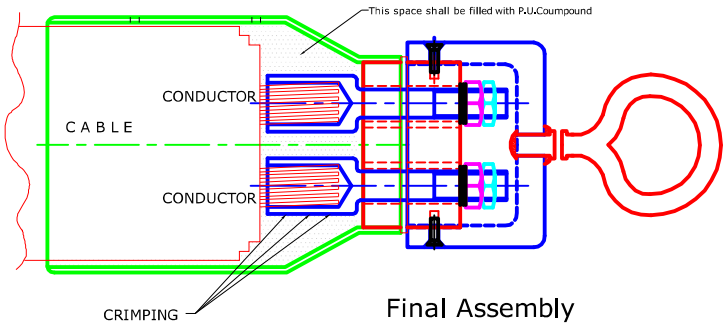
DRAWN BY: | CHECKED BY: | APPROVED BY:

REVISIONS

Addl V.P.




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.

| NO. | DISCRIPTION | QTY. | MATERIAL |
|---|---|---|---|
| 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 |

BSES

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

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

CABLE PULLING EYE ASSEMBLY (TYPICAL)

DRAWN BY: | CHECKED BY: | APPROVED BY:

REVISIONS

Addl V.P.

# ANNEXURE-G

## QUALITY ASSURANCE PLAN (QAP)
## FOR 66 kV EHV CABLES

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

## QUALITY ASSURANCE PLAN (QAP)
## FOR 66 kV EHV CABLES

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

## QUALITY ASSURANCE PLAN (QAP)
## FOR 66 kV EHV CABLES

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

BSES

# QUALITY ASSURANCE PLAN (QAP)
## FOR 66 kV EHV CABLES

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

BSES

# QUALITY ASSURANCE PLAN (QAP)

## FOR 66 kV EHV CABLES

| S. NO. | COMPONENT & OPERATION | CHARACTERISTICS | CLASS | TYPE OF CHECK | QUANTUM OF CHECK | REFERENCE DOCUMENT | ACCEPTANCE NORMS | FORMAT OF RECORD | AGENCY | | | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | SV | MFR | BSES | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| | **Legend : SV : Sub-Vendor of Cable Manufacturer, MFR : Cable Manufacturer, MPS : Material Purchase Specification,** | | | | | | | | | | | |
| | **P : Perform, W : Witness, V : Verification** | | | | | | | | | | | |
| | | g) Tensile strength & Elongation at break of insulation & outer sheath | Major | Physical | | IS 7098/III & IS 5831/84 | IS 7098/III & IS 5831/84 | Test Report | - | P | W | |
| | | h) Partial discharge test | Critical | Electrical | | IS 7098/III | IS 7098/III | Test Report | - | P | W | |
| | | i) High voltage test | Critical | Electrical | | IS 7098/III | IS 7098/III | Test Report | - | P | W | |
| | | j) Insulation resistance (Volume resistivity) test | Major | Electrical | | IS 7098/III | IS 7098/III | Test Report | - | P | W | |
| | | k) Tests for dimension of armour wires/strips | Major | Physical | | 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 | |
| 3 | Acceptance tests | 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 | Each Lot Sample Basis | IEC:60502 | IEC:60502 | Test Report | - | P | W | **Test shall be conducted for leakage of water through conductor.** |
| | | r) Armour coverage | Major | Physical | | As per data sheet & FS | As per data sheet & FS | Test Report | - | P | W | |
| | | s) Ovality | Major | Physical | | As per data sheet | As per data sheet | Test Report | - | P | W | |
| | | t) Eccentricity | Major | Physical | | As per data sheet | As per data sheet | Test Report | - | P | W | |
| | | u ) Mass & uniformity & zinc coating on armour | Major | Physical | | As per data sheet & FS | As per data sheet & FS | Test Report | - | P | W | |
| | | v ) Resistivity of Strip armour | Major | Electrical | | As per data sheet & FS | As per data sheet & FS | Test Report | - | P | W | |
| | | w ) Swelling height of water swellable tape | Major | Physical | | As per data sheet & FS | As per data sheet & FS | Test Report | - | P | W | |
| | | x) Flammability test | Major | Physical | | As per IS-78098/II/2011 | As per IS-78098/II/2011 | Test Report | - | P | W | |
| | | y)Impulse withstand test | Critical | Electrical | | IS 7098/III | IS 7098/III | Test Report | - | P | W | |

## QUALITY ASSURANCE PLAN (QAP)
## FOR 66 kV EHV CABLES

| S. NO. | COMPONENT & OPERATION | CHARACTERISTICS | CLASS | TYPE OF CHECK | QUANTUM OF CHECK | REFERENCE DOCUMENT | ACCEPTANCE NORMS | FORMAT OF RECORD | AGENCY | | | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | SV | MFR | BSES | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| | **Legend : SV : Sub-Vendor of Cable Manufacturer, MFR : Cable Manufacturer, MPS : Material Purchase Specification,** | | | | | | | | | | | |
| | **P : Perform, W : Witness, V : Verification** | | | | | | | | | | | |
| | | z) Ageing & Water absorption test(Gravimetric) on Insulation & Outer sheath | Major | Physical | | IS 5831/84 | IS 5831/84 | Test Report | - | P | W | |
| | | z1) Heating Cycle with Potential | Critical | Electrical | sample basis, once per PO | | | Test Report | - | P | W | |
| | | z2) Raw Material Verification in all aspects | Major | Physical | Each Lot | | | | | P | W | |
| 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/III & Tech. Data sheet | IS 7098/III & Tech. Data sheet | Test Report | - | P | W | |
| | | d) Physical tests for insulation | | | | | | | | | W | |
| | | i) Tensile strength & Elongation test | Major | Physical | | IS 7098/III | IS 7098/III | Test Report | - | P | W | |
| | | ii) Ageing in air oven | Major | Physical | | IS 7098/III | IS 7098/III | Test Report | - | P | W | |
| | | iii) Hot set test | Major | Physical | | IS 7098/III | IS 7098/III | Test Report | - | P | W | |
| | | iv) Shrinkage test | Major | Physical | | IS 7098/III | IS 7098/III | Test Report | - | P | W | |
| | | v) Water absorption (gravimetric) | Major | Physical | One sample per Tender | IS 7098/III | IS 7098/III | 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 | |

## QUALITY ASSURANCE PLAN (QAP)
## FOR 66 kV EHV CABLES

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

## QUALITY ASSURANCE PLAN (QAP)
## FOR 66 kV EHV CABLES

| S. NO. | COMPONENT & OPERATION | CHARACTERISTICS | CLASS | TYPE OF CHECK | QUANTUM OF CHECK | REFERENCE DOCUMENT | ACCEPTANCE NORMS | FORMAT OF RECORD | AGENCY | | | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | SV | MFR | BSES | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| | **Legend : SV : Sub-Vendor of Cable Manufacturer, MFR : Cable Manufacturer, MPS : Material Purchase Specification,** | | | | | | | | | | | |
| | **P : Perform, W : Witness, V : Verification** | | | | | | | | | | | |

**Note**

1. Checks specified above for Raw Material, In-Process and Final Inspection shall be as relevant to the specific cable construction.
2. Number of samples shall be selected as per Factory Standard/Agreement wherever 'sample' is indicated for extent of check.
3. Plant standards shall be followed in case Technical Data Sheet does not include requirements for characteristics to be checked.
4. BSES may witness Raw material and in process inspection in addition to Routine/Acceptance tests at any time/stage of manufacturing.
5. BSES's Inspector may randomly select a cable drum for type testing at vendor's works.
6. For each of the offered lot for inspection, BSES may randomly select one cable drum for testing of end cap "Destructive testing" to verify adhesion of sealing cap to cable outer sheath. .
7. All factory Type Tests shall be Witnessed by BSES

ANNEXURE-H

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

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

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

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

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

ANNEXURE-I

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

BSES

# Technical Specification of Various Types of Structural Steel Items

## Specification no – BSES-TS-17-SSI-R0

| | | |
|---|---|---|
| Rev: | | 0 |
| Date: | | 05 Apr 2022 |
| Pages: | | 07 |
| Prepared by | Jeena Borana | |
| | Vani Sood/ Pronab Bairagi | 05/04/22 05/04/2022 |
| Reviewed by | Srinivas Gopu | |
| | Amit Tomar | 05/04/2022 |
| Approved by | Gaurav Sharma | |
| | K. Sheshadri | 05/04/22 |

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## 1.0 SCOPE OF SUPPLY

The specification covers design, manufacturing, testing of structural steel items at manufacturers works before dispatch. Packing, delivery of material and submission of documents/test reports to purchaser.

## 2.0 SERVICE CONDITION

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

| S. No. | Parameters | Requirements |
| --- | --- | --- |
| 2.1 | Peak ambient temp. | 55°C |
| 2.2 | Min ambient temp. in shade | 45°C |
| 2.3 | Max.average ambient temp in 24 hours period in shade | 40°C |
| 2.4 | Min ambient temp. | (-)5°C |
| 2.5 | Max. temp. attainable by an object exposed to sun | 70°C |
| 2.6 | Max. relative humidity | 95% |
| 2.7 | Average number of thunder storm days per annum | 40 |
| 2.8 | Average number of rainy storm days per annum | 120 |
| 2.9 | Average annual rainfall | 1250mm |
| 2.10 | No of months of tropical monsoon condition | 4 months |
| 2.11 | Max. wind pressure | 150kg/m2 |
| 2.12 | Altitudes | Not exceeding 1000mtrs |

## 3.0 CODES & STANDARDS

| S. No. | Code | Description |
| --- | --- | --- |
| 3.1 | 2629.1985 | Important guidelines for general for general hot-dip galvanizing of iron and steel |
| 3.2 | IS 2062 | Hot Rolled Medium and High Tensile Structural Steel |
| 3.3 | IS 808 | Dimension for Hot Rolled Steel Beam, Column, Channel and Angle Section |
| 3.4 | IS : 5561-1970 | Specification for electric power connection |

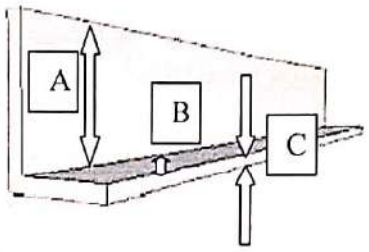
## 4.0 ELECTRICAL DATA

| S.No. | Parameters | Details |
| --- | --- | --- |
| 4.1 | LT Supply System | 3 phase AC, 4 Wire |
| 4.2 | Rated Voltage | 415+/-10% |
| 4.3 | Rated Frequency | 50Hz ± 5% |
| 4.4 | Fault level | 35MVA – 50kA |

## 5.0 DESIGN PARAMETERS

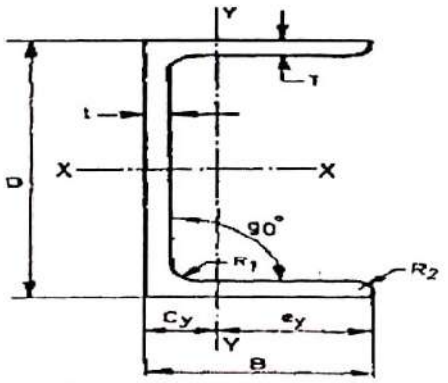
| S. No. | Description |
| --- | --- |
| 5.1 | MS Angle, Strctl,50mm , 50mm , 6mm |
| 5.2 | MS Angle, Strctl, 65mm , 65mm , 6mm |
| 5.3 | MS Angle, Strctl, 75mm , 75mm , 6mm |
| 5.4 | CHNL, Strctl, ISMC;150MM;75MM;16.8KG/M |
| 5.5 | CHNL, Strctl, ISMC100; 100MM; 50mm; 7.7mm |
| 5.6 | Flat, Strctl, 8mm;50mm;6000mm |
| 5.7 | Flat, Strctl, 6mm; 50mm;6000mm |
| 5.8 | Flat, Strctl, 6mm;50mm;5500mm |

5.1 MS Angle (50MM:50MM:6MM): Dimension shall be A =50mm, B=50mm, C=6mm
5.2 MS Angle (65MM:65MM:6MM): Dimension shall be A =65mm, B=65mm, C=6mm
5.3 MS Angle (75MM:75MM:6MM): Dimension shall be A =75mm, B=75mm, C=6mm




For MS Angle reference drawing (a, b & c)

5.4 Channel Structural (150MM;75MM;16.8KG/M): Dimension shall be 150MM;75MM;16.8KG/M
5.5 MS Channel (100MM;100MM;5MMX7.7MM): Dimension shall be D=100, B=100,t=5,T=7.7mm




For MS Channel reference drawing (g & h)

5.6 Flat Structural (8MM;50MM;6000MM) : Dimension shall be 8MM;50MM;6000MM
5.7 Flat Structural (6MM;50MM;6000MM) : Dimension shall be 6MM;50MM;6000MM
5.8 Flat Structural (6MM;50MM;5500MM) : Dimension shall be 6MM;50MM;5500MM

## 6.0 MATERIAL

| | | |
|---|---|---|
| 6.1 | Material | Material shall be mild steel, grade 'A', Designation E-250 as per IS 2062. |
| 6.2 | Make | Steel shall be of TATA/SAIL/ESSAR/RINL/JSPL/JSW/VISA steel/Bhushan Steel/Other BSES approved make |

## 7.0 TESTING & INSPECTION

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

| | | |
|---|---|---|
| 7.1 | Visual Check | Material shall be visually checked and shall free from external defects. |
| 7.2 | Dimensional Check | The dimensional requirements shall be checked as per the drawing. |

| | | |
|---|---|---|
| 7.3 | Acceptance Test | Following tests needs to be conducted by the vendor during inspection (value shall be followed as per relevant IS/IEC)<br>a) Tensile Strength<br>b) Yield Stress<br>c) Elongation<br>d) Chemical Composition as per IS 2062 from NABL accredited LAB.<br>e) Incase of unavailability of inhouse testing facility, tests shall be conducted from NABL accredited LAB. |

## 8.0 MARKING

| | | |
|---|---|---|
| 8.1 | The material shall be embossed with the details mentioned | a) Name/Model of the material<br>b) Identification of the source of manufacture<br>c) ISI mark |

## 9.0 DEVIATION

Deviations from this Specification shall be stated in writing with the tender by reference to the Specification clause/GTP/Drawing and a description of the alternative offer. In absence of such a statement, requirements of the Specification shall be met without exception.

## 10.0 GUARANTEE CERTIFICATE

Guarantee Certificate to be given for any manufacturing defects along with its consignment from the date of receipts at stores for free replacement within one year.

## 11.0 DOCUMENTS SUBMISSION

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

| S.No. | Detail of Document | For Tender | For Approval/Review | Final Submission |
|---|---|---|---|---|
| 11.1 | Deviation Sheet, if any | Required | Required | Required |
| 11.2 | GA and Dimensional | Required | Required | Required |

| S.No. | Detail of Document | For Tender | For Approval/Review | Final Submission |
| --- | --- | --- | --- | --- |
| | Drawing | | | |
| 11.3 | Manufacturer's quality assurance plan and certification for quality standards | | Required | Required |
| 11.4 | Make of Raw Materials | Required | Required | Required |
| 11.5 | Inspection and test reports, carried out in manufacturer's works | | | Required |
| 11.6 | Routine Test Certificates | | | Required |
| 11.7 | Test certificates of all the raw materials | | | Required |

CONTROLLED COPY

Reliance Energy
A Dhirubhai Ambani Enterprise

# Specifications

# Outdoor Disconnecting Switch

## (66 & 33 KV)

**Specification no. : SP-ISLU-01-R0**

| Prepared By | | Reviewed By | | Approved By | | Revision | Date |
|---|---|---|---|---|---|---|---|
| Name | Sign. | Name | Sign. | Name | Sign. | | |
| AAG | | HPB | | DG | | 0 | 29-Jan-2005 |

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**General Specification**

### 1.0.0 Codes & Standards

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

**National Standards**

| Standard Code | Standard Description |
|---|---|
| | Indian Electricity Rules |
| | Indian electricity act |
| | CBIP manual |
| IS : 9921 - Part I to V | Specification for Alternating Current Disconnectors (Isolators) and Earthing Switches |
| IS : 0996 -1979 | Single phase small AC and Universal Electric Motors. |
| IS : 7572 -1974 | Guide for testing single phase AC and Universal motors. |
| IS : 4237 -1967 | General Requirement for switchgear for voltage not exceeding 1.1 kV. |
| IS : 2147 -1962 | Degree of protection provided by enclosure for low-voltage switchgear control gear |
| IS : 2544 | Porcelain Post Insulator |
| IS : 2629 -1985 | Recommended Practice for Hot-Dip Galvanizing of Iron and Steel |
| IS : 6639 - 1972 | Specification for Hexagon Bolts for Steel Structures |
| | |
| | |

**Important Note :**

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

i. Specification including applicable codes, standards
ii. Guaranteed Technical Particulars (GTP)
iii. Approved Vendor Drawings

| Sr. No. | Description | Requirement / Rating |
|---|---|---|
| **2.0.0** | **Design Features** | Common for both 66KV and 33 KV equipment |
| 2.1.0 | Disconnect Switch Type & Mechanism | Motor operated, central rotating double break with turn and twist mechanism, triple pole, outdoor type for installation and operation in horizontal plane for 66KV & in vertical plane for 33 kv with or without earth switches, as required complete in all respects. |
| i) | Motor assembly | Suitable for 3 phase 415V, 50 Hz. Provided with a quick electro-mechanical brake on high speed shaft for rapid braking. |
| 2.2.0 | Earth Switch Mechanism | Manually operated |
| 2.3.0 | Disconnector Switch Controls | |
| i) | Remote electrical control | Required |
| ii) | Local Manual control | Required |
| iii) | Local electrical control | Required from integral Local Control Cabinet |
| 2.4.0 | Interlock with circuit breakers | Electrical interlock suitable for 220 V / 50 V DC |
| 2.5.0 | Interlock with Earth Switch | Mechanical & Electrical interlock |
| 2.6.0 | Padlock for Earth Switch | Padlock & keys for both positions i.e. when earth switch is grounded and when earth switch is un-grounded |
| 2.7.0 | Fixed Contacts | |
| i) | Type of contacts | Spring loaded with smooth surface, silver plated |
| ii) | Current carrying castings | Non corrodible, non ferrous material |
| iii) | Current carrying Springs | Made of non aging, non magnetic stainless steel with life long spring action strength |
| 2.8.0 | Insulators | |
| i) | Construction | Comprising of cylindrical solid core post insulators. The porcelain used in the insulators shall be homogeneous, free from laminations, cavities or any other defect which may affect its mechanical and dielectric qualities and shall be thoroughly vitrified, tough and impervious to moisture. The glazing of the porcelain shall be of uniform brown colour, free from blisters, burrs and other defects. |
| ii) | Fasteners | All metal caps, jointing flanges, bolts and nuts shall be made of high grade cast iron or malleable steel casting, machine faced and hot-dip galvanised. |

| Sr. No. | Description | Requirement / Rating |
|---|---|---|
| | | |
| 2.9.0 | Moving Contacts | |
| i) | Type of contacts | High pressure relieving copper contacts, silver plated |
| ii) | Wiping Action | Required during opening & closing. Shall be adequate to remove any oxide film formed without causing scouring or abrasion on the contact surfaces. |
| 2.10.0 | Current carrying Springs | Made of non aging, non magnetic stainless steel with life long spring action strength |
| 2.11.0 | Fault Current rating | Earth switch shall be able to carry same Fault Current as assigned to the disconnecting switch. |
| 2.12.0 | Disconnecting Switch contacts movement | 90 deg from full open to full close in order to ensure a distinct break ands clear visibility. |
| 2.13.0 | Corona Effect | Shall be free from visible corona discharge in both open & close positions at visible discharge test voltages. |
| 2.14.0 | Control cabinet | |
| i) | Enclosure | Weather-proof, water-shedding, corrosion-proof IP-55 steel cabinet |
| ii) | Cabinet Door | Gasketed, hinged access door shall have a mechanical indicator fitted to clearly indicate fully opened and fully closed positions of the disconnection switch. |
| iii) | Wiring | Control wiring shall be done using 1.1KV grade 2.5 sq.mm stranded copper conductor, PVC insulated, cables laid in GI conduits. |
| iv) | Locking arrangement | Padlocking arrangement to be provided. |
| v) | Incomer | A local TPN MCB to be provided in cabinet at power supply incoming point. |
| vi) | Outgoing Control Wiring | All outgoing control wiring shall terminate on terminal blocks, inside the cabinet so as to have maximum access to all conductor terminals. |
| vii) | Aux. Contacts | All auxiliary contacts of the disconnection switch and earthing switches shall be supplied duly wired up to the terminal blocks. |
| viii) | Terminals | Stud type terminals with at least twenty (20) percent spare terminals shall be provided over and above the number actually required. |
| ix) | Paint Shade | Polyurethane Paint Shade no. 692 of IS-5. |
| x) | Local Controls | A local/ remote changeover switch shall be fitted inside the cabinet together with open/ close push buttons for local control. |
| | | |

| Sr. No. | Description | Requirement / Rating |
|---|---|---|
| xi) | Cabinet accessories | Cabinet illumination incandescent lamp with ON/OFF switch, 5/15A single phase 3 pin socket with switch & fuse, 240V AC space heater with switch & thermostat etc. |
| 2.15.0 | Manual Operation | Manual operation of disconnection switch by means of crank handle disconnecting power supply to the 3-pole operating mechanism on insertion into its socket. The height of socket shall be about 1.2 metre above the finished ground level of the substation. |
| 2.16.0 | Disconnection switches with Earth switch | Switch shall have three (3) grounding blades forming integral part of the isolator. These blades shall be capable of being fitted on either side of the brakes. Flexible heavily tinned copper braids of adequate cross-sectional area with connector suitable for the specified short circuit current shall be provided on the hinged end of the grounding blade for connection to the station grounding grid. |
| 2.17.0 | Grounding Blades Operation | Manually operated and interlocked with disconnection switch so that the grounding blades can be closed only when the disconnection switch is open. |
| 2.18.0 | Pivot bearings | Shall be maintenance-free and corrosion resistant. Double tapered-roller bearings located 150 mm apart suitable for ensuring smooth and dependable operation of the disconnection switch shall be located at the base of the supporting insulators. The earthing switch shaft shall also be provided with necessary bearings. The bearings shall be suitable for effective operation of disconnection switch and earthing switches even after long periods of their remaining in closed/ open position. |
| 2.19.0 | Disconnection Switch Poles & base | Each pole of the disconnection switch shall be provided with a complete galvanized steel base designed for mounting on a supporting structure/ gantry.<br><br>The base shall be rigid and self-supporting and shall require no guying or cross bracing between phases. The group operated isolators shall have a common supporting structure for all the three (3) poles. |
| 2.20.0 | Grounding Pads | Each pole of disconnection switch shall be provided with two (2) grounding pads of non-corrodible material brazed to the channel base at opposite ends. Flexible tinned copper (15-25 microns) connectors shall be provided for a) Connection of earthing pad of each pole, b) Operating handle, c) Earthing switches. |
| | | |

| Sr. No. | Description | Requirement / Rating |
|---|---|---|
| 2.21.0 | Counter-Balancing Springs/ Weights | Springs/ weights of non-rusting alloy composition shall be provided for counter-balancing the earthing switch blades to prevent impact at the end of travel both on opening and closing of the earthing switch. |
| 2.22.0 | Name Plates | Corrosion-proof nameplates giving all the relevant mandatory as well as optional information as stipulated in IS shall be provided on disconnection switches, earthing switches and operating devices as per the Purchaser's/ Consulting Engineer's approval. |
| | | |
| **3.0.0** | **Approved Make of Components** | Common for both 66KV and 33 KV outdoor disconnecting switch |
| 3.1.0 | Motors | ABB / Siemens / Crompton |
| 3.2.0 | Insulators | JSI / WSI / Modern / Saravana / BHEL |
| 3.3.0 | Switch | Kaycee / L&T (Salzer) |
| 3.4.0 | HRC Fuse Links | Alstom / Siemens / L&T |
| 3.5.0 | AC Contactors & O/L Relay | L&T / Siemens / Schneider |
| 3.6.0 | Terminals | Connectwell / Elmex |
| 3.7.0 | Push buttons / Actuator | L&T / Teknic / Siemens |
| 3.8.0 | MCB | Merlin Gerin / Siemens / Schneider |
| | | |
| | | |
| | | |

| Sr. No. | Description | Requirement / Rating |
|---|---|---|
| **4.0.0** | **Testing & Inspection** | |
| 4.1.0 | Internal Test | Manufacturer shall carry out comprehensive inspection and testing during manufacture of the equipment. |
| 4.2.0 | Type test | The product must be of type tested quality. Type test reports shall be submitted for the type, size & rating of equipment offered along with bid. If the manufacturer's lab is accredited by govt./ authorised body then it shall be acceptable for type testing. |
| 4.3.0 | Routine test | As per relevant IS / IEC. |
| 4.4.0 | Acceptance test | As per relevant IS / IEC. |
| 4.5.0 | Test Witness | |
| 4.5.1 | | The Buyer reserves the right to witness all tests specified on completed product. |
| 4.5.2 | | The Buyer reserves the right to inspect the product at the Sellers works at any time prior to dispatch, to verify compliance with the specifications. |
| 4.4.3 | | In-process and final inspection call intimation shall be given in advance to purchaser. |
| 4.6.0 | Tests on fitting and Accessories | As per Manufacturer's Standards and relevant IS / IEC. |
| | | |
| **5.0.0** | **Drawing, Data & Manuals** | |
| 5.1.0 | To be submitted along with bid | The seller has to submit : |
| | i) | Tentative GA / cross sectional drawing of product showing all the views / sections. |
| | ii) | Detailed reference list of customers already using the offered product during the last 5 years with particular emphasis on units of similar design and rating. |
| | iii) | Completely filled GTP |
| | iv) | Deviations from this specification. Only deviations approved in writing before award of contract shall be accepted. |
| | v) | Details of manufacturer's quality assurance standards and program and ISO 9000 series or equivalent national certification. |

| Sr. No. | Description | Requirement / Rating |
|---|---|---|
| | vi) | Type test reports shall be submitted for the type, size & rating of product / equipment offered along with bid. In case the type test report for identical product is not available then type test report of nearby size/ rating shall be submitted for review. They shall be considered valid for 5 years from date of test performed on product /equipment. |
| | vii) | Complete product catalogue and Manual along with the bid. |
| | viii) | Recommended spare parts and consumable items for five years of operation with prices and spare parts catalogue with price list for future requirements. |
| | ix) | Bill of material with make, model & quantity of items. |
| 5.2.0 | To be submitted after award of contract | The seller has to submit : for buyer's Approval (A) / Reference (R) |
| | i) | Program for production and testing (A) |
| | ii) | Guaranteed Technical Particulars (A) |
| | iii) | Calculations to substantiate choice of electrical, structural, mechanical component size / ratings (A) |
| | iv) | a) Detailed dimension drawing for all components, genera<br>b) Drawings of major components (A)<br>c) Rating and diagram plate (R) |
| | v) | Detailed loading drawing to enable the buyer to design and construct foundations (as applicable) (R) |
| | vi) | Transport / Shipping dimensions with weights (R) |
| | vii) | Detailed Bill of Materials for all fittings and accessories with their make, model & tag no. etc. (A) |
| | viii) | Detailed installation and commissioning instructions (R) |
| | ix) | Quality plan (A) |
| 5.3.0 | Submittals required prior to dispatch | The seller has to submit : |
| | i) | Inspection and test reports, carried out in manufacturer's works (R) |
| | ii) | Test certificates of all bought out items |
| | iii) | Operation and maintenance Instruction as well as trouble shooting charts/ manuals |
| 5.4.0 | Drawing and document sizes | Standard size paper A0, A1, A2, A3, A4 |
| 5.5.0 | No of drgs. / Documents required at different stages | As per Annexure- A |
| | | |

| Sr. No. | Description | Requirement / Rating |
|---|---|---|
| **6.0.0** | **Packing** | |
| 6.1.0 | Packing Protection | Against corrosion, dampness, heavy rains, breakage and vibration |
| 6.2.0 | Packing for accessories and spares | Robust wooden non returnable packing case with all the above protection & identification Label |
| 6.3.0 | Packing Identification Label | In 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 and Quantity |
| | 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 |
| | | |
| **7.0.0** | **Shipping, Handling & Storage** | |
| 7.1.0 | Shipping Information | The seller shall give complete shipping information concerning weight, size etc. of each package. |
| 7.2.0 | Shipping Constraints | The seller shall ascertain at an early date 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, upto the site. Any modifications required in the infrastructure and cost thereof in this connection shall be brought to the notice of the Purchaser. |
| 7.3.0 | Transit Damage | The seller shall be responsible for any transit damage due to improper packing. |
| 7.4.0 | Handling & Storage | Manufacturer's instructions shall be followed. Detail handling & storage instruction sheet / manual needs to be furnished before commencement of supply. |
| | | |

| Sr. No. | Description | Requirement / Rating |
|---|---|---|
| **8.0.0** | **Quality Assurance** | |
| 8.1.0 | Vendor quality plan | To be submitted for purchaser approval |
| 8.2.0 | Inspection points | To be mutually identified & agreed in quality plan |
| | | |
| **9.0.0** | **Progress Reporting** | |
| 9.1.0 | Outline Document | To be submitted for purchaser approval for outline of production, inspection, testing, inspection, packing, dispatch, documentation program |
| 9.2.0 | Detailed Progress report | To be submitted to Purchaser once a month containing |
| | i) | Progress on material procurement |
| | ii) | Progress on fabrication (As applicable) |
| | iii) | Progress on assembly (As applicable) |
| | iv) | Progress on internal stage inspection |
| | v) | Reason for any delay in total program |
| | vi) | Details of test failures if any in manufacturing stages |
| | vii) | Progress on final box up |
| | viii) | Constraints / Forward path |
| | | |
| **10.0.0** | **Deviations** | |
| | i) | Deviations from this Specification are only acceptable where the Seller has listed in his quotation the requirements he can't or does not wish to comply with and the buyer has accepted in writing the deviations before the order is placed. |
| | ii) | In the absence of a list of deviations, it will be assumed by the Buyer that the Seller complies fully with this specification. |
| | | |

**Annexure – A**

## 1.0 Scope

| Sr. No. | Description | Requirement / Rating |
|---|---|---|
| **1.0.0** | **Scope** | |
| 1.1.0 | Main Equipment | Design, manufacture, assembly & testing at manufacturer's works before dispatch, packing & delivery of outdoor disconnecting switch rated up to 66 kV. |
| 1.2.0 | Accessories | |
| | i) | Clamps & terminal connectors. |
| | ii) | Stainless steel hardware like nut bolts/ washers etc. for fixing of all equipment / accessories in the scope of the bidder with supporting structure. |
| | iii) | Any other item necessary or usual for efficient performance and satisfactory maintenance under the various operating and atmospheric conditions |
| 1.3.0 | Documentation | Submission of all drawings & documents pertaining to the equipment. |
| 1.4.0 | Site Supervision | Supervision of testing & commissioning of equipment at site. |
| 1.5.0 | Bill of Materials | Complete bill of materials shall be submitted in the following format. |

| Sr. No. | Purchaser Equipment Tag No. / Sap Code | Equipment Description | Location / Substation Name | Unit | Quantity |
|---|---|---|---|---|---|
| | | | e.g. Santacruz | Nos. | e.g. 1 |
| | | | e.g. Alaknanda | Nos. | e.g. 6 |
| | | | | | |
| | | | | | |

### 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 | 3 copies (Typical drgs) | 4 copies + 1 Soft Copy | 6 copies + 1 soft copy in CD | See Clause 5.0.0 for various drawings required |
| Calculations | 3 copies (Typical) | 4 copies + 1 Soft Copy | 6 copies + 1 soft copy in CD | See Clause 5.0.0 for details |
| Catalogues | 1 copy | | 6 copies + 1 soft copy in CD | |
| Instruction manual | 1 copy | | 6 copies + 1 soft copy in CD | |
| Test Report | 2 copies | | 6 copies + 1 soft copy in CD | Type test and routine test reports |

### 3.0.0 Delivery Schedule

| **Sr. No.** | **Description** | **Requirement / Rating** |
|---|---|---|
| i) | Delivery period start date | From date of purchase order |
| ii) | Delivery period end date | As agreed with supplier |
| iii) | Material dispatch clearance | After inspection by purchaser |
| | | |

**Annexure – B**

**Ambient Conditions :**

**A) Mumbai**

| | | |
|---|---|---|
| a) | Average grade atmosphere | Heavily polluted , salt Laden, dusty, humid with possibility of condensation |
| b) | Maximum altitude above sea level | 1000 M |
| c) | Ambient Air temperature | Highest 45 deg C, Average 35 deg C |
| d) | Minimum ambient air temperature | 20 deg C |
| e) | Relative Humidity | 100 % Max |
| f) | Thermal Resistivity of Soil | 150 Deg. C cm/W |
| g) | Seismic Zone | 3 |
| h) | Rainfall | 3000 mm concentrated in four months |

**B) Delhi**

| | | |
|---|---|---|
| a) | Average grade atmosphere | Heavily polluted, dry |
| b) | Maximum altitude above sea level | 1000 M |
| c) | Ambient Air temperature | Highest 50 deg C, Average 40 deg C |
| d) | Minimum ambient air temperature | 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 |

**Annexure – C1**

**Guaranteed Tech. Particulars for 66KV Outdoor Disconnecting Switch**

| Sr. No. | Description | Data By Purchaser | Data by Supplier |
|---|---|---|---|
| 1 | Name of manufacturer | | |
| 2 | Type | Motor operated, central rotating double break with turn & twist mechanism. | |
| 3 | Model | | |
| 4 | No. of units. | | |
| 5 | Installation | Outdoor horizontal | |
| 6 | System Particulars | | |
| i) | Highest System Voltage | 72.5 kV | |
| ii) | Rated frequency | 50 Hz ± 5% | |
| iii) | System Neutral | Solidly Earthed | |
| 7 | Rated Insulation Data | | |
| 7.1 | 1.2/50 µs lighting impulse withstand voltage (Positive and negative polarity) | | |
| i) | To earth | 325 kV | |
| ii) | Across the isolating distance | 375 kV | |
| 7.2 | Rated One minute power frequency withstand voltage | | |
| i) | To earth | 140 kV | |
| ii) | Across the isolating distance | 160 kV | |
| 8 | Main Switch Current Capacity | | |
| i) | Rated normal current | 800 A / 1250 A | |
| ii) | Rated Short time withstand Current | 31.5 kA for 3 Sec. | |
| iii) | Rated peak withstand current | 2.5 times of short time withstand current | |
| iv) | Maximum magnetizing current (Make/ break capacity) | 6 - 8 Amps. | |
| 9 | Earthing switch current capacity | | |
| i) | Rated Short time withstand Current | 31.5 kA for 3 Sec. | |
| ii) | Rated peak withstand current | 2.5 times of short time withstand current | |
| iii) | Making capacity for discharging line charge | | |
| 10 | Minimum clearances | | |
| i) | In air between live parts and earth | 630 mm | |
| ii) | In air between Phase to phase | 630 mm | |
| iii) | Minimum ground clearance | 4000 mm | |

| Sr. No. | Description | Data By Purchaser | Data by Supplier |
|---|---|---|---|
| 11 | Phase spacing | 2000 mm (Project Specific) | |
| 12 | No. of breaks per circuit pole | Two for double break | |
| 13 | Nos. of insulators pedestal | Three stacks per phase of heavy duty post type insulators | |
| 14 | Main Switch Contacts | | |
| i) | Type of Contact | High pressure relieving copper contacts (rotating blade features of twist mechanism). The moving arm enters the fixed female contact assembly developing high pressure. | |
| ii) | Material for rotating blade | Electrolytic tinned copper | |
| iii) | Material of contact | Silver plated electrolytic copper. | |
| 15 | Earth Switch Contacts | | |
| i) | Type of Contact of Earth switch | High pressure banging type | |
| ii) | Material for earth switch blade | Electrolytic tinned copper | |
| iii) | Material of earth switch contact | Silver plated electrolytic copper. | |
| 16 | Thickness of Silver Coating | 15 - 25 microns. | |
| 17 | Maximum current density | 1.5 A /sq mm | |
| 18 | Type of bearing for rotating insulator stocks | | |
| 19 | Number of auxiliary contacts | | |
| i) | Isolator operating mechanism | 10 NO + 10 NC | |
| ii) | Earthing Device | 4 No + 4 NC | |
| 20 | Temperature rise | As per IS 9921 | |
| 21 | Control supply voltage | 220 V / 110 V / 50 V DC | |
| 22 | AC Aux. Supply (4 wire) | 415 V $\pm$ 10% | |
| 23 | Inter Locking arrangement | Electrical and mechanical | |
| | | | |

| Sr. No. | Description | Data By Purchaser | Data by Supplier |
|---|---|---|---|
| 24 | Terminal connectors | Suitable for twin ACSR Zebra conductor | |
| 25 | Minimum creepage distance of insulator | | |
| 26 | Type of control for | | |
| i) | Disconnection switch | Motorised with Manual Facility | |
| ii) | Earthing switch | Manual | |
| 27 | Locking arrangement | | |
| 28 | Rated mechanical terminal loads in addition to wind load acting on the equipment and short-circuit forces | | |
| 29 | Total operating time of disconnection switch including that of its operating mechanism | | |
| 30 | Weight of Isolators | | |
| 31 | Post insulators | | |
| i) | Make & type | | |
| ii) | Height | | |
| iii) | Voltage level | | |
| iv) | Cantilever Strength | | |
| v) | Torsinal Strength | | |
| vi) | Creepage Distance | Min 31mm/KV | |
| vii) | Basic insulation level (1 min. power frequency flashover voltage) | | |
| | a) Dry | 140 KV rms | |
| | b) Wet | 140 KV rms | |
| viii) | Visible corona discharge voltage | | |
| ix) | 1.2/50 micro second impulse flashover voltage | 325 KVp | |
| x) | Insulation class | A | |
| 32 | Drive Motor | | |
| i) | Make | | |
| ii) | KW Rating / rpm | | |
| iii) | Rated current | | |
| iv) | Frame size | | |
| v) | Rated Voltage | 415 V AC | |
| vi) | Degree of Protection | IP-55 | |
| vii) | Insulation Class | B/F | |
| viii) | Duty | | |
| | | | |

**Annexure – C2**

**Guaranteed Tech. Particulars for 33KV Outdoor Disconnecting Switch**

| Sr. No. | Description | Data By Purchaser | Data by Supplier |
|---|---|---|---|
| 1 | Name of manufacturer | | |
| 2 | Type | Motor operated, central rotating double break with turn & twist mechanism. | |
| 3 | Model | | |
| 4 | No. of units. | | |
| 5 | Installation | Outdoor Vertical | |
| 6 | System Particulars | | |
| i) | Highest System Voltage | 36 kV | |
| ii) | Rated frequency | 50 Hz ± 5% | |
| iii) | System Neutral | Solidly Earthed | |
| 7 | Rated Insulation Data | | |
| 7.1 | 1.2/50 µs lighting impulse withstand voltage (Positive and negative polarity) | | |
| i) | To earth | 145 kV | |
| ii) | Across the isolating distance | 165 kV | |
| 7.2 | Rated One minute power frequency withstand voltage | | |
| i) | To earth | 70 kV | |
| ii) | Across the isolating distance | 80 kV | |
| 8 | Main Switch Current Capacity | | |
| i) | Rated normal current | 1250 A | |
| ii) | Rated Short time withstand Current | 26.3 kA for 3 Sec. | |
| iii) | Rated peak withstand current | 2.5 times of short time withstand current | |
| iv) | Maximum magnetizing current (Make/ break capacity) | 6 - 8 Amps. | |
| 9 | Earthing switch current capacity | | |
| i) | Rated Short time withstand Current | 26.3 kA for 3 Sec. | |
| ii) | Rated peak withstand current | 2.5 times of short time withstand current | |
| iii) | Making capacity for discharging line charge | | |
| 10 | Minimum clearance | | |
| i) | In air between live part and earth | 320 mm | |
| ii) | In air between Phase to phase | 320 mm | |
| iii) | Minimum ground clearance | 3700 mm | |

| Sr. No. | Description | Data By Purchaser | Data by Supplier |
|---|---|---|---|
| 11 | Phase spacing | 1500 mm (Project Specific) | |
| 12 | No. of breaks per circuit pole | Two for double break | |
| 13 | Nos. of insulators pedestal | Three stacks / phase of heavy duty post type insulators | |
| 14 | Main Switch Contacts | | |
| i) | Type of Contact | High pressure relieving copper contacts (rotating blade features of twist mechanism). The moving arm enters the fixed female contact assembly developing high pressure. | |
| ii) | Material for rotating blade | Electrolytic tinned copper | |
| iii) | Material of contact | Silver plated electrolytic copper. | |
| 15 | Earth Switch Contacts | | |
| i) | Type of Contact of Earth switch | High pressure banging type | |
| ii) | Material for earth switch blade | Electrolytic tinned copper | |
| iii) | Material of earth switch contact | Silver plated electrolytic copper. | |
| 16 | Thickness of Silver Coating | 15 - 25 microns. | |
| 17 | Maximum current density | 1.5 A /sq mm | |
| 18 | Type of bearing for rotating insulator stocks | | |
| 19 | Number of auxiliary contacts | | |
| i) | Isolator operating mechanism | 10 NO + 10 NC | |
| ii) | Earthing Device | 4 No + 4 NC | |
| 20 | Temperature rise | As per IS 9921 | |
| 21 | Control supply voltage | 220 V / 110 V / 50 V DC | |
| 22 | AC Aux. Supply (4 wire) | 415 V $\pm$ 10% | |
| 23 | Inter Locking arrangement | Electrical and mechanical | |
| | | | |

| Sr. No. | Description | Data By Purchaser | Data by Supplier |
|---|---|---|---|
| 24 | Terminal connectors | Suitable for twin ACSR Zebra conductor | |
| 25 | Minimum creepage distance of insulator | | |
| 26 | Type of control for | | |
| i) | Disconnection switch | Motorised with Manual Facility | |
| ii) | Earthing switch | Manual | |
| 27 | Locking arrangement | | |
| 28 | Rated mechanical terminal loads in addition to wind load acting on the equipment and short-circuit forces | | |
| 29 | Total operating time of disconnection switch including that of its operating mechanism | | |
| 30 | Weight of Isolators | | |
| 31 | Post insulators | | |
| i) | Make & type | | |
| ii) | Height | | |
| iii) | Voltage level | | |
| iv) | Cantilever Strength | | |
| v) | Torsinal Strength | | |
| vi) | Creepage Distance | Min 31mm/KV | |
| vii) | Basic insulation level (1 min. power frequency flashover voltage) | | |
| | a) Dry | 70 KV rms | |
| | b) Wet | 70 KV rms | |
| viii) | Visible corona discharge voltage | | |
| ix) | 1.2/50 micro second impulse flashover voltage | 145 KVp | |
| x) | Insulation class | A | |
| 32 | Drive Motor | | |
| i) | Make | | |
| ii) | KW Rating / rpm | | |
| iii) | Rated current | | |
| iv) | Frame size | | |
| v) | Rated Voltage | 415 V AC | |
| vi) | Degree of Protection | IP-55 | |
| vii) | Insulation Class | B/F | |
| viii) | Duty | | |
| | | | |

**Annexure – D**

**Recommended spares (Data by supplier)**

List of recommended spares shall be submitted as follows –

| Sr. No. | Description of spare part | Unit | Quantity |
|---|---|---|---|
| 1 | | Nos. | |
| 2 | | Nos. | |
| 3 | | | |
| 4 | | | |
| 5 | | | |
| 6 | | | |
| | | | |

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Reliance Energy
A Dhirubhai Ambani Enterprise

# Specification

# Outdoor Circuit Breaker

# (33 & 66 KV)

**Specification no. : SP-CBLU-01-R0**

| Prepared By | | Reviewed By | | Approved By | | Revision | Date |
|---|---|---|---|---|---|---|---|
| Name | Sign. | Name | Sign. | Name | Sign. | | |
| RH | | HPB | | DG | | 0 | 29-Jan-2005 |

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**General Specification**

### 1.0.0 Codes & standards

The circuit breakers shall be designed, manufactured and tested in accordance with the latest applicable Indian Standard, IEC standard and CBIP manuals as listed below-

**National Standards**

| | |
|---|---|
| Indian Electricity Rules | |
| Indian electricity act | |
| CBIP manual | |
| IS-2516 | Specification for circuit. Breaker. |
| IS-13118-1991 | Specification for high voltage alternating current circuit-breaker |
| IS-335-1995 | Insulating oil for Transformer & Switchgear. |
| IS-2090-1973 | Bushing for alternating voltage above 1000 volts. |
| IS-731-1971 | Insulator for Overhead lines. |
| IS -996-1979 | Single phase small AC and Universal Electric Motors. |
| IS-7572-1974 | Guide for testing single phase AC and Universal motors. |
| IS 4237-1967 | General Requirement for switchgear for voltage not exceeding 1Kv. |
| IS-2147-1962 | degree of protection provided by enclosure for low-voltage switchgear control gear. |
| IS-1554 Part-I 1988 | PVC insulated cables up to & including 1100 volts. |
| IS-2208 | HRC Cartridge fuses links up to 650 volts. |
| IS-375 | Outdoor switchgear & control gear matching with latest IS/IEC requirement |
| IS-2544 | Porcelain Post Insulator |
| IS-5621 | Hollow insulators for use in electrical equipment |

**International Standards**

| | |
|---|---|
| IEC-56 | Specification for high voltage alternating current circuit-breaker |
| IEC- 62271 – 100 | High Voltage alternating Current Circuit Breaker |
| IEC-60694 | Common specification for high voltage switchgear and control gear standards |
| IEC-376 | SF6 Gas |

## 2.0.0 Circuit Breaker design features

| | | |
|---|---|---|
| 2.1.0 | Contacts | |
| 2.1.1 | Making & Breaking Contacts | Hermetically sealed, free from atmospheric effects , adjustable to allow for wear and shall have a minimum number of moveable parts and adjustments to accomplish these results. |
| 2.1.2 | Arcing Contacts | First to close and last to open |
| 2.1.3 | Main Contacts | First to open and last to close. |
| 2.1.4 | Material of tips of contact | Silver-plated and have tungsten alloy tipping. |
| 2.2.0 | Sulphur Hexa Fluoride Gas (SF6 Gas) | SF6 gas shall comply with IEC 376 , suitable in all respect for use in the switchgear under all the operating conditions. |
| 2.3.0 | Operating Mechanism | a) Suitable for high speed re-closing, anti-pumping and trip free (as per IEC definition) electrically or mechanically under every method of closing (except during closing for maintenance). |
| | | b) The operating mechanism shall be such that the failure of any auxiliary spring will not prevent tripping. |
| 2.4.0 | Indicators | Electrical indicator as well as mechanical indicator shall be provided for<br>a) Open and close position indication of breaker.<br>b) Spring Charged indication |

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| | | c) Local / Remote indication<br>These indications shall be located in a position where it will be visible to a man standing on the ground with the mechanism housing closed.<br>An operation counter shall also be provided with each breaker. |
| | | SF6 gas density monitor shall be provided at 1.5 metre from ground level, tubing between gauge & breaker shall be stainless steel. |
| 2.5.0 | Closing Coil | Closing coil shall operate correctly at all values of voltage between 85% and 110% of the rated voltage. |
| 2.6.0 | Tripping Coil | a) Shunt trip shall operate correctly at all values of supply voltage between 70% and 110% of rated voltage.<br>b) Trip coil shall be suitable for trip circuit supervision, the relay for monitoring which will be provided by the purchaser and mounted on control panel. |
| 2.7.0 | Remote / Local Closing & Tripping | a) Operating mechanism shall normally be operated by remote electrical control. Electrical tripping shall be performed by shunt trip coils.<br>b) A conveniently located manual tripping lever or button shall also be provided for local tripping of the breaker and simultaneously opening the re-closing circuit. It shall be possible to trip the breaker in the event of auxiliary supply failure. |
| 2.8.0 | Manual Spring Charging | For spring charged mechanism a local manual closing device which can easily be operated by one man standing on the ground shall also be provided for maintenance purpose and |

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| | | direction of motion of handle shall be clearly marked. |
| 2.9.0 | Spring Operated Mechanism | a) Complete with motor, opening spring and closing spring with limit switch for automatic charging and all other necessary accessories to make the mechanism a complete operating unit |
| | | b) One close-open operation shall be possible after failure of power supply to motor |
| | | c) Closing action of the circuit breaker shall compress the opening spring ready for tripping. |
| 2.10.0 | Motors | Motors shall be 'Universal type' capable of satisfactory operation for the application and duty as required by the driven equipment. Motor shall be rated for 240 Volts AC. |
| 2.10.1 | Duty Requirement | Motors shall be capable of giving rated output without reduction in the expected life span when operated continuously in the system. |
| 2.10.2 | Supply Voltage Variation | ± 10% |
| 2.10.3 | Frequency variation | ± 5% |
| 2.10.4 | Combined voltage & frequency | ± 10% |
| 2.11.0 | Interlocks | Necessary interlocks to prevent the closing or opening of the breaker under low SF6 pressure & devices for initiating alarm shall be provided |
| 2.12.0 | Control Cabinets | Operating mechanism and all accessories shall be enclosed in a control cabinet. A common marshalling box for the three poles of the breaker shall be provided. |
| 2.12.1 | Enclosure | Control cabinet enclosure shall be sheet steel enclosed, dust, weather and vermin proof with |

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| | | a degree of protection as mentioned in Annexure-B. |
| 2.12.2 | Mounting | Control cabinets shall be suitable for mounting on the breaker structure at sufficient height for easy operation. |
| 2.12.3 | Doors & Locks | Control, cabinets shall be provided with double hinged doors with padlocking arrangement. All doors, removable covers and plates shall be gasketed all around with neoprene gaskets. |
| 2.12.4 | Control cables | Control cable entries shall be from bottom. Suitable removable, undrilled cable gland plate shall be provided on the cabinet for this purpose. |
| 2.12.5 | Heaters | Suitable heaters with auto control for ON/OFF at preset temp. shall be mounted in the cabinet to prevent condensation. ON/OFF switch and fuse shall also be provided. Heater shall be suitable for 240 V AC supply voltage |
| 2.12.6 | Terminals | a) Terminal blocks shall be 650 V grade 10 Amps rating, complete with insulated barriers stud type terminals, washers, nuts and lock nuts and identification strips. Separate stud shall be provided for incoming and outgoing, wires. Marking of terminal strips shall correspond to wire number on diagrams.<br><br>b) Terminal blocks shall be fully enclosed with easily removable covers and made of moulded non-inflammable plastic material. The terminal blocks shall have marking strips and all terminals shall be clearly marked with identification numbers or letters to facilitate connections to the external wiring |

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| | | c) 20 percent spare terminal blocks shall be provided for purchasers use in addition to those already provided for interlocks |
| 2.12.7 | Illumination | A suitable switch to operate on opening of the door shall be provide to illuminate the interior of the control cabinet |
| 2.12.8 | Control Cubicle Wiring | All wiring shall be carried out with 650 Volt grade Single core stranded, flexible copper conductor wire with PVC insulation and shall be vermin and rodent proof. The size of control wire shall be 1.5 sqmm. |
| 2.12.9 | Lugs | Wire terminations shall be made with solderless crimping type of tinned copper lugs. All lugs shall be pre insulated type. |
| 2.12.10 | Sleeves | Insulated sleeves shall be provided at all the wire ends and shall fit tightly on the wires and shall not fall off when the wire is disconnected from terminal blocks. The wire numbers on the wiring diagram shall be in accordance with IS: 375 or to the international Standard |
| 2.12.11 | Push Button | a) Close/Trip push buttons shall be momentary contact type. The color of the push button shall be subject to approval of the Purchaser. Each push Button shall be provided with integral inscription plates engraved with their function. |
| | | b) All push buttons shall have two normally open and two normally open and two c normally closed contacts. The contact shall be able to make and carry 5 Amps at 220V/110V/50V DC and shall be capable of breaking 1 Amp. Inductive load |
| 2.12.12 | Switches | All control switches shall be of rotary switch type and toggle/piano switches shall not be |

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| | | accepted. All control switches shall be rated for 220V/110V/50V DC |
| 2.12.13 | MCB | 220V/110V/50V DC, 16A DP MCB shall be used for control circuit and 240V AC, 10A SPN MCB shall be used for motor and heater circuit. |
| 2.12.14 | Earthing | a) All metal parts not intended for carrying current shall be made of stainless steel and connected to duplicate earthing system and suitable terminals shall be provided on each equipment or part of equipment in conformity with the I.E. Rules and relevant ISS. |
| | | b) The earth continuity conductor shall have sufficient cross-sectional area so as afford a low resistance path for the full fault current corresponding to the Circuit breaker rating |
| | | c) The size of earth continuity conductor shall be as large as possible to reduce the potential rise to minimum of the metal frame of the circuit breaker and in no case, more than 10 V. |
| | | d) The size of earth conductor shall also be adequate, so as to restrict the temperature rise to the limit without causing any damage to the earth connection while short circuit current flows through it for the short time rating of the equipment |
| | | e) No riveted joints in current conducting path shall be permitted. Only bolted joints with proper size of nuts & bolts with Plain/spring washer and also locking washer is permitted. The nuts & bolts shall made of stainless steel only. |
| 2.13.0 | Caution/Danger Plate | Caution name plate shall be provided at all points where terminals are likely to remain live |

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| | | and isolation is possibly only at remote end |
| 2.14.0 | Safety Interlocks | Suitable provision for safety electrical interlocks shall be made as per advise of the purchaser |
| 2.15.0 | Bushings | Porcelain used in bushing manufacture shall be homogenous, free from laminations, cavities and other flaws or imperfections that might affect the mechanical or di-electric quality and shall be thoroughly vitrified tough and impervious to moisture |
| 2.15.1 | Colour & Glazing of Bushing | Glazing of the porcelain shall be of uniform brown colour free from blisters, burns and similar other defects. |
| 2.16.0 | Galvanization | All iron parts shall be hot-dip galvanized |
| 2.17.0 | Nuts & Bolts | Nuts & Bolts shall be of stainless steel only |
| 2.18.0 | Joints | All joints shall be airtight. Surfaces of the joints shall be tarred up, porcelain parts by grinding and metal part of machining. |
| 2.19.0 | Creepage distance | The Creepage distance of the bushing shall in no case be less than 31mm/KV. Suitable for heavily polluted atmosphere |
| 2.20.0 | Duty Requirement of Circuit Breaker | a) The circuit breakers shall be totally re strike free under all duty conditions as per specification in Annexure-B |
| | | b) The circuit breakers shall meet the above duty requirements in case of application on U/G cable circuits as well as on power transformer |
| | | c) The circuit breaker shall be capable of Breaking the steady and transient magnetizing current corresponding to transformers Breaking line charging currents as per IS 2165 (Part-II Sec.2) with a temporary over voltage of 3.5 PU without the use of opening resistors. |

| | | |
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| | | d) Breaking 25% of the rated fault current at twice rated voltage under phase oppositions conditions as per IS: 9135 1979 |
| 2.21.0 | Transient recovery voltage | The rated transient recovery voltage for terminal fault and short line faults shall be as per IS: 2165. |
| 2.22.0 | Temperature rise | The temperature rise and the maximum temperature on any part of the equipment when in service at site under continuous full load condition and exposed continuously in the direct rays of the sun shall not exceed the permissible limits as per table-4 of IEC publication No. 56-2 and IS: 2516 when the standard specifies the limit of temperature rise. This shall not be exceeded when corrected for the difference between the ambient temperature at site and the ambient temperature specified in the relevant specification. The correction proposed shall be stated in the tender and shall be subjected to the approval of the purchaser |
| 2.23.0 | Painting | Polyurethane based paints shall be used. The color for the finishing paint shall be light gray as per shade No. 692 of IS-5. |
| 2.24.0 | Line side terminal connector | Al-alloy terminal connectors shall suitable for single/twin ACSR conductor as specified in Annexure-C. |

### 3.0.0 Quality assurance

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

### 4.0.0 Testing & Inspection

| | | |
|---|---|---|
| 4.1.0 | Tests | Test shall be carried out in accordance with IS-13118 / IEC-56 / IEC-60694 / IEC-62271-100 |
| 4.1.1 | Type Tests | a) Circuit breakers must be of type tested quality. |
| | | b) Incase, the product is never type tested earlier, seller has to conduct the type tests from Govt. recognized / Internationally accredited test Labs at their own cost, before commencement of supply. |
| | | c) If the manufacturer's lab is accredited by govt. /authorised body then it shall be acceptable for type testing. |
| 4.1.2 | Routine test | Test shall be carried out in accordance with IS-13118 / IEC-56 / IEC-60694 / IEC-62271-100 |
| 4.1.3 | Acceptance Test | Test shall be carried out in accordance with IS-13118 / IEC-56 / IEC-60694 / IEC-62271-100 |
| 4.2.0 | Tests on fitting and Accessories | As per Manufacturer's Standards |
| 4.3.0 | Inspection and Testing | a) The Buyer reserves the right to witness all tests specified on completed product. |
| | | b) The Buyer reserves the right to inspect the product at the Sellers works at any time prior to dispatch, to verify compliance with the specifications. |
| | | c) In-process and final inspection call intimation shall be given in advance to purchaser. |

### 5.0.0 Drawings, Data & manuals

| | | |
|---|---|---|
| 5.1.0 | To be submitted along with bid | The seller has to submit : |
| | | a-1: Complete assembly drawing of the outdoor type circuit breaker showing plan, elevation and typical sectional view giving complete dimensions. |
| | | a-2: Assembly drawings and weight of main component parts |
| | | a-3: Drawings showing the loads for foundations |
| | | a-4: Schematic control and wiring diagram in accordance with National / International practice |
| | | a-5: Structural drawing and the breaker mounting arrangement |
| | | a-6: Rating Plate diagram |
| | | a-7: Drawings of terminal connectors |
| | | b) Detailed reference list of customers already using the offered product during the last 5 years with similar design and rating. |
| | | c) Completely filled GTP |
| | | d) Deviations from this specification. Only deviations approved in writing before award of contract shall be accepted. |
| | | e) Details of manufacturer's quality assurance standards and programme and ISO 9000 series or equivalent national certification. |
| | | f) Type test reports shall be submitted for the type, size & rating of product / equipment offered along with bid. They shall be considered valid for 5 years from date of test performed on product /equipment. |

| | | |
|---|---|---|
| | | g) Complete product catalogue and Manual along with the bid. |
| | | h) Recommended spare parts and consumable items for five years of operation with prices and spare parts catalogue with price list for future requirements |
| 5.2.0 | After award of contract, seller has to submit mentioned drawings for buyer's Approval (A) / Reference (R) | a) Programme for production and testing (A) |
| | | b) Guaranteed Technical Particulars (A) |
| | | c) Calculations to substantiate choice of electrical, structural, mechanical component size / ratings (A) |
| | | e-1: General arrangement drawing of the circuit breaker (A). |
| | | e-2: Schematic wiring diagram of the circuit breaker external wiring termination along with terminal and wiring numbers for the various equipment controlled from the control panel etc (A) |
| | | e-3: Foundation drawings of circuit breaker with size & nos of foundation bolts (A) |
| | | e-4: Structural erection drawings (A) |
| | | e-5: Terminal connector drawings. (A) |
| | | e-6: Detailed loading drawing to enable the buyer to design and construct foundations (as applicable) (R) |
| | | e-7: General arrangement drawing of control cabinet (A) |
| | | f) detailed installation and commissioning instructions (R) |
| | | g) quality plan |

| | | |
|---|---|---|
| 5.3.0 | Submittals required prior to dispatch | a) Inspection and test reports, carried out in manufacturer's works (R) |
| | | b) Test certificates of all bought out items |
| | | c) Operation and maintenance Instruction as well as trouble shooting charts/ manuals |
| 5.4.0 | Drawing and document sizes | Standard size paper A0, A1, A2, A3, A4 |
| 5.5.0 | No of drgs. / Documents required at different stages | As per Annexure- A |

**6.0.0 Packing, Shipping, Handling & Storage**

| | | |
|---|---|---|
| 6.1.1 | Packing Protection | Against corrosion, dampness, heavy rains, breakage and vibration |
| 6.1.2 | Packing for accessories and spares | Robust wooden non returnable packing case with all the above protection & identification Label |
| 6.1.3 | Packing Identification Label | In each packing case, following details are required : |
| | | a) Individual serial number |
| | | b) Purchaser's name |
| | | c) PO number (along with SAP item code, if any) & date |
| | | d) Equipment Tag no. (if any) |
| | | e) Destination |
| | | f) Manufacturer / Supplier's name |
| | | g) Address of Manufacturer / Supplier / it's agent |
| | | h) Description and Quantity |
| | | i) Country of origin |
| | | j) Month & year of Manufacturing |
| | | k) Case measurements |
| | | l) Gross and net weights in kilograms |
| | | m) All necessary slinging and stacking instructions |
| 6.2.0 | Shipping | a) Bidder shall furnish the confirmation that the proposed packages can be delivered safely upto the site. |

| | | |
|---|---|---|
| | | b) The seller shall be responsible for all transit damage due to improper packing. |
| 6.3.0 | Handling & Storage | Manufacturer instruction shall be followed. Detail handling & storage instruction sheet / manual needs to be furnished before commencement of supply. |

**7.0.0 Progress reporting**

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

**8.0.0 Deviations**

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

**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 of Circuit Breaker as per BOQ and submission of all documents.

1.2 Supply of SF6 Gas cylinder for first filling.

1.3 Gas filling equipment with valves and tubing

1.4 Terminal connector

1.5 Hot-dip galvanized supporting structure along with foundation bolts.

1.6 Supervision of testing & commissioning of Circuit Breaker at site

1.7 BOQ as following -

| Sr No | Purchaser Equipment Tag No / SAP code | Equipment Description | Location / Substation name | Unit | Quantity |
|---|---|---|---|---|---|
| 1 | | | e.g. Santacruz | No | e.g. 1 |
| 2 | | | e.g. Alaknanda | No | e.g. 1 |
| 3 | | | | | |
| 4 | | | | | |
| 5 | | | | | |
| 6 | | | | | |
| 7 | | | | | |

**2.0 Submission of documents**

Submission of 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 | 3 copies (Typical drgs) | 4 copies | 6 copies + 1 soft copy in CD | See Clause 5.0 for various drawings required |
| Calculations | 3 copies (Typical) | 4 copies | 6 copies + 1 soft copy in CD | See Clause 5.0 for details |

| | | | | |
|---|---|---|---|---|
| Catalogues | 1 copy | | 6 copies + 1 soft copy in CD | |
| Instruction manual for the circuit breaker | 1 copy | | 6 copies + 1 soft copy in CD | |
| Test Report | 2 copies | | 6 copies + 1 soft copy in CD | Type test and sample routine test reports |
| | | | | |

**Delivery schedule**

| | | | |
|---|---|---|---|
| 2.1 | Delivery period start date | - | from date of purchase order |
| 2.2 | Delivery period end date | - | as agreed with supplier |
| 2.3 | Material dispatch clearance | - | after inspection by purchaser and written dispatch clearances for purchaser |

**Annexure – B Service Conditions**

| | | |
|---|---|---|
| 1.0.0 | Mumbai Atmospheric conditions | |
| a) | Average grade atmosphere : | Heavily polluted , salt Laden, dusty, humid with possibility of condensation |
| b) | Maximum altitude above sea level | 1000 M |
| c) | Ambient Air temperature | Highest 45 deg C, Average 35 deg C |
| d) | Minimum ambient air temperature | 20 deg C |
| e) | Relative Humidity | 100 % Max |
| f) | Thermal Resistivity of Soil | 150 Deg.C cm/W |
| g) | Seismic Zone | 3 |
| h) | Rainfall | 3000 mm concentrated in four months |

| | | |
|---|---|---|
| 2.0.0 | Delhi Atmospheric conditions | |
| a) | Average grade atmosphere : | Heavily polluted, dry |
| b) | Maximum altitude above sea level | 1000 M |
| c) | Ambient Air temperature | Highest 50 deg C, Average 40 deg C |
| d) | Minimum ambient air temperature | 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 |

**Annexure - C Guaranteed Technical Particulars (33kV Circuit Breaker)**

| Sr. No. | Description | Data By Purchaser | Data By Supplier |
|---|---|---|---|
| 1.0 | Name of manufacturer | | |
| 2.0 | Manufacturer's type and designation | | |
| 3.0 | Governing standard | As per Clause 1.0.0 0f the specification | |
| 4.0 | Type of circuit breaker | Vacuum | |
| 5.0 | Installation | Outdoor | |
| 6.0 | No. of phase & no. of pole | 3 (Three), 3 (Three) | |
| 7.0 | Rated voltage (kV) | 33kV | |
| 8.0 | Highest system voltage (kV) | 36kV | |
| 9.0 | System Neutral | Solidly earthed | |
| 10.0 | Rated insulation level | 170kVp | |
| 11.0 | Frequency (Hz) | 50Hz | |
| 12.0 | Class | | |
| 13.0 | Normal current rating (amps) | | |
| 13.1 | Under standard conditions | 1250A | |
| 13.2 | Under site conditions overload rating<br>a) 1 Hour<br>b) 3 Hour | | |
| 13.3 | Derating factor, if any, for site condition | | |
| 13.4 | Temperature rise at 150% rating for 3 Hours | | |
| 14.0 | Short time current rating (kA)<br>(a) For 1 Second<br>(b) For 3 Second | <br><br><br>25kA | |

| Sr. No. | Description | Data By Purchaser | Data By Supplier |
|---|---|---|---|
| 15.0 | Maximum temperature rise over highest ambient ( refer annexure-B ) due to rated current in main contacts, measured after breaking test. | 40 deg C | |
| 16.0 | Rated short circuit breaking current | | |
| 16.1 | Rated short circuit current (Ac component) | | |
| 16.2 | Percentage DC component at KV | | |
| 16.3 | Asymmetrical breaking Current (including DC Component) | | |
| 16.4 | Making capacity (KA peak) – at KV | | |
| 17.0 | Rated operating sequence | O-0.3Sec.-CO-3Min.-CO | |
| 18.0 | Total break time (Milli-seconds) : | | |
| 18.1 | For interruption of 10% of the rated capacity | 60ms (max) | |
| 18.2 | For interruption of 30% of the rated capacity | 60ms (max) | |
| 18.3 | For interruption of 60% of the rated capacity | 60ms (max) | |
| 18.4 | For interruption of the full rated capacity | 60ms (max) | |
| 19.0 | Arcing time (Milli-seconds) | | |
| 20.0 | Opening time (Milli-seconds) | | |

| Sr. No. | Description | Data By Purchaser | Data By Supplier |
|---|---|---|---|
| 21.0 | Break time (Milli-seconds) | | |
| 22.0 | Closing time (Milli-seconds) | 60ms (max) | |
| 23.0 | Minimum re-closing time at rated interrupted capacity from the instant of the trip coil energisation (Milli-seconds) | | |
| 24.0 | Minimum dead time for | | |
| 24.1 | 3 phase re-closing (Milli-seconds) | | |
| 24.2 | Limit of adjustment of dead time for 3- phase re-closing. | | |
| 25.0 | Data on re-striking voltage for 100%, 50% or 30% rated capacity | 100% 50% 30% | |
| 25.1 | Phase factor | | |
| 25.2 | Amplitude factor | | |
| 25.3 | Natural frequency (Hz) | | |
| 25.4 | Rate of rise of re-striking voltage (V/micro sec.) | | |
| 26.0 | Rated out-of phase breaking current | | |
| 27.0 | Rated line charging breaking current | | |
| 28.0 | Maximum line charging current breaking capacity and corresponding over-voltage recorded in test:<br>a) On supply side<br>b) On line side | | |

| Sr. No. | Description | Data By Purchaser | Data By Supplier |
|---|---|---|---|
| 29.0 | Maximum cable charging current :<br>breaking capacity and corresponding over-voltage recorded in test:<br>a) On supply side.<br>b) On line side | | |
| 30.0 | Rated single capacitor bank : | | |
| 30.1 | Capacity in rush current handling, capability | | |
| 30.2 | Capacitive breaking current Capability. | | |
| 31.0 | Rated small inductive breaking current and the corresponding over voltage | | |
| 32.0 | First pole to clear factor | 1.5 | |
| 33.0 | Rated transient recovery voltage for terminal faults | | |
| 34.0 | Rated characters for short line faults is rate of rise. | | |
| 30.0 | Rated short circuit breaking current | | |
| 35.0 | Dry 1-minute power frequency test withstand voltage, for complete circuit breaker | | |
| 35.1 | Between line terminal and grounded parts (KV rms) | 80kV (rms) | |

| Sr. No. | Description | Data By Purchaser | Data By Supplier |
|---|---|---|---|
| 35.2 | Between terminals with breaker contact open (KV rms) | 80kV (rms) | |
| 36.0 | Wet 1-minute power frequency test withstand voltage : | | |
| 36.1 | Between line terminal and grounded parts (KV rms) | 75kV (rms) | |
| 36.2 | Between terminals with breakers contacts open (KV rms) | 75kV (rms) | |
| 36.3 | Between poles | | |
| 37.0 | 1.2/50 microsecond wave impulse with stand test voltage for complete circuit breaker: | | |
| 37.1 | Between line terminal and ground (KV peak) | 200kVp | |
| 37.2 | Between terminal with circuit breaker contacts open. | 200kVp | |
| 37.3 | Between Poles | | |
| 38.0 | Minimum Clearance in air. | | |
| 38.1 | Between phases (mm). | 320mm (min) | |
| 38.2 | Live parts and earth (mm). | 320mm (min) | |
| 38.3 | Live parts to ground level (mm). | 3700mm (min) | |

| Sr. No. | Description | Data By Purchaser | Data By Supplier |
|---|---|---|---|
| 39.0 | Number of operation possible without maintenance. | | |
| 39.1 | At full rated interrupting capacity | | |
| 35.2 | At 150% of rated current. | | |
| 39.3 | At 100% of rated current | | |
| 39.4 | At 50% of rated current. | | |
| 40.0 | Supporting Insulator | | |
| 40.1 | Make and type. | | |
| 40.2 | Insulation class | A | |
| 40.3 | Weight. | | |
| 40.4 | Transport dimensions. | | |
| 40.5 | Visible corona discharge voltage | | |
| 40.6 | Dry-1 minute power frequency flashover voltage. | 70kV rms | |
| 40.7 | Wet-1-minute power frequency lashover voltage. | 70kV rms | |
| 40.8 | 1.2/50 microsecond impulse flashover voltage. | 170kVp | |

| Sr. No. | Description | Data By Purchaser | Data By Supplier |
|---|---|---|---|
| 40.9 | Creepage distance to ground (mm)<br>a) Total<br>b) Protected | 31mm/kV | |
| 41.0 | No. of breaks per pole | 1 (one) | |
| 42.0 | Total length or breaks per phase (mm) | | |
| 43.0 | Type of main contacts | | |
| 44.0 | Material of main contacts | Silver plated copper | |
| 45.0 | Whether main contacts silver plated (Yes/No.)<br>Thickness of silver coating on main contacts (mm). | 15 +/- 5 microns (min) | |
| 46.0 | Contact pressure on arcing contacts (kg/m2). | | |
| 47.0 | Type of arcing contacts | | |
| 48.0 | Contact pressure on main contact (kg/m2). | | |
| 49.0 | Type of auxiliary switches. | | |
| 50.0 | Whether all contacts silver plated (Yes/No) | | |
| 51.0 | No. of auxiliary switch contacts operating with all three poles of breaker | | |
| 51.1 | Which are closed when breaker is closed. | | |

| Sr. No. | Description | Data By Purchaser | Data By Supplier |
|---|---|---|---|
| 51.2 | Which are open when breaker is closed | | |
| 51.3 | Those adjustable with respect to the position of main contacts | | |
| 52.0 | No. of spare auxiliary switch contacts operation with all three poles of breaker: | | |
| 52.1 | Which are closed when breaker is closed | 6 (six) | |
| 52.2 | Which are open when breaker is closed | 6 (six) | |
| 52.3 | Those adjustable with respect to the position of main contacts | | |
| 53.0 | Total number of terminal block | | |
| 54.0 | Number of spare terminal Block: | 20% | |
| 55.0 | Mounting flange details:<br>(a)Opening.<br>(b)Closing. | | |
| 56.0 | Tripping and closing circuit voltage (V). | 50V/110V/220V DC | |
| 57.0 | Power required for trip coil | | |
| 58.0 | Power required for closing coil. | | |
| 59.0 | Rated voltage for spring charging motor | 240V AC | |
| 60.0 | Rated voltage of space heater and socket | 240V AC | |

| Sr. No. | Description | Data By Purchaser | Data By Supplier |
|---|---|---|---|
| 61.0 | Contingencies for which alarm provided | | |
| 62.0 | Design data for supporting structure. | | |
| 63.0 | Weight of supporting steel structure for breaker. | | |
| 64.0 | Descriptive leaflets enclosed (Yes/No) | | |
| 65.0 | Operating Mechanism | | |
| 65.1 | Type of operating mechanism offered | | |
| 65.2 | Manufacturer's type designation | | |
| 65.3 | Material of control cabinet enclosure | | |
| 65.4 | Thickness of sheet metal enclosure | 3.0mm for bottom and 2.5mm elsewhere. | |
| 65.5 | Painting & colour shade | Polyurethane paint, 692 of IS-5 | |
| 65.6 | Enclosure protection | IP 55 | |
| 65.7 | Pad locking facility provided (Yes/No) | | |
| 65.8 | Wring<br>a) Control wire size<br>b) Insulation<br>c) Colour | <br>1.5 Sqmm<br>650V<br>Grey for control, Black for AC and Green for earth | |

| Sr. No. | Description | Data By Purchaser | Data By Supplier |
|---|---|---|---|
| 65.9 | Normal power consumption at rated voltage (Watt) | | |
| 65.10 | Normal power of spring charging motor | | |
| 65.11 | Number of close/open operation possible after failure of AC supply to motor | | |
| 65.12 | Time required to charge the closing spring | | |
| 65.13 | Whether indication of spring charged condition provided in central control cabinet (Yes/No) | Yes | |
| 65.14 | Dimension of the control cabinets. | | |
| 65.15 | Weight of control cabinet | | |
| 66.0 | Details of safety interlock provided | | |
| 67.0 | Whether supporting structure for circuit breaker provided (Yes/No) | Yes | |
| 67.1 | Thickness of galvanizing (mm) | | |
| 67.2 | Size of foundation bolts | | |
| 68.0 | Material of nuts & bolts | Stainless steel | |
| 69.0 | Weight of 3-phase breaker complete with operating mechanism, insulating support frame work, etc. | | |

| Sr. No. | Description | Data By Purchaser | Data By Supplier |
|---|---|---|---|
| 70.0 | Impact loading for foundation design to include load plus impact value on opening at maximum interrupting ratings in terms of equivalent of static load. | | |
| 71.0 | Weight of heaviest package | | |

**Annexure - D Guaranteed Technical Particulars (66kV Circuit Breaker)**

| Sr. No. | Description | Data By Purchaser | Data By Supplier |
|---|---|---|---|
| 1.0 | Name of manufacturer | | |
| 2.0 | Manufacturer's type and designation | | |
| 3.0 | Governing standard | As per Clause 1.0.0 0f the specification | |
| 4.0 | Type of circuit breaker | SF6 | |
| 5.0 | Installation | Outdoor | |
| 6.0 | No. of phase & no. of pole | 3 (Three), 3 (Three) | |
| 7.0 | Rated voltage (kV) | 66 kV | |
| 8.0 | Highest system voltage (kV) | 72.5 kV | |
| 9.0 | System Neutral | Solidly earthed | |
| 10.0 | Rated insulation level | 325kVp | |
| 11.0 | Frequency (Hz) | 50Hz | |
| 12.0 | Class | | |
| 13.0 | Normal current rating (amps) | | |
| 13.1 | Under standard conditions | 2000A | |
| 13.2 | Under site conditions overload rating<br>c) 1 Hour<br>d) 3 Hour | | |
| 13.3 | Derating factor, if any, for site condition | | |
| 13.4 | Temperature rise at 150% rating for 3 Hours | | |
| 14.0 | Short time current rating (kA)<br>(a) For 1 Second<br>(b) For 3 Second | <br><br><br>31.5kA | |

| Sr. No. | Description | Data By Purchaser | Data By Supplier |
|---|---|---|---|
| 15.0 | Maximum temperature rise over highest ambient ( refer annexure-B ) due to rated current in main contacts, measured after breaking test. | 40 deg C | |
| 16.0 | Rated short circuit breaking current | | |
| 16.1 | Rated short circuit current (Ac component) | | |
| 16.2 | Percentage DC component at KV | | |
| 16.3 | Asymmetrical breaking Current (including DC Component) | | |
| 16.4 | Making capacity (KA peak) – at KV | | |
| 17.0 | Rated operating sequence | O-0.3Sec.-CO-3Min.-CO | |
| 18.0 | Total break time (Milli-seconds) : | | |
| 18.1 | For interruption of 10% of the rated capacity | 60ms (max) | |
| 18.2 | For interruption of 30% of the rated capacity | 60ms (max) | |
| 18.3 | For interruption of 60% of the rated capacity | 60ms (max) | |
| 18.4 | For interruption of the full rated capacity | 60ms (max) | |
| 19.0 | Arcing time (Milli-seconds) | | |
| 20.0 | Opening time (Milli-seconds) | | |
| 21.0 | Break time (Milli-seconds) | | |

| Sr. No. | Description | Data By Purchaser | Data By Supplier |
|---|---|---|---|
| 22.0 | Closing time (Milli-seconds) | 60ms (max) | |
| 23.0 | Minimum re-closing time at rated interrupted capacity from the instant of the trip coil energisation (Milli-seconds) | | |
| 24.0 | Minimum dead time for | | |
| 24.1 | 3 phase re-closing (Milli-seconds) | | |
| 24.2 | Limit of adjustment of dead time for 3- phase re-closing. | | |
| 25.0 | Data on re-striking voltage for 100%, 50% or 30% rated capacity | 100% 50% 30% | |
| 25.1 | Phase factor | | |
| 25.2 | Amplitude factor | | |
| 25.3 | Natural frequency (Hz) | | |
| 25.4 | Rate of rise of re-striking voltage (V/micro sec.) | | |
| 26.0 | Rated out-of phase breaking current | | |
| 27.0 | Rated line charging breaking current | | |
| 28.0 | Maximum line charging current :<br>breaking capacity and corresponding over-voltage recorded in test:<br>c) On supply side<br>d) On line side | | |

| Sr. No. | Description | Data By Purchaser | Data By Supplier |
|---|---|---|---|
| 29.0 | Maximum cable charging current breaking capacity and corresponding over-voltage recorded in test:<br>a) On supply side.<br>b) On line side | | |
| 30.0 | Rated single capacitor bank : | | |
| 30.1 | Capacity in rush current handling, capability | | |
| 30.2 | Capacitive breaking current Capability. | | |
| 31.0 | Rated small inductive breaking current and the corresponding over voltage | | |
| 32.0 | First pole to clear factor | 1.5 | |
| 33.0 | Rated transient recovery voltage for terminal faults | | |
| 34.0 | Rated characters for short line faults is rate of rise. | | |
| 30.0 | Rated short circuit breaking current | | |
| 35.0 | Dry 1-minute power frequency test withstand voltage, for complete circuit breaker | | |
| 35.1 | Between line terminal and grounded parts (KV rms) | 140kV (rms) | |
| 35.2 | Between terminals with breaker contact open (KV rms) | 140kV (rms) | |

| Sr. No. | Description | Data By Purchaser | Data By Supplier |
|---|---|---|---|
| 36.0 | Wet 1-minute power frequency test withstand voltage : | | |
| 36.1 | Between line terminal and grounded parts (KV rms) | 140kV (rms) | |
| 36.2 | Between terminals with breakers contacts open (KV rms) | 140kV (rms) | |
| 36.3 | Between poles | | |
| 37.0 | 1.2/50 microsecond wave impulse with stand test voltage for complete circuit breaker: | | |
| 37.1 | Between line terminal and ground (KV peak) | 325kVp | |
| 37.2 | Between terminal with circuit breaker contacts open. | 325kVp | |
| 37.3 | Between Poles | | |
| 38.0 | Minimum Clearance in air. | | |
| 38.1 | Between phases (mm). | 630mm (min) | |
| 38.2 | Live parts and earth (mm). | 630mm (min) | |
| 38.3 | Live parts to ground level (mm). | 4000mm (min) | |
| 39.0 | Number of operation possible without maintenance. | | |

| Sr. No. | Description | Data By Purchaser | Data By Supplier |
|---|---|---|---|
| 39.1 | At full rated interrupting capacity | | |
| 35.2 | At 150% of rated current. | | |
| 39.3 | At 100% of rated current | | |
| 39.4 | At 50% of rated current. | | |
| 40.0 | Supporting Insulator | | |
| 40.1 | Make and type. | | |
| 40.2 | Insulation class | A | |
| 40.3 | Weight. | | |
| 40.4 | Transport dimensions. | | |
| 40.5 | Visible corona discharge voltage | | |
| 40.6 | Dry-1 minute power frequency flashover voltage. | 140kV rms | |
| 40.7 | Wet-1-minute power frequency lashover voltage. | 140kV rms | |
| 40.8 | 1.2/50 microsecond impulse flashover voltage. | 325kVp | |
| 40.9 | Creepage distance to ground (mm)<br>c) Total<br>d) Protected | <br><br>31mm/kV | |

| Sr. No. | Description | Data By Purchaser | Data By Supplier |
|---|---|---|---|
| 41.0 | No. of breaks per pole | 1 (one) | |
| 42.0 | Total length or breaks per phase (mm) | | |
| 43.0 | Type of main contacts | | |
| 44.0 | Material of main contacts | Silver plated copper | |
| 45.0 | Whether main contacts silver plated (Yes/No.) Thickness of silver coating on main contacts (mm). | 15 +/- 5 microns (min) | |
| 46.0 | Contact pressure on arcing contacts (kg/m2). | | |
| 47.0 | Type of arcing contacts | | |
| 48.0 | Contact pressure on main contact (kg/m2). | | |
| 49.0 | Type of auxiliary switches. | | |
| 50.0 | Whether all contacts silver plated (Yes/No) | | |
| 51.0 | No. of auxiliary switch contacts operating with all three poles of breaker | | |
| 51.1 | Which are closed when breaker is closed. | | |
| 51.2 | Which are open when breaker is closed | | |
| 51.3 | Those adjustable with respect to the position of main contacts | | |

| Sr. No. | Description | Data By Purchaser | Data By Supplier |
|---|---|---|---|
| 52.0 | No. of spare auxiliary switch contacts operation with all three poles of breaker: | | |
| 52.1 | Which are closed when breaker is closed | 6 (six) | |
| 52.2 | Which are open when breaker is closed | 6 (six) | |
| 52.3 | Those adjustable with respect to the position of main contacts | | |
| 53.0 | Total number of terminal block | | |
| 54.0 | Number of spare terminal Block: | 20% | |
| 55.0 | Mounting flange details:<br>(a)Opening.<br>(b)Closing. | | |
| 56.0 | Tripping and closing circuit voltage (V). | 50V/110V/220V DC | |
| 57.0 | Power required for trip coil | | |
| 58.0 | Power required for closing coil. | | |
| 59.0 | Rated voltage for spring charging motor | 240V AC | |
| 60.0 | Rated voltage of space heater and socket | 240V AC | |
| 61.0 | Contingencies for which alarm provided | | |
| 62.0 | Design data for supporting structure. | | |

| Sr. No. | Description | Data By Purchaser | Data By Supplier |
|---|---|---|---|
| 63.0 | Weight of supporting steel structure for breaker. | | |
| 64.0 | Descriptive leaflets enclosed (Yes/No) | | |
| 65.0 | For SF6 gas circuit breaker | | |
| 65.1 | Rated pressure of SF-6 Gas in the gas cylinder (kg./sq cm.). | | |
| 65.2 | Quantity of SF-6 gas required per single pole unit (kg.) | | |
| 65.3 | Quantity of SF-6 gas required cylinder (kg.) | | |
| 65.4 | Weight of empty cylinder (kg). | | |
| 65.5 | Quantity of absorbent required per pole (kg). | | |
| 65.6 | Recommended interval for renewal of absorbent in case of outdoor circuit breakers operating in tropical conditions. | | |
| 65.7 | Chemical composition of the absorbent | | |
| 65.8 | Quantity of absorbent covered in the scope of supply. (including spare qty. ) (kg). | | |
| 65.9 | Limit of gas pressure for proper operation of circuit breaker. | | |

| Sr. No. | Description | Data By Purchaser | Data By Supplier |
|---|---|---|---|
| 65.10 | Pressure and temperature at which the temperature compensated gas pressure switch will:<br>a) Give alarm.<br>b) Cut off. | | |
| 65.11 | Name of SF-6 supplier and country of origin. | | |
| 65.12 | Quantity of SF-6 gas supplied for:<br>a) Actual use in breaker (kg).<br>b) As spare (kg). | | |
| 65.13 | Chemical composition of gas:<br>a) Qty. of air by weight (ppm).<br>b) Qty. of H20 by weight (ppm).<br>c) Qty. of CF4 by weight (ppm). | | |
| 66.0 | Operating Mechanism | | |
| 66.1 | Type of operating mechanism offered | | |
| 66.2 | Manufacturer's type designation | | |
| 66.3 | Material of control cabinet enclosure | | |
| 66.4 | Thickness of sheet metal enclosure | 3.0mm for bottom and 2.5mm elsewhere. | |
| 66.5 | Painting & colour shade | Polyurethane paint, 692 of IS-5 | |

| Sr. No. | Description | Data By Purchaser | Data By Supplier |
|---|---|---|---|
| 66.6 | Enclosure protection | IP 55 | |
| 66.7 | Pad locking facility provided (Yes/No) | | |
| 66.8 | Wring<br>a) Control wire size<br><br><br>b) Insulation<br>c) Colour | <br>1.5 Sqmm<br><br><br>650V<br>Grey for control, Black for AC and Green for earth | |
| 66.9 | Normal power consumption at rated voltage (Watt) | | |
| 66.10 | Normal power of spring charging motor | | |
| 66.11 | Number of close/open operation possible after failure of AC supply to motor | | |
| | | | |
| 66.12 | Time required to charge the closing spring | | |
| 66.13 | Whether indication of spring charged condition provided in central control cabinet (Yes/No) | | |
| 66.14 | Dimension of the control cabinets. | | |
| 66.15 | Weight of control cabinet | | |

| Sr. No. | Description | Data By Purchaser | Data By Supplier |
|---|---|---|---|
| 67.0 | Details of safety interlock provided | | |
| 68.0 | Whether supporting structure for circuit breaker provided (Yes/No) | | |
| 68.1 | Thickness of galvanizing (mm) | | |
| 68.2 | Size of foundation bolts | | |
| 69.0 | Material of nuts & bolts | Stainless steel | |
| 70.0 | Weight of 3-phase breaker complete with operating mechanism, insulating support frame work, etc. | | |
| 71.0 | Impact loading for foundation design to include load plus impact value on opening at maximum interrupting ratings in terms of equivalent of static load. | | |
| 72.0 | Weight of heaviest package | | |

**Annexure - E 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 | | | |
| | | | |

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Reliance Energy
A Dhirubhai Ambani Enterprise

# Specifications

# Lightning Arrestor

## (66 & 33 KV)

**Specification no. : SP-LALU-01-R0**

| Prepared By | | Reviewed By | | Approved By | | Revision | Date |
|---|---|---|---|---|---|---|---|
| Name | Sign. | Name | Sign. | Name | Sign. | | |
| AAG | | HPB | | DG | | 0 | 29-Jan-2005 |

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**General Specification**

## 1.0.0 Codes & Standards

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

**National Standards**

| Standard Code | Standard Description |
|---|---|
| | Indian Electricity Rules |
| | Indian electricity act |
| | CBIP manual |
| IS : 3070 – Part 3 | Lightning Arresters for Alternating Current Systems |
| IS : 2071 - Part I | Method of high voltage testing |
| IS : 2629 - 1985 | Recommended Practice for Hot-Dip Galvanizing of Iron and Steel |
| IS : 5621 - 1980 | Hollow insulators for use in electrical equipment |
| IS : 6639 - 1972 | Specification for Hexagon Bolts for Steel Structures |

**International Standards**

| Standard Code | Standard Description |
|---|---|
| IEC 60099-4-2001 | Metal-Oxide Surge Arresters without gaps for AC Systems |

**Important Note :**

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

i. Specification including applicable codes, standards
ii. Guaranteed Technical Particulars (GTP)
iii. Approved Vendor Drawings

| Sr. No. | Description | Requirement / Rating |
|---|---|---|
| **2.0.0** | **Design Features** | Common for both 66KV and 33 KV Lightning Arresters |
| 2.1.0 | Application | To be used for protection of transformers, circuit breakers and other sub-station equipment against lightning and switching surges. |
| 2.2.0 | Type of Lightning Arrester | Gap-less metal oxide type (ZnO Type). |
| 2.3.0 | Pressure relief device | Pressure relief device of class 40 KA shall be provided. |
| 2.4.0 | Accessories | Refer Annexure-A : Scope of Supply. |
| 2.5.0 | Mounting | LA mounting vertically on steel structures with insulating bases.<br><br>Surge counters in weather proof enclosures suitable for mounting on structure of lightning arrester. |
| 2.6.0 | Line side Terminal Connectors | Suitable for ACSR Zebra/ Goat conductor (Refer GTP) |
| 2.7.0 | Ground Terminal Connectors | Suitable for 50x6 mm GS flat |
| 2.8.0 | Surge Counter | Non-resettable type |
| 2.9.0 | Name plate Marking | Following minimum information must be marked –<br>i) Name of the manufacturer<br>ii) Type and serial No.<br>iii) Model No.<br>iv) Rated voltage<br>v) Max. continuous Operating Voltage<br>vi) Nominal discharge current<br>vii) Pr. Relief Class<br>viii) Identification mark on each separately housed unit to enable it to be replaced in correct position after the multiunit arrester has been dismantled. |
| | | |
| **3.0.0** | **Approved Make of Components** | Common for both 66KV and 33 KV Lightning Arresters |
| 3.1.0 | Insulators | JSI / WSI/ BHEL/ Modern/ Saravana |
| | | |

| Sr. No. | Description | Requirement / Rating |
|---|---|---|
| **4.0.0** | **Testing & Inspection** | |
| 4.1.0 | Internal Test | Manufacturer shall carry out comprehensive inspection and testing during manufacture of the equipment. |
| 4.2.0 | Type test | The product must be of type tested quality. Type test reports shall be submitted for the type, size & rating of equipment offered along with bid. If the manufacturer's lab is accredited by govt./ authorised body then it shall be acceptable for type testing. |
| 4.3.0 | Routine test | As per relevant IS / IEC. |
| 4.4.0 | Acceptance test | As per relevant IS / IEC. |
| 4.5.0 | Test Witness | |
| 4.5.1 | | The Buyer reserves the right to witness all tests specified on completed product. |
| 4.5.2 | | The Buyer reserves the right to inspect the product at the Sellers works at any time prior to dispatch, to verify compliance with the specifications. |
| 4.5.3 | | In-process and final inspection call intimation shall be given in advance to purchaser. |
| 4.6.0 | Tests on fitting and Accessories | As per Manufacturer's Standards and relevant IS / IEC. |
| | | |
| **5.0.0** | **Drawing, Data & Manuals** | |
| 5.1.0 | To be submitted along with bid | The seller has to submit : |
| | i) | Tentative GA / cross sectional drawing of product showing all the views / sections. |
| | ii) | Detailed reference list of customers already using the offered product during the last 5 years with particular emphasis on units of similar design and rating. |
| | iii) | Completely filled GTP |
| | iv) | Deviations from this specification. Only deviations approved in writing before award of contract shall be accepted. |
| | v) | Details of manufacturer's quality assurance standards and program and ISO 9000 series or equivalent national certification. |

| Sr. No. | Description | Requirement / Rating |
|---|---|---|
| | vi) | Type test reports shall be submitted for the type, size & rating of product / equipment offered along with bid. In case the type test report for identical product is not available then type test report of nearby size/ rating shall be submitted for review. They shall be considered valid for 5 years from date of test performed on product /equipment. |
| | vii) | Complete product catalogue and Manual along with the bid. |
| | viii) | Recommended spare parts and consumable items for five years of operation with prices and spare parts catalogue with price list for future requirements |
| | ix) | Bill of material with make, model & quantity of items. |
| 5.2.0 | To be submitted after award of contract | The seller has to submit : for buyer's Approval (A) / Reference (R) |
| | i) | Program for production and testing (A) |
| | ii) | Guaranteed Technical Particulars (A) |
| | iii) | Calculations to substantiate choice of electrical, structural, mechanical component size / ratings (A) |
| | iv) | a) Detailed dimension drawing for all components, ge<br>b) Drawings of major components (A)<br>c) Rating and diagram plate (R) |
| | v) | Detailed loading drawing to enable the buyer to design and construct foundations (as applicable) (R) |
| | vi) | Transport / Shipping dimensions with weights (R) |
| | vii) | Detailed Bill of Materials for all fittings and accessories with their make, model & tag no. etc. (A) |
| | viii) | Detailed installation and commissioning instructions (R) |
| | ix) | Quality plan (A) |
| 5.3.0 | Submittals required prior to dispatch | The seller has to submit : |
| | i) | Inspection and test reports, carried out in manufacturer's works (R) |
| | ii) | Test certificates of all bought out items |
| | iii) | Operation and maintenance Instruction as well as trouble shooting charts/ manuals |
| 5.4.0 | Drawing and document sizes | Standard size paper A0, A1, A2, A3, A4 |
| 5.5.0 | No of drgs. / Documents required at different stages | As per Annexure- A |
| | | |

| Sr. No. | Description | Requirement / Rating |
|---|---|---|
| **6.0.0** | **Packing** | |
| 6.1.0 | Packing Protection | Against corrosion, dampness, heavy rains, breakage and vibration |
| 6.2.0 | Packing for accessories and spares | Robust wooden non returnable packing case with all the above protection & identification Label |
| 6.3.0 | Packing Identification Label | In 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 and Quantity |
| | 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 |
| | | |
| **7.0.0** | **Shipping, Handling & Storage** | |
| 7.1.0 | Shipping Information | The seller shall give complete shipping information concerning weight, size etc. of each package. |
| 7.2.0 | Shipping Constraints | The seller shall ascertain at an early date 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, upto the site. Any modifications required in the infrastructure and cost thereof in this connection shall be brought to the notice of the Purchaser. |
| 7.3.0 | Transit Damage | The seller shall be responsible for any transit damage due to improper packing. |
| 7.4.0 | Handling & Storage | Manufacturer's instructions shall be followed. Detail handling & storage instruction sheet / manual needs to be furnished before commencement of supply. |
| | | |

| Sr. No. | Description | Requirement / Rating |
|---|---|---|
| **8.0.0** | **Quality Assurance** | |
| 8.1.0 | Vendor quality plan | To be submitted for purchaser approval |
| 8.2.0 | Inspection points | To be mutually identified & agreed in quality plan |
| | | |
| **9.0.0** | **Progress Reporting** | |
| 9.1.0 | Outline Document | To be submitted for purchaser approval for outline of production, inspection, testing, inspection, packing, dispatch, documentation program |
| 9.2.0 | Detailed Progress report | To be submitted to Purchaser once a month containing |
| | i) | Progress on material procurement |
| | ii) | Progress on fabrication (As applicable) |
| | iii) | Progress on assembly (As applicable) |
| | iv) | Progress on internal stage inspection |
| | v) | Reason for any delay in total program |
| | vi) | Details of test failures if any in manufacturing stages |
| | vii) | Progress on final box up |
| | viii) | Constraints / Forward path |
| | | |
| **10.0.0** | **Deviations** | |
| | i) | Deviations from this Specification are only acceptable where the Seller has listed in his quotation the requirements he can't or does not wish to comply with and the buyer has accepted in writing the deviations before the order is placed. |
| | ii) | In the absence of a list of deviations, it will be assumed by the Buyer that the Seller complies fully with this specification. |
| | | |

**Annexure – A**

## 1.0 Scope

| Sr. No. | Description | Requirement / Rating |
|---|---|---|
| **1.0.0** | **Scope** | |
| 1.1.0 | Main Equipment | Design, manufacture, assembly & testing at manufacturer's works before dispatch, packing & delivery of Lightning Arresters rated up to 66 kV. |
| 1.2.0 | Accessories | |
| | i) | Supporting insulators for LA. |
| | ii) | Line terminal connectors. |
| | iii) | Surge counter with leakage current ammeter. |
| | iv) | Grounding terminal bracket |
| | v) | Necessary flanges alongwith all stainless steel hardware like nut bolts/ washers etc. for mounting of LA & surge Counter |
| | vi) | Suitably sized Cu flat or insulated copper cable for connection between LA and surge counter |
| | vii) | Any other item necessary or usual for efficient performance and satisfactory maintenance under the various operating and atmospheric conditions |
| 1.3.0 | Documentation | Submission of all drawings & documents pertaining to the equipment. |
| 1.4.0 | Site Supervision | Supervision of testing & commissioning of equipment at site. |
| 1.5.0 | Bill of Materials | Complete bill of materials shall be submitted in the following format. |

| Sr. No. | Purchaser Equipment Tag No. / Sap Code | Equipment Description | Location / Substation Name | Unit | Quantity |
|---|---|---|---|---|---|
| | | | e.g. Santacruz | Nos. | e.g. 1 |
| | | | e.g. Alaknanda | Nos. | e.g. 6 |
| | | | | | |
| | | | | | |

### 2.0.0 Document Submission

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

| Item Description | Along with offer | For Approval after award of contract | Final after approval | Remarks |
|---|---|---|---|---|
| Drawings | 3 copies (Typical drgs) | 4 copies + 1 Soft Copy | 6 copies + 1 soft copy in CD | See Clause 5.0.0 for various drawings required |
| Calculations | 3 copies (Typical) | 4 copies + 1 Soft Copy | 6 copies + 1 soft copy in CD | See Clause 5.0.0 for details |
| Catalogues | 1 copy | | 6 copies + 1 soft copy in CD | |
| Instruction manual | 1 copy | | 6 copies + 1 soft copy in CD | |
| Test Report | 2 copies | | 6 copies + 1 soft copy in CD | Type test and routine test reports |

### 3.0.0 Delivery Schedule

| Sr. No. | Description | Requirement / Rating |
|---|---|---|
| i) | Delivery period start date | From date of purchase order |
| ii) | Delivery period end date | As agreed with supplier |
| iii) | Material dispatch clearance | After inspection by purchaser |
| | | |

**Annexure – B**

**Ambient Conditions :**

**A) Mumbai**

| | | |
|---|---|---|
| a) | Average grade atmosphere | Heavily polluted , salt Laden, dusty, humid with possibility of condensation |
| b) | Maximum altitude above sea level | 1000 M |
| c) | Ambient Air temperature | Highest 45 deg C, Average 35 deg C |
| d) | Minimum ambient air temperature | 20 deg C |
| e) | Relative Humidity | 100 % Max |
| f) | Thermal Resistivity of Soil | 150 Deg. C cm/W |
| g) | Seismic Zone | 3 |
| h) | Rainfall | 3000 mm concentrated in four months |

**B) Delhi**

| | | |
|---|---|---|
| a) | Average grade atmosphere | Heavily polluted, dry |
| b) | Maximum altitude above sea level | 1000 M |
| c) | Ambient Air temperature | Highest 50 deg C, Average 40 deg C |
| d) | Minimum ambient air temperature | 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 |

**Annexure – C1**

**Guaranteed Tech. Particulars for 66KV Lightning Arrester**

| Sr. No. | Description | Data By Purchaser | Data by Supplier |
|---|---|---|---|
| 1 | Name of manufacturer | | |
| 2 | Type | Gapless, ZnO type, single pole, heavy duty, station class, pedestal mounted | |
| 3 | Model | | |
| 4 | No. of units. | | |
| 5 | Installation | Outdoor | |
| 6 | Application | Protection of Transformers, circuit breakers, lines and other outdoor S/S equipment. | |
| 7 | LA connection to system | Phase to earth | |
| 8 | Type of Conductor | ACSR Zebra / Goat | |
| 9 | Construction | Single Phase | |
| 10 | Rated voltage of arrester (KVrms) | 60 KV | |
| 11 | Nominal discharge current (Amps) (8x20 micro sec. wave) peak value | 10KA | |
| 12 | System Particulars | | |
| i) | Highest System Voltage | 72.5 KV | |
| ii) | Frequency | 50HZ ± 5% | |
| iii) | System neutral | Solidly earthed | |
| iv) | Max. value of temporary over voltage & its max. duration | | |
| | - Insulation level of equipment to be protected | 325 KVp | |
| | - System short circuit level | 31.5KA for 3 seconds. | |
| 13 | Maximum continuous operating voltage (MCOV) | 52KV | |
| 14 | Impulse withstand current | 100KAp | |
| 15 | Long Duration discharge class | 3 | |
| 16 | Minimum single impulse energy capability | | |
| 17 | Maximum residual voltage at switching impulse current of 1KAp (30/60 micro sec. wave) | 136 KVp | |

| Sr. No. | Description | Data By Purchaser | Data by Supplier |
|---|---|---|---|
| 18 | Max. residual voltage (1x20 micro sec. wave) | | |
| i) | At 05 KAp | | |
| ii) | At 10 KAp | | |
| iii) | At 20 KAp | | |
| 19 | Minimum creepage distance | 31 mm/KV | |
| 20 | Pressure relief class | 40KA | |
| 21 | Reference current (mA) | | |
| 22 | Leakage current at COV (mA) | | |
| | Resistive | | |
| | Capacitive | | |
| 23 | Dry and wet power frequency withstand voltage of arrester insulation (KVrms) | | |
| 24 | Virtual steepness for front of wave for above (KV/micro sec.) | | |
| 25 | Ratio of system voltage withstand level to protection level of surge arrester | | |
| 26 | High current impulse withstand 4/10 micro second peak value (KV) | | |
| 27 | Long duration current Impulse | | |
| i) | Current peak. | | |
| ii) | Virtual duration. | | |
| 28 | Temporary Over Voltage Capacity (KVp) | | |
| i) | At 0.1 Sec. | | |
| ii) | At 1.0 Sec. | | |
| iii) | At 10.0 Sec. | | |
| iv) | At 100.0 Sec. | | |
| 29 | Weight of complete unit (Kg) | | |
| 30 | Height of complete unit from base to the line side (mm) | | |
| 31 | Minimum recommended spacing between arresters Centro to Centro (mm) | | |
| 32 | Clearance required from ground equipment at various heights of arresters unit (mm) | | |

| Sr. No. | Description | Data By Purchaser | Data by Supplier |
|---|---|---|---|
| 33 | Earthing arrangement provided for earthing side of arresters. | | |
| 34 | Mounting flanges dimensional details. | | |
| 35 | Type and range of milli-ampere meter. | | |
| 36 | Type and specifications of the surge connecters. | | |
| 37 | Surge counter min. current for recording a lightning stroke | 200 Amp | |
| 38 | Surge counter max. disch. Current withstand | 100KA peak for 4/10 wave shape. | |
| 39 | Range of continuous leakage current at rated voltage with variation due to change in temperature & frequency | | |
| 40 | Size and length of flexible Cu cable for connection between LA & surge counter | | |
| 41 | Voltage time curve for thermal stability of LA after a stroke | To be provided | |
| 42 | Paint shade of surge counter housing | Polyurethane, 692 of IS-5 | |

**Annexure – C2**

**Guaranteed Tech. Particulars for 33KV Lightning Arrester**

| Sr. No. | Description | Data By Purchaser | Data by Supplier |
|---|---|---|---|
| 1 | Name of manufacturer | | |
| 2 | Type | Gapless, ZnO type, single pole, heavy duty, station class, pedestal mounted | |
| 3 | Model | | |
| 4 | No. of units. | | |
| 5 | Installation | Outdoor | |
| 6 | Application | Protection of Transformers, circuit breakers, lines and other outdoor S/S equipment. | |
| 7 | LA connection to system | Phase to earth | |
| 8 | Type of Conductor | ACSR Zebra / Goat | |
| 9 | Construction | Single Phase | |
| 10 | Rated voltage of arrester (KVrms) | 30 KV | |
| 11 | Nominal discharge current (Amps) (8x20 micro sec. wave) peak value | 10KA | |
| 12 | System Particulars | | |
| i) | Highest System Voltage | 36 KV | |
| ii) | Frequency | 50HZ ± 5% | |
| iii) | System neutral | Solidly earthed | |
| iv) | Max. value of temporary over voltage & its max. duration | | |
| | - Insulation level of equipment to be protected | 170 KVp | |
| | - System short circuit level | 26.3KA for 3 seconds. | |
| 13 | Maximum continuous operating voltage (MCOV) | 25KV | |
| 14 | Impulse withstand current | 100KAp | |
| 15 | Long Duration discharge class | 3 | |
| 16 | Minimum single impulse energy capability | | |
| 17 | Maximum residual voltage at switching impulse current of 1KAp (30/60 micro sec. wave) | 70 KVp | |

| Sr. No. | Description | Data By Purchaser | Data by Supplier |
|---|---|---|---|
| 18 | Max. residual voltage (1x20 micro sec. wave) | | |
| i) | At 05 KAp | | |
| ii) | At 10 KAp | | |
| iii) | At 20 KAp | | |
| 19 | Minimum creepage distance | 31 mm/KV | |
| 20 | Pressure relief class | 40KA | |
| 21 | Reference current (mA) | | |
| 22 | Leakage current at COV (mA) | | |
| | Resistive | | |
| | Capacitive | | |
| 23 | Dry and wet power frequency withstand voltage of arrester insulation (KVrms) | | |
| 24 | Virtual steepness for front of wave for above (KV/micro sec.) | | |
| 25 | Ratio of system voltage withstand level to protection level of surge arrester | | |
| 26 | High current impulse withstand 4/10 micro second peak value (KV) | | |
| 27 | Long duration current Impulse | | |
| i) | Current peak. | | |
| ii) | Virtual duration. | | |
| 28 | Temporary Over Voltage Capacity (KVp) | | |
| i) | At 0.1 Sec. | | |
| ii) | At 1.0 Sec. | | |
| iii) | At 10.0 Sec. | | |
| iv) | At 100.0 Sec. | | |
| 29 | Weight of complete unit (Kg) | | |
| 30 | Height of complete unit from base to the line side (mm) | | |
| 31 | Minimum recommended spacing between arresters Centro to Centro (mm) | | |
| 32 | Clearance required from ground equipment at various heights of arresters unit (mm) | | |

| Sr. No. | Description | Data By Purchaser | Data by Supplier |
|---|---|---|---|
| 33 | Earthing arrangement provided for earthing side of arresters. | | |
| 34 | Mounting flanges dimensional details. | | |
| 35 | Type and range of milli-ampere meter. | | |
| 36 | Type and specifications of the surge connecters. | | |
| 37 | Surge counter min. current for recording a lightning stroke | 200 Amp | |
| 38 | Surge counter max. disch. Current withstand | 100KA peak for 4/10 wave shape. | |
| 39 | Range of continuous leakage current at rated voltage with variation due to change in temperature & frequency | | |
| 40 | Size and length of flexible Cu cable for connection between LA & surge counter | | |
| 41 | Voltage time curve for thermal stability of LA after a stroke | To be provided | |
| 42 | Paint shade of surge counter housing | Polyurethane, 692 of IS-5 | |

**Annexure – D**

**Recommended spares (Data by supplier)**

List of recommended spares shall be submitted as follows –

| Sr. No. | Description of spare part | Unit | Quantity |
|---|---|---|---|
| 1 | | Nos. | |
| 2 | | Nos. | |
| 3 | | | |
| 4 | | | |
| 5 | | | |
| 6 | | | |
| | | | |

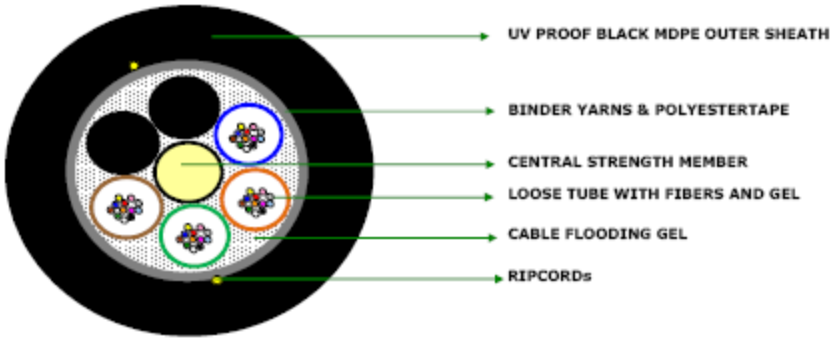
BSES

# 48F Composite Fiber Multitube (MDPE) Single Sheath Duct Lite Optical Fiber Cable

## PRODUCT INFORMATION

| | | |
|---|---|---|
| **Fiber** | | |
| **Single Mode Optical Fiber** | **36 Nos.** | |
| Maximum Cabled Fiber Attenuation dB/Km | | 1310nm : 0.36 & 1550nm : 0.23 & 1625nm : 0.26 |
| **Multi Mode Optical Fiber** | **12 Nos.** | **Fiber OM2 : 50/125** |
| Maximum Cabled Fiber Attenuation dB/Km | | 8500nm : 3.5 & 1300nm : 1.5 |
| **Loose Tube** | | |
| Filling Gel | | Thixotropic gel to prevent water ingress in loose tube (ITCO T 250) |
| Fiber Per Tube | 12 Nos. | |
| Tube | 4 Nos. | Thermoplastic Material (PBT) |
| **Core** | | |
| Central Strength Member | | Fibre Reinforced Plastic (FRP) to provide tensile strength and antibuckling properties. |
| Filler | 2 Nos. | Polyethylene Black |
| Water blocking elements | | Cable flooding gel is added in interstices of core to prevent water ingress in the cable core (ITCO C 480) |
| Core Covering | | Binder and Polyester Tape |
| **Cable** | | |
| Rip Cord | 2 Nos. | Polyester Based Twisted Yarn — Applied below Outer Sheath |
| Outer Sheathing | | UV Proof Black MDPE (ME 6052/ME 6056) — 2.2 mm Nominal Thickness |

## CONSTRUCTIONAL DETAILS




Typical construction Diagram - Not to Scale

## OPTICAL FIBER CABLE PERFORMANCE

| MECHANICAL | | | | ENVIRONMENTAL | |
|---|---|---|---|---|---|
| **Max. Tensile strength** | 2500 N | **Crush Resistance** | 2000 N / 100x100 mm | **Temp. Performance** | |
| **Minimum Bend Radius** | 20 D | **Impact strength** | 25 Nm. | **Installation** | -20°C to +80°C |
| **Repeated Bending Test** | 20 D,30Cycle | **Torsion** | ±180° | **Service** | -20°C to +80°C |
| | | | | **Storage** | -20°C to +80°C |
| **Water Penetration** | 1m head, 3m samples, 24 Hr | | | **Drip Test** | 30 cm, 70°C, 24 hr |

*Tests shall be carried out as per IEC 60793 & IEC 60794-1-2/GR 20 Standards. Change in attenuations shall be ≤ 0.05 dB.*

## COLOR DETAILS

| | |
|---|---|
| **Optical Fibre Colour** | Blue, Orange, Green, Brown, Slate, White, Red, Black, Yellow, Violet, Pink, Aqua. |
| **Loose Tube Colour** | For G657A1 : Blue, Orange, Green & For OM2 : Brown. |
| **Outer Sheath Colour** | Black |

## PHYSICAL PARAMETERS

| | | | | | |
|---|---|---|---|---|---|
| **Cable Diameter (mm)** | 11.75 ± 0.25 | **Cable Wt. (Kg/Km)** | 114 ± 10% | **Cable Length:** | 2 Km ± 5% |

## PRINTING DETAILS

| | |
|---|---|
| **Cable Printing details** (White - Hot Foil Emb.) | MONTH & YEAR OF MANUFACTURE LENGTH CODE METER MARKING |

The accuracy of marking shall be ± 0.5%. Occasional loss of printing & remarking shall be as per Bell core CR 20 and this supercedes the earlier markings.

BSES

# TECHNICAL SPECIFICATION

# FOR

# LAYING OF PVC/XLPE CABLES FOR 33kV & 66kV CABLE

## SPECIFICATION NO – BSES-TS-168-CL-R0

| | | |
|---|---|---|
| Rev: | | 0 |
| Date: | | 13th January, 2026 |
| Pages: | | |
| Prepared by | Pronab Bairagi | |
| | Vijender Goyal | |
| Reviewed by | Anupam Kumar | |
| | Srinivas Gopu | |
| Approved by | Deepti Sharma | |
| | Amit Tomar | |

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# 1. CODES & STANDARDS

Materials, equipment and methods used in the Laying for 33kV and 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, (2007, 2017) |
| 3 | --- | Indian Electricity Supply Act, (2007, 2017) |
| 4 | --- | Electricity Laws Act, (2007, 2017) |
| 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 2274 | Code of Practice for electrical wiring installation – system voltage exceeding 650V |
| 8 | IS 7098 Part II | Crosslinked Polyethylene Insulated PVC sheathed cables for working voltages from 3.3KV upto and including 33KV |
| 9 | IS 5820 | Specification of precast concrete Cable cover. |
| 10 | --- | Central Electricity Authority (Measures relating to Safety and Electric Supply) Regulations, 2023 |

# 2. DESIGN GUIDELINES AND PARAMETER FOR CABLE LAYING

| S. No. | Parameter | Details |
|---|---|---|
| 2.1 | Selection of Cable Route | The cable route selection shall be done by the concerned supervising engineer by first conducting route survey and selecting a route along with contractor and further clearance shall be taken from different department as mentioned below-:<br>-The side of road which presents the least obstacles and the fewest roadways crossings.<br>-The future consumers and existing cables in the route may influence the cable route.<br>-Railway, road crossings, MCD, other government agencies (MCD/PWD/DDA ) and other private owner<br>-Plans for future building projects should be considered.<br>-The route shall be as far as possible away from parallel running gas, water pipes and telephone/telecommunication cables.<br>- Safety Clearance<br>- Quality Clearance – in process and final inspection /testing.<br>- Traffic police / Concern authority.<br>- GPR shall be done by vendor of whole the route (before and after of cable laying) and same shall be submitted to BYPL/BRPL. This work shall be done by vendor both before |

| | | |
|---|---|---|
| | | and after execution of job. (refer Fig 5, Fig 6 Fig 11)<br>Route survey with Cable avoidance Tool (Cable locator) to be checked for other electrical cable, utility services and depth of installations |
| 2.2 | Site Preparation | a) Barricading:<br>• The identified cable route shall be barricaded continually before excavation.<br>• Barricading shall be as drawing laid<br>• Open Trench method shall be adopted as far as possible for trench preparation.<br>b) Excavated Earth:<br>• The excavated earth shall be so stored at site, that it shall not cause trouble to running traffic<br>• All excavated earth shall be stored within the barricaded area.<br>c) Full-height fence, along with barriers, barricades, shall be installed around the site to safeguard the work area from accidents caused by fast-moving vehicles. Similarly, barricades protect road users from hazards arising from construction equipment and temporary structures.<br>d) The dimensions, materials, composition, colour scheme, BSES logo, and other details of the barricades shall comply with the specifications and drawings provided in the tender documents.<br>e) All barricades shall be installed as per the employer's approved design, properly numbered, clearly painted, and maintained in good condition. The designated barricade in-charge shall also maintain a barricade register at the site.<br>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.<br>g) PPP to be provided by vendor to all workers and engineers.<br>h) Also refer Annexure- 7: Barricading and Safety |
| 2.3 | Clearance | The desired minimum clearances are as follows –<br>- Power cable to power cable – A minimum clearance equal to diameter shall be maintained. Trench drawings shall be referred to for guidance.<br>- Power Cable to control cables – 0.2 m |

| | | |
|---|---|---|
| | | - Power cable to communication cable – 0.3 m<br>- Power cable to gas/water main – 0.3 m |
| 2.4 | Depth of Cable Laying | The desired minimum depth of laying from natural ground surface to the top of cable shall be:<br>19/33kV grade XLPE Cables – 1235 mm<br>38 / 66kV grade XLPE Cables – 1445 mm.<br>Cables at Road crossing - 1.0 M (min.)<br>Cables at railways level crossings (measured from bottom of sleepers to the top of Pipe) - 1.0 M (min.)<br>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.<br>In case approval for deviation in regard to depth of cable & joint is sought, provide additional protection / safe guarding for cable& joint such as providing double layer tile on top and RCC tiles at the sides, HDPE / GI pipe / HUME pipe etc |
| 2.5 | Width of Cable Trenches | - The width and depth of Cable Trenches shall depend upon number of circuits and Voltage Grade and drawings of this specification shall be followed.<br>- The trench should be wide enough so that persons can stand in it and guide the cable when cable laying process is in progress.<br>- Whenever the excavation is across streets, Opposite Gate, signal, Rectify or where ever it is necessary, laying of HDPE/RCC pipes is necessary. The size of the pipes should be sufficiently large to allow cables to be pulled through freely and to lay additional cables in future. Besides, for future use, additional pipes also may be laid across road or under railway tracks. The mouth of these additional pipes shall be effectively blocked to prevent pipes from being chocked. 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. |
| 2.6 | Bending Radius of Cables | 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 –<br>A) Single Core Cables ( PVC& XLPE)<br>33kV and 66kV grade - 20 X D<br>B) Multi Core Cables ( PVC& XLPE)<br>33kV and 66kV grade - 20 X D Where ‘D’ is overall diameter of the cable.<br>The rollers, corner rollers and properly aligned and smooth-running cable rollers should be placed every 3 to 4 m (at least) in the cable trench. (refer Fig 1, Fig 2, Fig 3, Fig 4 and Fig 10) |
| 2.7 | Maximum | For cables pulled with Stocking |

| | | |
|---|---|---|
| | permissible Tensile Strength for Cables | PVC and XLPE SWA Armoured cables P = 30 X D<br>PVC and XLPE AWA Armoured cables P = 20 X D<br>Where P= pulling force in kgf, D= Diameter of Cable in mm<br><br>For Cables pulled by Cable eyes<br>Aluminium conductor – 30 N/mm2 = 3 Kg/sq. mm<br><br>Permissible force is calculated by multiplying the above values by cross sectional area (CSA) of conductor of each core and then number of cores. |
| 2.8 | Methods of Laying | 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.<br><br>b) HDPE pipe ( Ref annexure- 8 for sizes of HDPE pipe ) including RCC cover/ducts over the laid HDPR pipe shall be used where cable cross roads and railways tracks in open trench. After finishing of RCC cover/duct over the laid HDPE pipe, warning tape shall also be laid for identifications. Spare ducts for future extensions should be provided. Spare duct should be sealed off. Buried ducts or ducting blocks shall project into footpath or up to the edge of road, where there is no footpath, to permit smooth entry of cable without 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.<br><br>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 minimized so that it doesn't exceed by 12% of total route length. This is to avoid De-rating of Cables.<br><br>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.<br><br>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.<br><br>f) 75 mm of the sand bed shall be placed at the bottom of cable trench.<br><br>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.<br>h) To protect the cables against external mechanical damage, which may be caused by other agencies, the cable shall be protected by suitable cover including the portion of route where HDPE pipe used in open trench. (for drawing of RCC cable cover refer annexure-9).<br><br>i) The type of the covers shall be as under<br>- 33KV Cables – Single layer of RCC slab<br>- 66KV Cables – Single layer of RCC slab<br>The RCC cable cover shall be embossed as “BSES EHVCABLE”.<br><br>j) Back fill to be filled up to 75mm and the warning tape shall be installed continuously even on the RCC cover used over the HDPE pipe in open trench. 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.<br><br>k) The trench shall be filled-up by loose soft soil (300mm) and Excavated soil as indicated in drawings.<br>l) RFID Active ball and passive ball shall be used for identification of route before backfilling of trench. Passive ball shall be placed at every 50 mtr distance of the route (1 no for combine route at every 50 mtr) and active ball shall be placed for each joint. Vendor shall also provide the mapping of route by using RFID ball in latest software. All kind of software and other technical |

| | | |
|---|---|---|
| | | requirement shall be in the scope of the bidder. |
| 2.9 | Cable over Bridges | On Bridges the cables are generally supported on wooden cleats and clamped on steel supports at regular intervals. The cables laid on bridges shall be provided with Sun shield.<br>Approval from appropriate authorities (PWD/railways) as applicable shall be taken by contractor. |
| 2.10 | laying EHV cables passing over open Nallah | Where ever there is a water body, drain, or an open nallah crossing during cable laying, the same shall be laid through truss made up of MS structure with coating of red oxide &aluminium paint.<br>• The MS Structure should have adequate mechanical protection and electrical clearance.<br>• Ensure continuous electrical earthing of metallic parts.<br>• The cables shall be laid in HDPE pipes<br>• For Design & Construction of Truss the laying agency/vendor should take approval from BRPL Civil Deptt.<br>• For single core cables, the cables are preferred to be laid on non-magnetic material (placed on MS structure and beneath the cables), like thick Bakelite sheet, FRP cable supports, refractory bricks etc. |
| 2.11 | Laying of Single Core Cables | a) The single core cables shall be laid in trefoil formation. Single core cables can be laid individually as per the recommended HDPE pipe in case of HDD only.<br>b) For single core cables laid in trefoil formation, plastic/nylon cable ties shall be used at interval of 1.0 (one) meter throughout the cable length to maintain the trefoil arrangement.<br>c) To balance the inductance, the phase sequence in trefoil format shall be maintained by vendor (for double circuit)<br>d) To avoid induced circulating current effect, it is not recommended to uses any kind of metallic pipe for single core cable laying job. HDPE pipe shall be used where and when it is required with suitable recommended dia. |
| 2.11 | Earthing of Single Core Cables | a) . Cross bonding shall be provided throughout the feeder length. At each 500 mtr length link box without SVL and at 1500 mtr length link box with SVL shall be provided to mitigate the circulating current effect.<br>b) Link cable shall be copper XLPE insulated 1Cx240 |

| | | |
|---|---|---|
| | | sqmm<br>c)<br>d) Link box shall be metallic with all copper accessories inside<br>e) Link box shall be accessible from over the ground level without any requirement of digging<br>f) Vendor has to submit proper design calculation along with BOM and their relevant type test (CPRI/ERDA) only for approval of BSES |
| 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.<br>BYPL/BRPL inspector/engineer in-charge shall be empowered to impose the above penalty. |

## 3. GENERAL GUIDELINES FOR LAYING CABLES

| S. No. | Parameter | Details |
|---|---|---|
| 3.1 | General | 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.<br>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<br>c) The contractor shall submit a drawing for the complete scheme showing the entire route, road crossings, location of joints and also the arrangement of cables to be laid. In case due to site exigencies, cables have to cross over within the trench, the same shall be shown in the drawing. For each and every job, these drawings shall be approved by BSES, prior to commencement of work.<br>d) BSES shall arrange for all the material and manpower required for jointing and end termination for in-house project only not for EPC/turnkey. 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 |

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| | | time.<br>e) Also contractor shall provide Engineer/Diploma , Labour , supervisor<br>*(*Man power shall have valid identity cards, numbers may vary as per<br>site condition and job requirement, availability and urgency of job)<br>f) 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. |
| 3.2 | Handling and Storage of Cable drums (All empty drums are returnable) | 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.<br>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.<br>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.<br>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 if not returned to BSES in case of in-house project. For turnkey/EPC |

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| | | project, empty drum shall be returnable basis to the vendor |
| 3.3 | Cable Laying | a) The ground over which the drum is positioned at site should be properly consolidated and jacks placed on both sizes of the drum to make the pay-off arrangement stable. Suitable arrangement be made to stop the drum rotation, during cable laying preferably by square wooden poles kept temporarily pivoted over cable roller under the flanges which when required can be applied on the flange as a brake by personnel manning the drum.<br>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.<br>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.<br>d) The pulling method to be used shall be approved by BSES. Cable supplier's recommended maximum pulling tension shall not be exceeded.<br>e) Rollers shall be placed at intervals (preferably 3 to 4 mtr at least) 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.<br>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.<br>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.<br>h) Check list for cable laying to be filled and submitted by the contractor to BYPL/BRPL (refer annexure-01) |
| 3.4 | Excavation of the Trenches | 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.<br>b) Before excavating any section of the trench, the contractor shall ensure that the trench line is free from underground obstructions by conducting trial pits along the proposed trench alignment. The exact location of each trench shall be approved on site by BSES. |

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| | | Trenches shall be kept as straight as possible and excavated to the approved formation and dimensions. Where required, trenches shall be properly shored with wooden planks and bracing to prevent cave-ins that could cause injury to personnel or damage to the laid cables.<br>c) 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.<br>d) The trench excavation and filling in shall be so executed that all walls, roads, sewers, drains, pipes, cables, structures, places and things shall be reasonably secured against risk of subsidence or injury and shall be carried out to the satisfaction of the authorities concerned. Should, however, a damage to an existing or other services be made, the Contractor will arrange and pay for any necessary repair, to make good the damages.<br>e) 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.<br>f) 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.<br>g) 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.<br>h) As the work proceeds and pipes or other services are unearthed, they must be supported temporarily with ropes or chains. If there is any danger of soil failing in, timbering or shuttering may have to be resorted to as the excavation proceeds. There must be no unevenness no rocks or stones to damage the cable. |
| 3.5 | Excavated material | 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.<br>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 |

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| | | for refilling the trench on completion of laying; surplus material shall be disposed off by the contractor at his own cost. |
| 3.6 | Pipes and Ducts | 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.<br>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 200 mm or more of PCC (1:2:4) as per the site requirement<br>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).<br>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.<br>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.<br>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.<br>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. |
| 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 |

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| | | commencement or work. The joint position should be staggered. |
| 3.8 | Back filling of trenches | 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.<br>b) The trench shall be backfilled after putting all protections for cables.<br>c) Soft soil shall be backfilled for 300 mm above the cable protection cover.<br>d) Caution Tape shall be laid all along the cable route above the soft soil filling.<br>e) Complete backfilling shall be done above the caution tape. |
| 3.9 | Temporary Reinstatement | 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.<br>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.<br>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. |
| 3.10 | Permanent Reinstatement of Public Road, | 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.<br>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. |
| 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 | All cables routes shall have markers at suitable location with a |

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| | Markers | gap not exceeding 50 meters. The route markers shall be approved design. Additional markers shall be provided at joint locations with approved markings.<br>If installing route marker is not possible, deviation to be taken in format (refer Fig 9) |
| 3.13 | Cable supports / Clamps | 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<br>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 | 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.<br>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.<br>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.<br>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, |

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| | | 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 | a) BSES intents to show all the cable routes, location of joints and other underground obstructions on a GPS map.<br>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 including tools and tackles | a) The contractor shall arrange for all the tools and tackles (own/ external services) required for cable laying as per this specification mentioned below-<br>I. Roller for cable laying<br>II. Manila ropes<br>III. Crow bar as per site requirement<br>IV. Wooden slipper as per site requirement<br>V. Spades (Phowrahs)<br>VI. Pick Axes chisel (wide) & point end<br>VII. Shovels (Square Nose)<br>VIII. Mortar pans |

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| | | IX. Wood cutting Axe<br>X. G I Wire<br>XI. Cable Grip for pulling purpose<br>XII. Diesel /petrol operated dewatering pump<br>XIII. Measurement Tape<br>XIV. Lighting accessories<br>XV. Testing instruments / services (as per specification)<br>XVI. Cable avoidance Tool (Cable Locator) and Ground penetrating Radar (GPR)<br>XVII. Barricading (MS plate, refer enclosed drawing )<br>XVIII. Cable cutter / Hacksaw Blade<br>XIX. Discharge rod, earth cable, voltage detector, crocodile clamp<br>XX. Tools and tackles for joints and termination<br>XXI. Ladder if required.<br>XXII. "Man At Work" Caution board with Stand / Sign Board<br>XXIII. Torque wrench (Range – 0 to 100 N.m)<br>XXIV. Road breaking compressor/ Pneumatic hammer<br>XXV. Core cutting / concert cutting machine<br>Horizontal Drilling services<br><br>b) BSES shall arrange for all the material and manpower required for jointing and end termination for in-house project. For turnkey/EPC project, vendor to arrange jointer from the OEM jointing kit only<br>c) Illumination and Power supply shall be arranged by the contractor so that the work can be carried out round the clock.<br>d) 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<br>e) The contractor shall make arrangement to provide suitable scaffolding arrangement to carry out the termination work<br>f) 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<br>g) Also refer Annexure-7: Barricading and Safety. |
| 3.19 | Type of Roads and guidelines for road restoration | The typical section of type of Roads (based on width) under PWD and MCD are :-<br>- 20 Feet Wide road<br>- 30 Feet wide road<br>- 40 to 60 Feet Road |

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| | | - Other ( which include Kota stone, Agra stone, Cement concrete, interlocking paving tiles, brick road, chequered tiles and asphalted road) |
| 3.20 | Materials Consumable | • For running length<br>o Sand<br>o Warning/Caution Tape<br>o Red Bricks continuous (without any gap)<br>o HDPE/RCC pipes as per cable size<br>• For joint coffin<br>o Cement<br>o Sand (for brick works and sand filling)<br>o RCC tiles on top<br>Consumable item's consumption will be depended on site conditions & hence will vary, vendor has to provide all kind of consumable items irrespective of the list mentioned above. |
| 3.21 | Preparation before jointing | • Proper joint position should be selected for jointing.<br>• The joint pit should be of sufficient dimensions as to allow jointers to work. Sides of the pit should be well covered with tarpaulin sheets to prevent loose earth from falling. When jointing cables in water logged ground or under monsoon conditions, sump hole should be excavated at one end of the joint pit in such a position so that the accumulating water can be pumped out or bailed out without causing interference to the jointing operation and tarpaulin tent to be made to avoid rain water. The jointing as far as possible is to be carried out inside a tent. |
| 3.22 | Jointing of cables | Contractor to ensure the jointing of cable joints as per the instruction manual of manufacturer (sample manuals refer annexure-05).<br><br>• All joints and terminations shall be installed by Original Equipment Manufacturer.<br>• To maintain minimum 10 mtr Cables in between two joints<br>• Double earthing should be maintained in joints by wrapping provided nos of cropper braids across the joints and tightening it through armour clamps on both sides<br>• Binding wire is used while removing the semi con layer and copper tape for avoid the uneven cuts and voids<br>• Maintain the crimping sequence over the ferrule for uneven expansion of ferrule during the crimping<br>• Avoid any scratches and cut marks in XLPE insulation while removing the semi con layer<br>• Proper filing the XLPE insulation by emery paper for removing impurities of semi-conductor and voids. |

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| | | • Match the R/Y/B phase sequence at both ends of the joint by using Megger/Multi meter for maintaining the phase sequence in new joints.<br>• Safeguard the joint by covering it with the help of RCC Slab, sand and by making coffin for safe guarding the joints from mechanical damage and water logging. (refer Fig 20) |
| 3.23 | Pre installation checks during termination | • Identify and maintain phasing sequence: At work place identify each phase with respective core |
| 3.24 | Termination process | • Contractor to ensure the jointing of cable joints as per the instruction manual of manufacturer (sample manuals refer annexure-05).<br>• All joints and terminations shall be installed by Original Equipment Manufacturer for all kind of project (i.e. turnkey/EPC/In-house) |
| 3.25 | Cable termination connection procedures | • Properly crimped lugs are to be connected using bi-metallic washer (if applicable), plain washer, spring washer and proper lugs. Copper based conductivity paste shall be applied at all metal-to-metal contact surfaces.<br>• Apply 7 to 8 layers of EPR tape covering all live portions in termination area with 50% overlap. This tape shall be stretched to minimum 200% while applying. No live part should be left exposed.<br>• In highly moisture prone areas, such as river / nalla, dumping area & area nearby creeks, 2 additional layers of self-fusing silicone tape shall be applied over the entire bushing and the area already covered by filler tape along with EPR tape.<br>• Please ensure use of PVC tape is forbidden. |
| 3.26 | After jointing and termination work checks | • Remove all packing, waste material and dump in appropriate place.<br>• Clean, backfill and level the whole work area as per ground levels.<br>• Remove the barricading, sign board etc.<br>• Shift all the manpower and tools and tackles from the Site<br>• Test the cable as mentioned in point no 12 above<br>• Inform BYPL/BRPL team (SDO/HT Breakdown/project in-charge who issued PTW) for cancellation of permit to work<br>• Following data reports along with completion report shall be submitted:<br>o Material received by contractor |

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| | | ○ Material reconciliation sheet<br>○ Unused / scrap material return sheet (refer annexure-03)<br>○ Field test reports<br>○ Cable route with depth details and GPS coordinates of joints on GIS map<br>○ OEM Job cards of cable jointing and termination<br>○ Check list for cable laying |

## 4. TESTING

| S. No. | Parameter | Details |
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| 4.1 | Tests to be carried out during and after completion of Cable Laying | Testing of cable before jointing –<br>- Cable shall be tested for Insulation Resistance prior to laying by opening the end and resealing end properly.<br><br>Testing on complete Cable Installation –<br><u>LT Cable:</u><br>a) Insulation resistance of each core shall be measured against all the other cores and the metal screen connected to earth.<br>b) DC High Voltage (3kV for 5 mnt)<br><br><u>EHV Cable:</u><br>c) Insulation resistance of each core shall be measured against all the other cores and the metal screen connected to earth.<br>d) The resistance of the conductor shall be measured.<br>e) VLF high voltage test as per IEEE 400.2 (instead of DC high voltage test)<br>○ VLF = 0.1 Hz Sinusoidal<br>f) VLF tan delta as per IEEE 400.2<br>○ VLF = 0.1 Hz Sinusoidal<br>○ Measure and record: Mean TD at U0, Tip up (TU) (difference in mean TD) between 0.5 U0 and 1.5 U0, TD time stability (Sdev) measured by standard deviation at U0<br>○ Refer sample report and diagrams (refer Fig 13, Fig 16)<br>g) VLF partial discharge as per IEEE 400.2<br>○ VLF = 0.1 Hz Sinusoidal<br>○ Measure and record: PD calibration, PD mapping, PD summary parameters such as PDIV, PDEV, PD max & PD level at 1Uo, 1.7Uo & 2Uo and operating mode / frequency, General and localized Phase Resolved PD pattern (PRPD)<br>○ Refer sample report and diagrams (refer Fig 14, Fig 17, Fig 18, Fig 19) |

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| | | h) Sheath Test (refer Fig 12)<br>i) Charging of Cable at No-Load at Nominal working voltage for 24 Hours. |
| 4.2 | Statutory clearance | a) Road cutting permission<br>Road cutting permission shall be taken from competent authority by vendor. However official fees shall be paid by BYPL/BRPL.<br>b) Electrical inspector clearance<br>Electrical Inspector clearance shall be in vendor scope. However official fees shall be paid by BYPL/BRPL. |

## 5. PROGRESS REPORTING

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

## 6. DRAWING, DATA & MANUALS

| S. No. | Parameter | Details |
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| 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'.<br>a) Feeder details ( sending end, receiving end, SAP number of project etc)<br>- Type of cables, cross section area, rated voltage. Details of construction, cable number & drum number.<br>- Year and month of laying.<br>- Actual total route length, cable length, length between joint to joints or end.<br>- Location of cables and joints in relation to certain fixed reference points, for example buildings, hydrant, boundary stones etc. |

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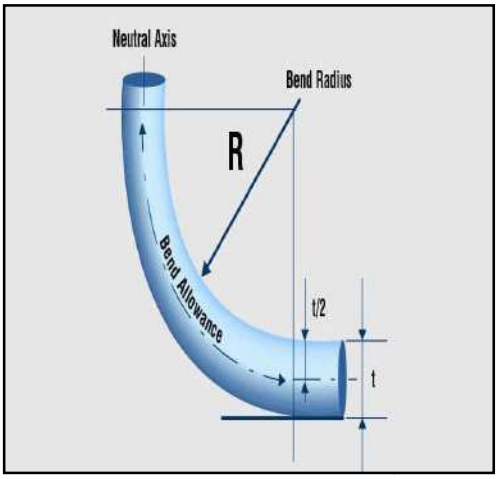
| | | - Jointing reports detailing the date, weather conditions, jointers and supervising Engineers names, details of type of cable and type of joint or termination, location and joint bay number, ambient temperature.<br>- Results of original electrical measurements and testing on cable installation.<br>- 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.<br>- Following data reports along with completion report shall be submitted:<br>o Material received by contractor<br>o Material reconciliation sheet<br>o Unused / scrap material return sheet (refer annexure-03)<br>o Field test reports<br>o Cable route with depth details and GPS coordinates of joints on GIS map<br>o OEM Job cards of cable jointing and termination<br>o Check list for cable laying<br>o Deviation to be taken in format (Annexure-2) |
| **6.2** | Drawing and document sizes | Standard size paper A0, A1, A2, A3, A4 |

## 7. 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, BYPL/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 # 2



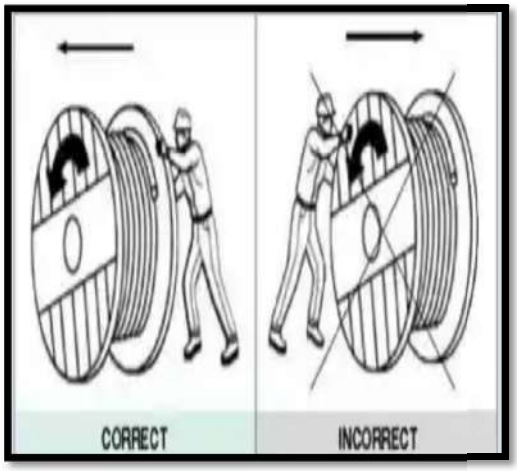




**Figure 1: Min Bending Radius = OD × Bending Factor Figure 2**

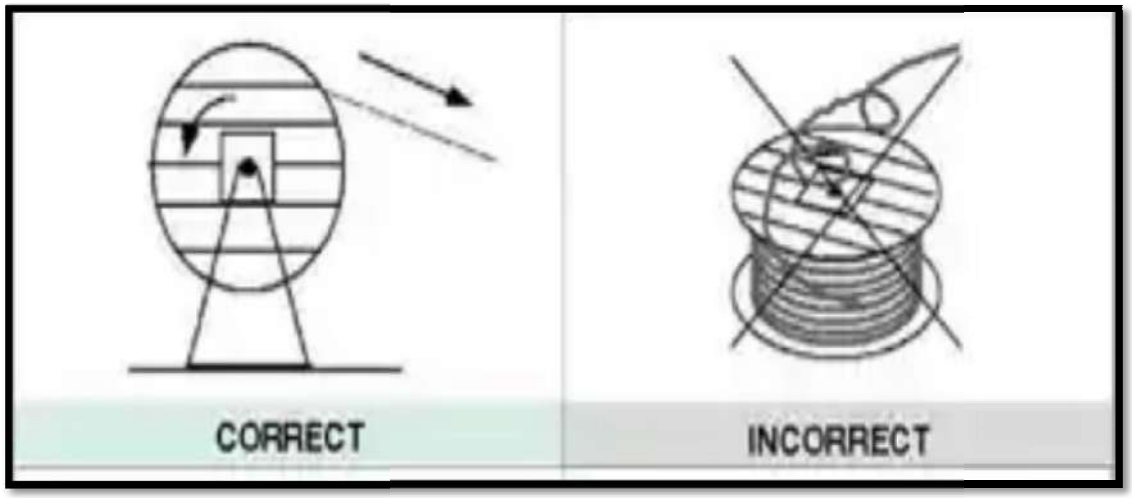



Figure 3



Figure-4 (Rollers for cable pulling and Jack for Free Reeling)

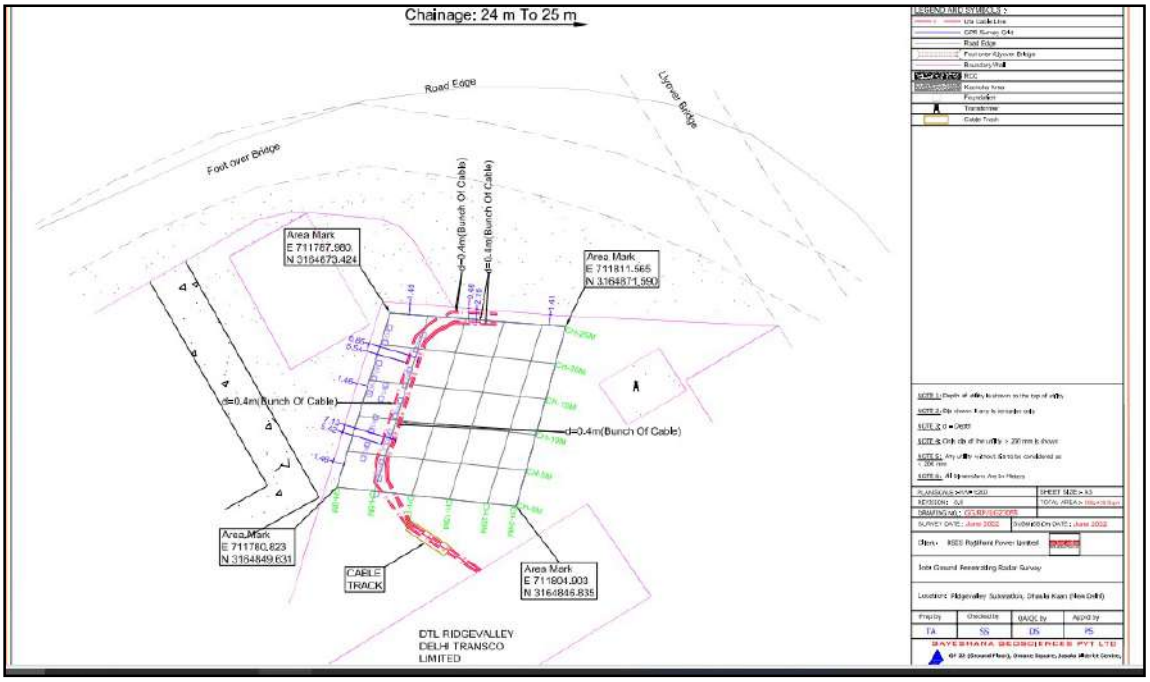
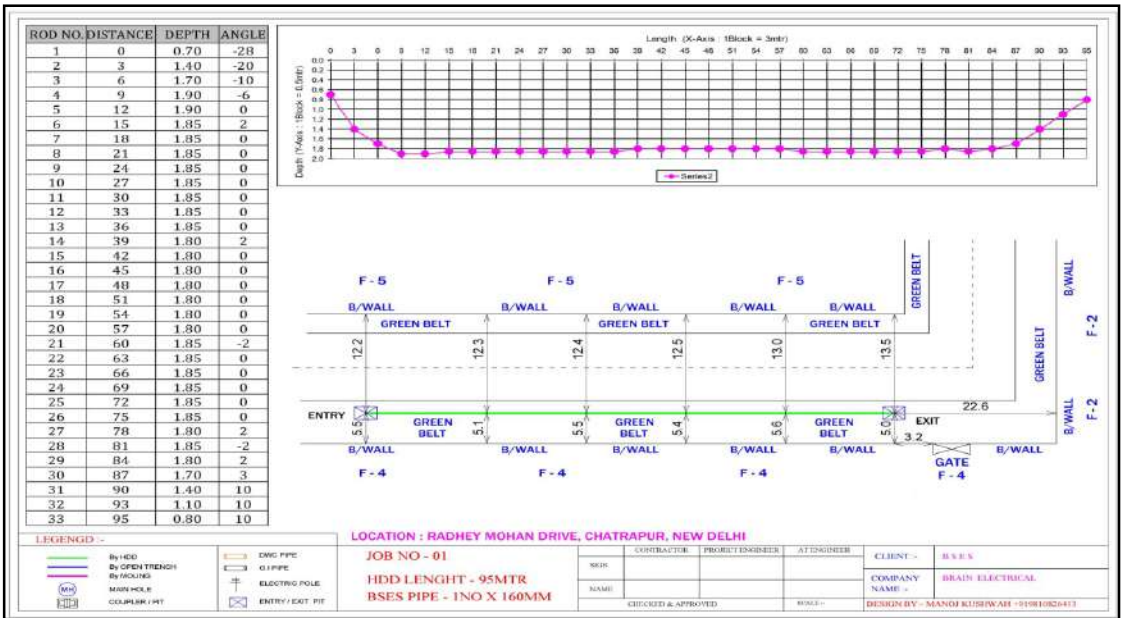



**Figure 5 (GPR Map)**



| ROD NO. | DISTANCE | DEPTH | ANGLE |
|---|---|---|---|
| 1 | 0 | 0.70 | -28 |
| 2 | 3 | 1.40 | -20 |
| 3 | 6 | 1.70 | -10 |
| 4 | 9 | 1.90 | -6 |
| 5 | 12 | 1.90 | 0 |
| 6 | 15 | 1.85 | 2 |
| 7 | 18 | 1.85 | 0 |
| 8 | 21 | 1.85 | 0 |
| 9 | 24 | 1.85 | 0 |
| 10 | 27 | 1.85 | 0 |
| 11 | 30 | 1.85 | 0 |
| 12 | 33 | 1.85 | 0 |
| 13 | 36 | 1.85 | 0 |
| 14 | 39 | 1.80 | 2 |
| 15 | 42 | 1.80 | 0 |
| 16 | 45 | 1.80 | 0 |
| 17 | 48 | 1.80 | 0 |
| 18 | 51 | 1.80 | 0 |
| 19 | 54 | 1.80 | 0 |
| 20 | 57 | 1.80 | 0 |
| 21 | 60 | 1.85 | -2 |
| 22 | 63 | 1.85 | 0 |
| 23 | 66 | 1.85 | 0 |
| 24 | 69 | 1.85 | 0 |
| 25 | 72 | 1.85 | 0 |
| 26 | 75 | 1.85 | 0 |
| 27 | 78 | 1.80 | 2 |
| 28 | 81 | 1.85 | -2 |
| 29 | 84 | 1.80 | 2 |
| 30 | 87 | 1.70 | 3 |
| 31 | 90 | 1.40 | 10 |
| 32 | 93 | 1.10 | 10 |
| 33 | 95 | 0.80 | 10 |



**Figure 6 (Trenchless Map)**

**Figure 7 and Figure 8 (SOP of Joint and Termination Kit): Not covered as it is mandatory OEM scope.**

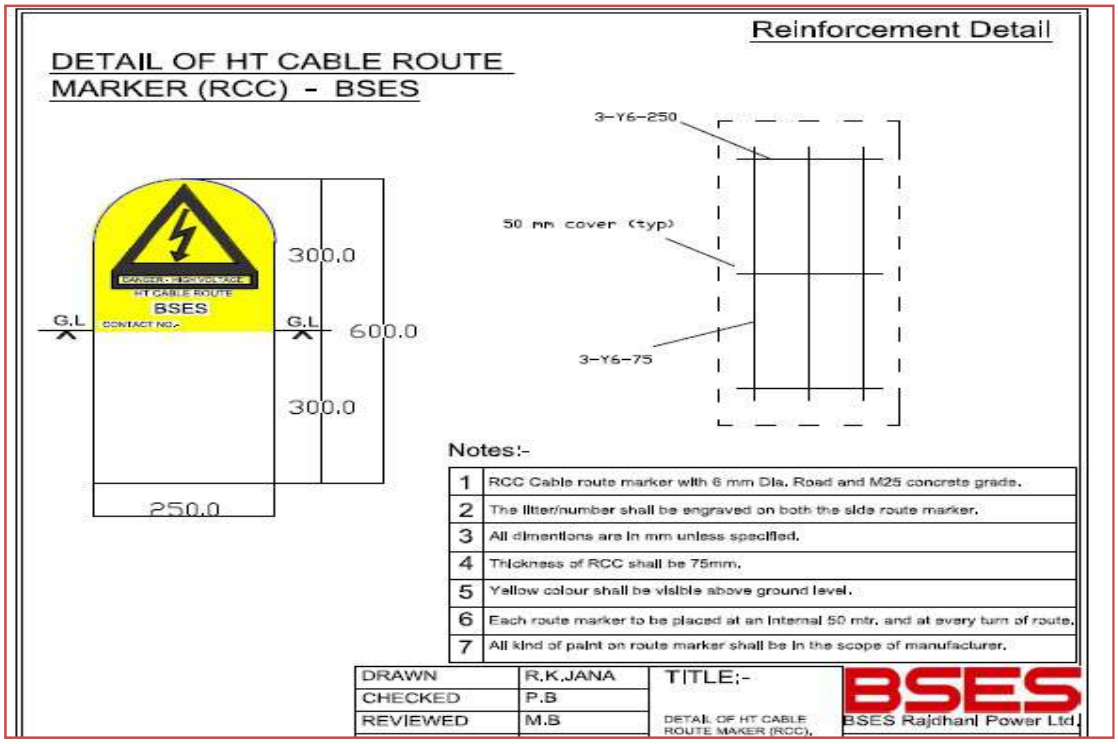


**Figure 9 (Cable route marker)**



**(Cable roller pulling machine)**

**Figure 10**



**(GPR Survey Kit)**

**Figure 11**

**Sheath testing kit & connection details:**

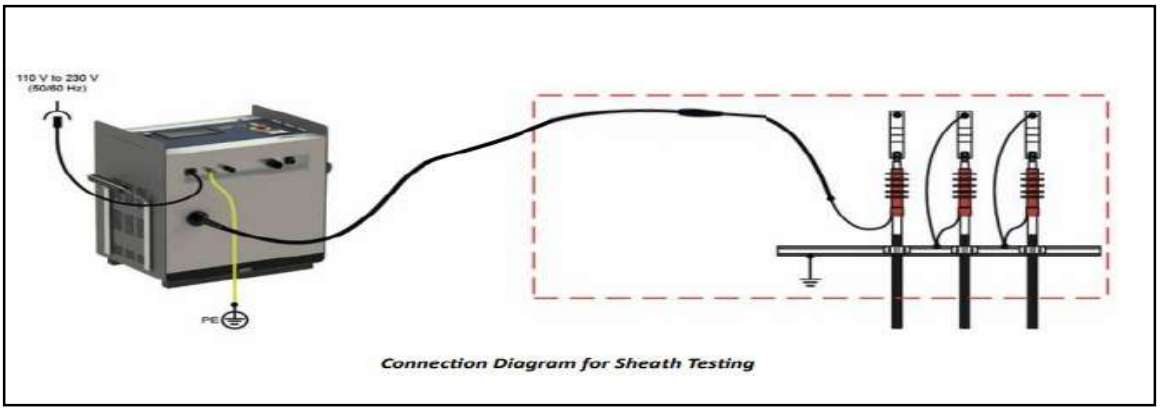



**Figure 12**

**VLF Tan Delta kit & Connection diagram:**

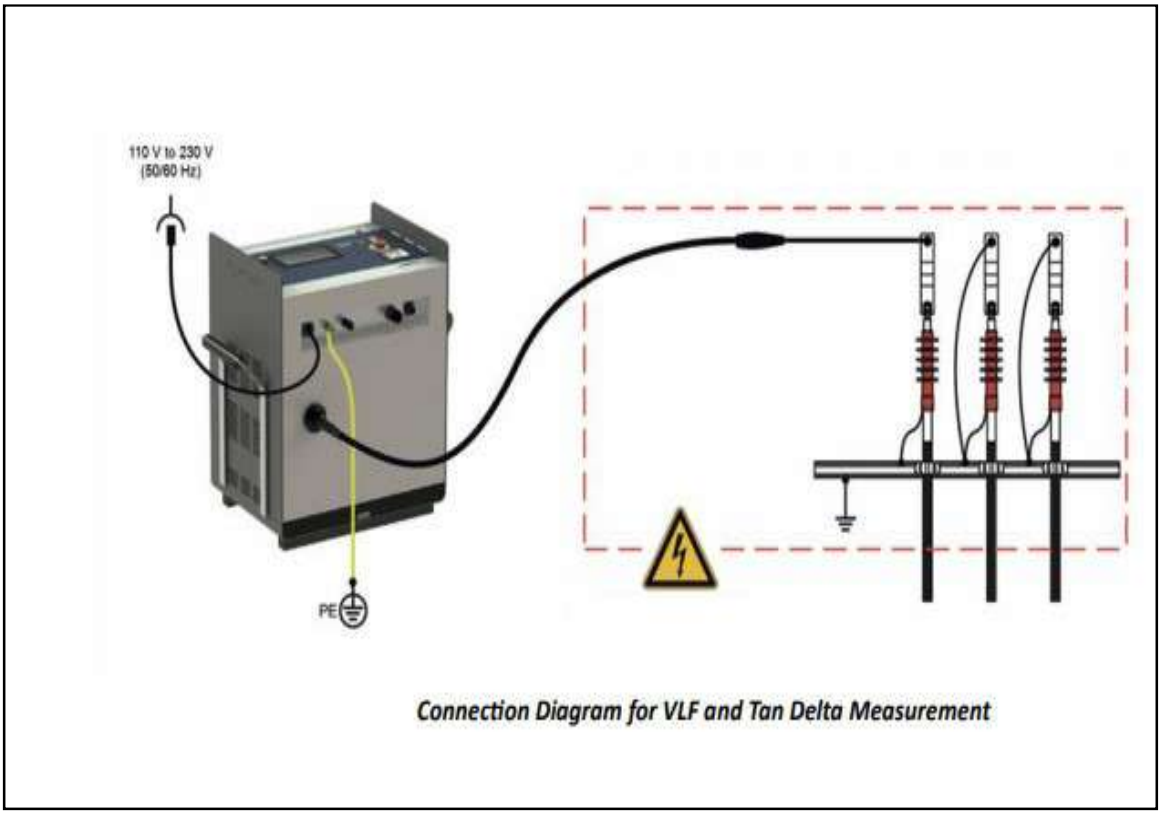



**Figure 13**

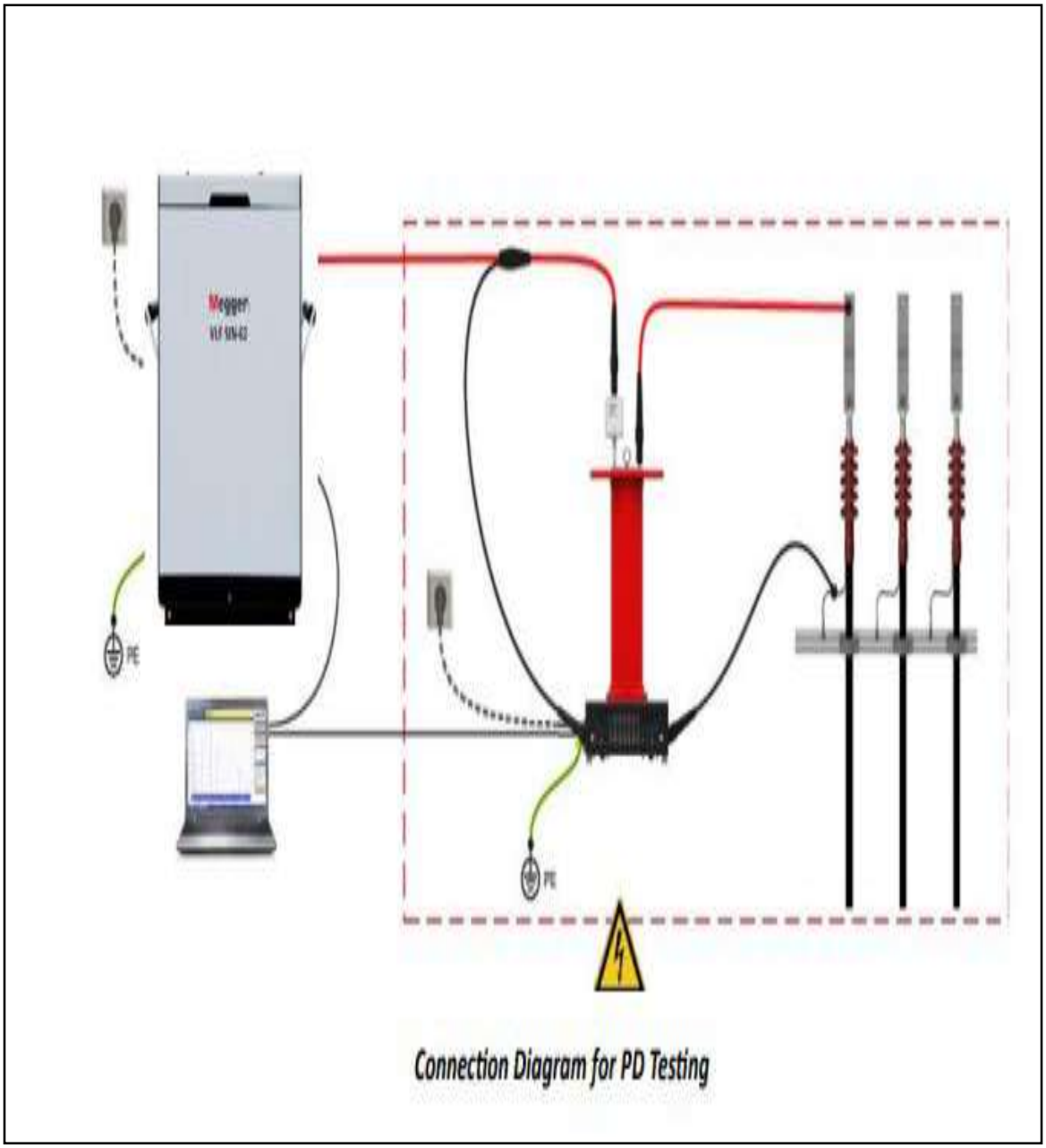



**Figure 14(PD testing kit & connection details)**

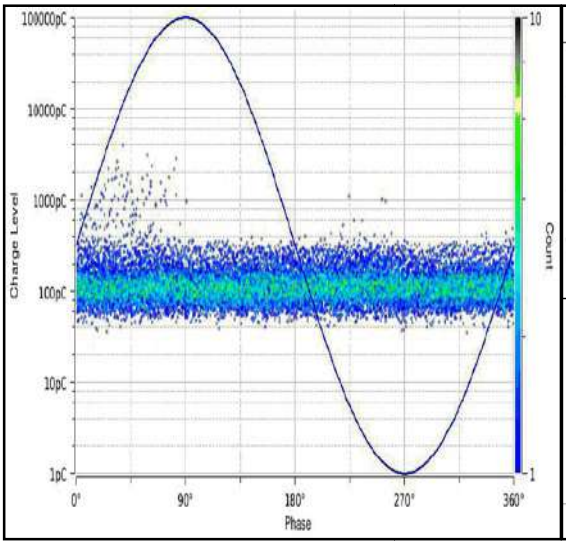



Figure 15(PRPD)

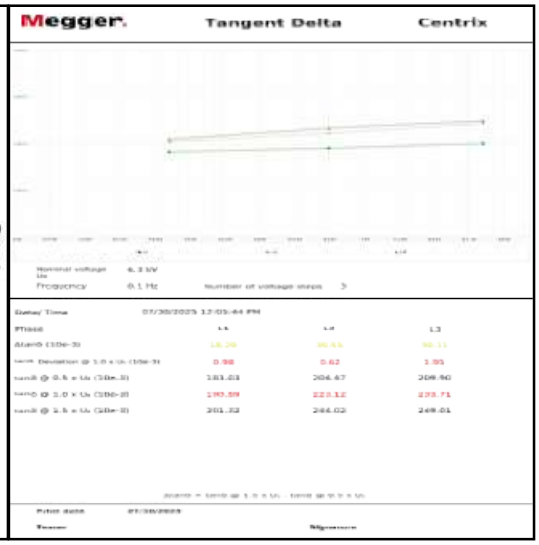



Figure 16(Tan delta)

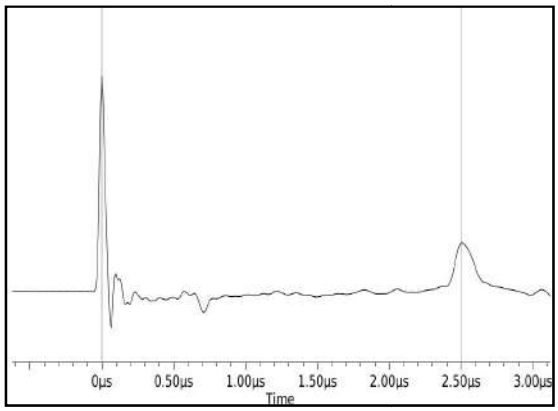



**Figure 17(PD Calibration)**

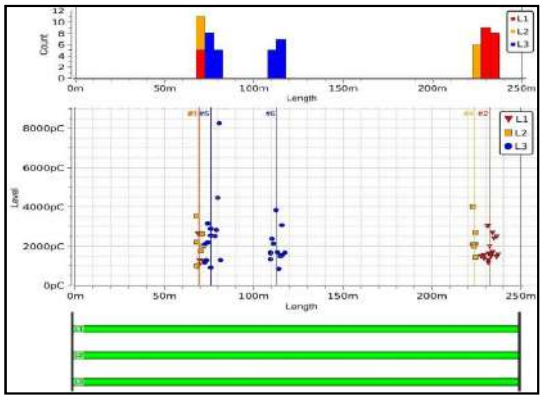



**Figure 18(PD Mapping)**

Megger Germany GmbH
Röderaue 41
01471 Radeburg / Germany
Phone +49 (0)35208 84 29124
Fax +49 (0)35208 84 29249

Megger.

Delhi
SS No 4 GHK → SS No 3 GH13

Length: 380 m U0 [kV rms]: 6.3

**Summary**

| | L1 | L2 | L3 |
|---|---|---|---|
| Disturbance level [pC] | 516 | - | - |
| PDIV [kV rms] | - | - | 7.6 |
| PDEV [kV rms] | - | - | - |
| PD max [pC] (PDIV) | - | - | 1972 |
| PD max [pC] (1 Uo) | 916 | 730 | 2518 |
| PD Level [pC] (1 Uo) | 507 | 445 | 1560 |
| PD max [pC] (1.7 Uo) | - | - | - |
| PD Level [pC] (1.7 Uo) | - | - | - |
| PD max [pC] (2 Uo) | - | - | - |
| PD Level [pC] (2 Uo) | - | - | - |
| Frequency [Hz] | 331 | 331 | 331 |
| Operating Mode | DAC- | DAC- | DAC- |

**Figure 19(PD Summary)**

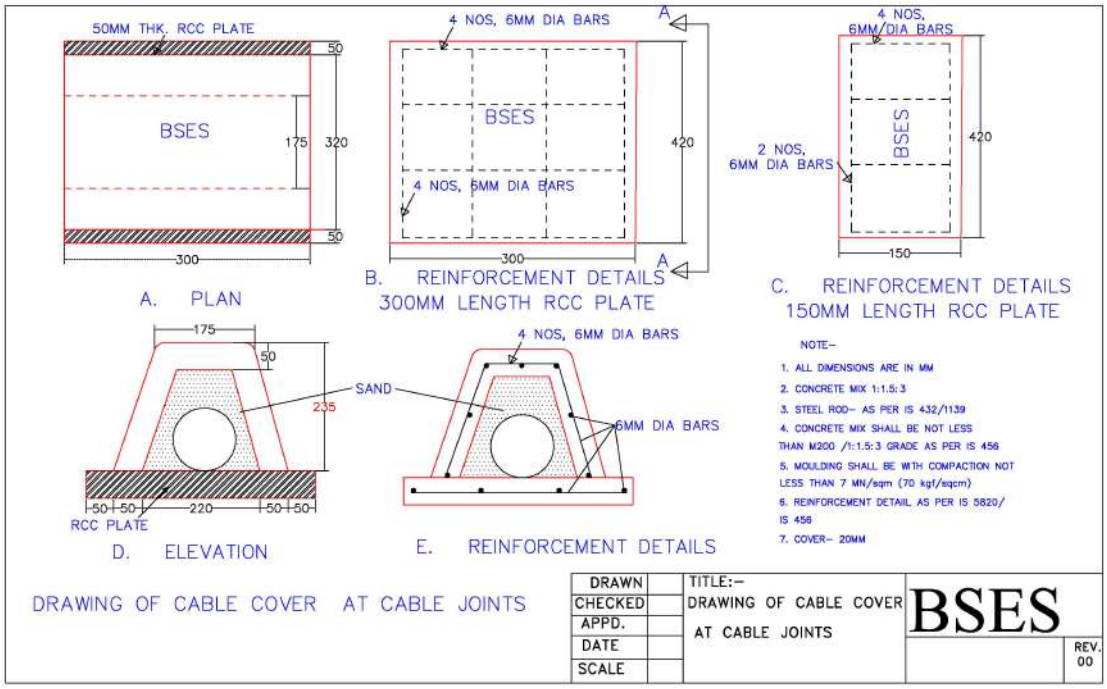



**Figure 20(Joint Coffin)**

**Annexure -01 (Checklist for cable laying)**

| Sr No | Checklist | Yes | No |
|---|---|---|---|
| 1 | Road cutting permission received | | |
| 2 | Route survey by following methods to identify existing utilities | | |
| 2.a | Cable avoidance tool (cable locator) | | |
| 2.b | Cable route tracer | | |
| 2.c | GPR (before and after cable laying) | | |
| 3 | Test Pit for type of soil (rocky/soft) | | |
| 4 | Proper loading, unloading of cable drum done by using Crane | | |
| 5 | Physical inspection of Cable for damages | | |
| 6 | Arrangement of Manpower with PPE's | | |
| 7 | Proper barricading arrangement done before excavation | | |
| 8 | Drum properly supported for free reeling | | |
| 9 | Cable rollers are used while pulling | | |
| 10 | Sharp Stones removed from pit | | |
| 11 | Proper Depth of pit maintained as per specification | | |
| 12 | Proper River sand bed at bottom and top of the cable (75 mm) | | |
| 13 | Tiles/bricks placed over the entire the cable length | | |
| 14 | Warning tape placed over the entire cable length | | |
| 15 | Proper refilling done | | |
| 16 | Testing of cable after completed laying work | | |
| 16.a | Insulation resistance test: (phase to earth; phase to phase) | | |
| 16.b | Conductor resistance measurement | | |
| 16.c | VLF high voltage test as per IEEE 400.2 (instead of DC high voltage test) | | |
| 16.d | VLF tan delta as per IEEE 400.2 | | |

| | | | |
|---|---|---|---|
| 16.e | VLF partial discharge as per IEEE 400.2 | | |
| 16.f | Sheath Test | | |
| 17 | Empty cable drum returned to store (for non-turnkey tenders) | | |
| 18 | HDPE pipe Installed (as per specification) | | |
| 19 | Site cleaned after laying | | |
| 20 | Coffin at all joints used (location of joint in GIS, safe guarding of joint, as per OEM manual) | | |
| 21 | Drain crossing with truss if applicable | | |
| 22 | Deviation taken | | |

Note: Signature of Vendor representative and BYPL/BRPL employee is mandatory

**Annexure -02 Deviation Report Format**

| Sr No | Clause no of Specification | Details about Deviation | Reason for Deviation | Approved by (Signature / Name) |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |

**Annexure-03 (Material Return Format)**

| | | | | | |
|---|---|---|---|---|---|
| Prepared by: | *Name of Vendor representative / engineer* | Vendor Emp no/ Id Card no: | | Date of declaration: | |
| Inspected by: | *BYPL/BRPL Engineer / project manager* | Employee no: | | Scheme no: | |
| Approved by: | *BYPL/BRPL Engineer / project* | Employee no: | | Location: | *From where these declared materialsarerecov* |

| | | | | | |
|---|---|---|---|---|---|
| | *manager* | | | | *ered* |
| Reason of return: | *The vendor representative to clearly specify the reason of material return e.g. excess, damaged, replacement etc.* | | | | |

| Sr No | Material code | Material description | Unit | Qty | Material category |
|---|---|---|---|---|---|
| 1 | | | | | Unused/ scrap |
| | | | | | |
| | | | | | |

**Signature:**

**(Vendor _____)** **(BSES _____)**

Note: Signature& Stamp of Vendor representative and BYPL/BRPL employee is mandatory

**Annexure-04 (IS of PPE's)**

| S.no | IS Number | PPE Name |
|---|---|---|
| 1 | IS 2925: 1984 | Safety Helmet |
| 2 | IS 4770: 1991 | Hand Gloves |
| 3 | IS 15298: Part-2:2016 | Safety Shoes |
| 4 | IS 7524: Part-1 1980 | Safety googles (if applicable) |
| 5 | IS 3521 | Safety Belt / Full Body Harness |

**Annexure-05 (make details)**

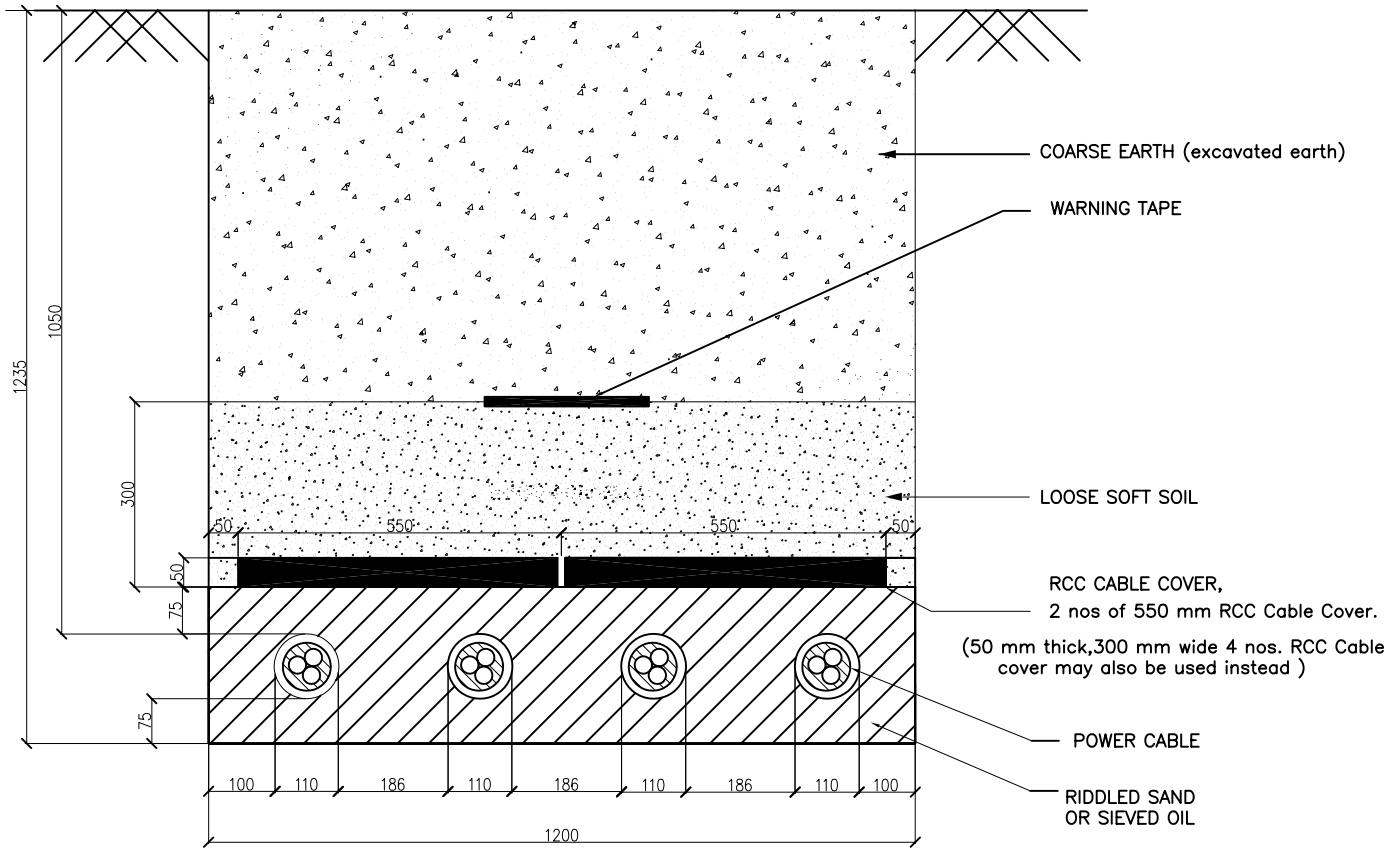
| S.no | Items Description | Approved Make |
|---|---|---|
| 1 | 33 kV/66kV Jointing and Termination Kit | • Raychem<br>• 3M |
| 2 | 33kV and 66kV Jointing and Termination Kit | • Raychem<br>• 3M<br>• |
| 3 | HDPE Pipes (PN6, PE80) | • Flow well<br>• Tirupati<br>• Narendra Polyplast<br>• Flexi flow<br>• Shivam Irrigation Works Pvt. Ltd. (Shivano)<br>• Safal Polymer pvt ltd<br>• Jindal Sanitations pvt ltd<br>• RajshreeTechnoplastpvt ltd. |
| 4 | Link joint (for single core cable) | • Raychem<br>• 3M |

Note – Any other make of component shall be approved by BSES during Detailed Design Engineering

**Annexure-6 CABLE TRENCH DETAILS**

| S. No. | Cable Size | Trench | | Cable Trench drawing reference |
|---|---|---|---|---|
| | | Width (mm) | Depth (mm) | |
| | | | | |
| 1 | **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) |

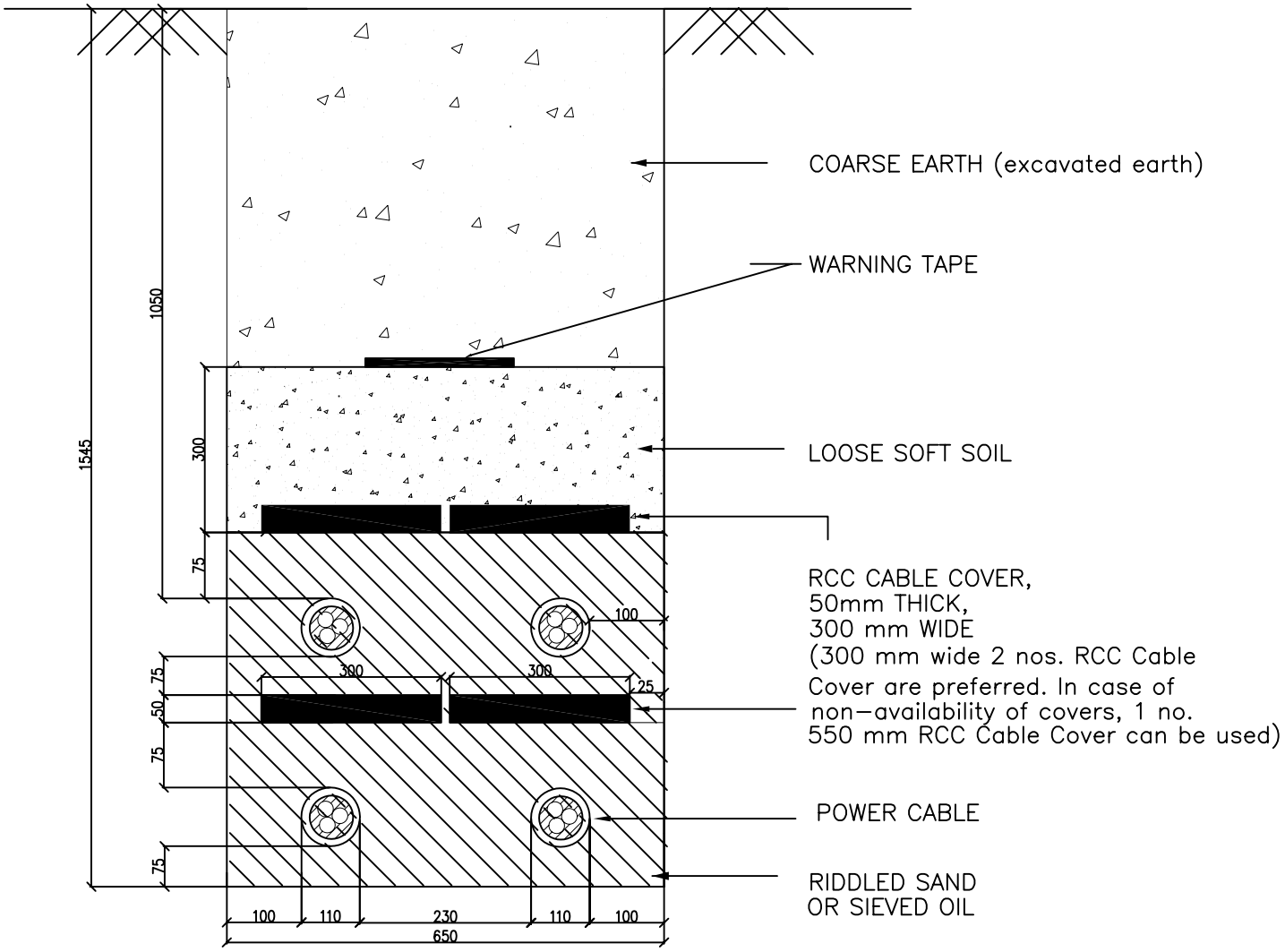
DRAWING # 5 C




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

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

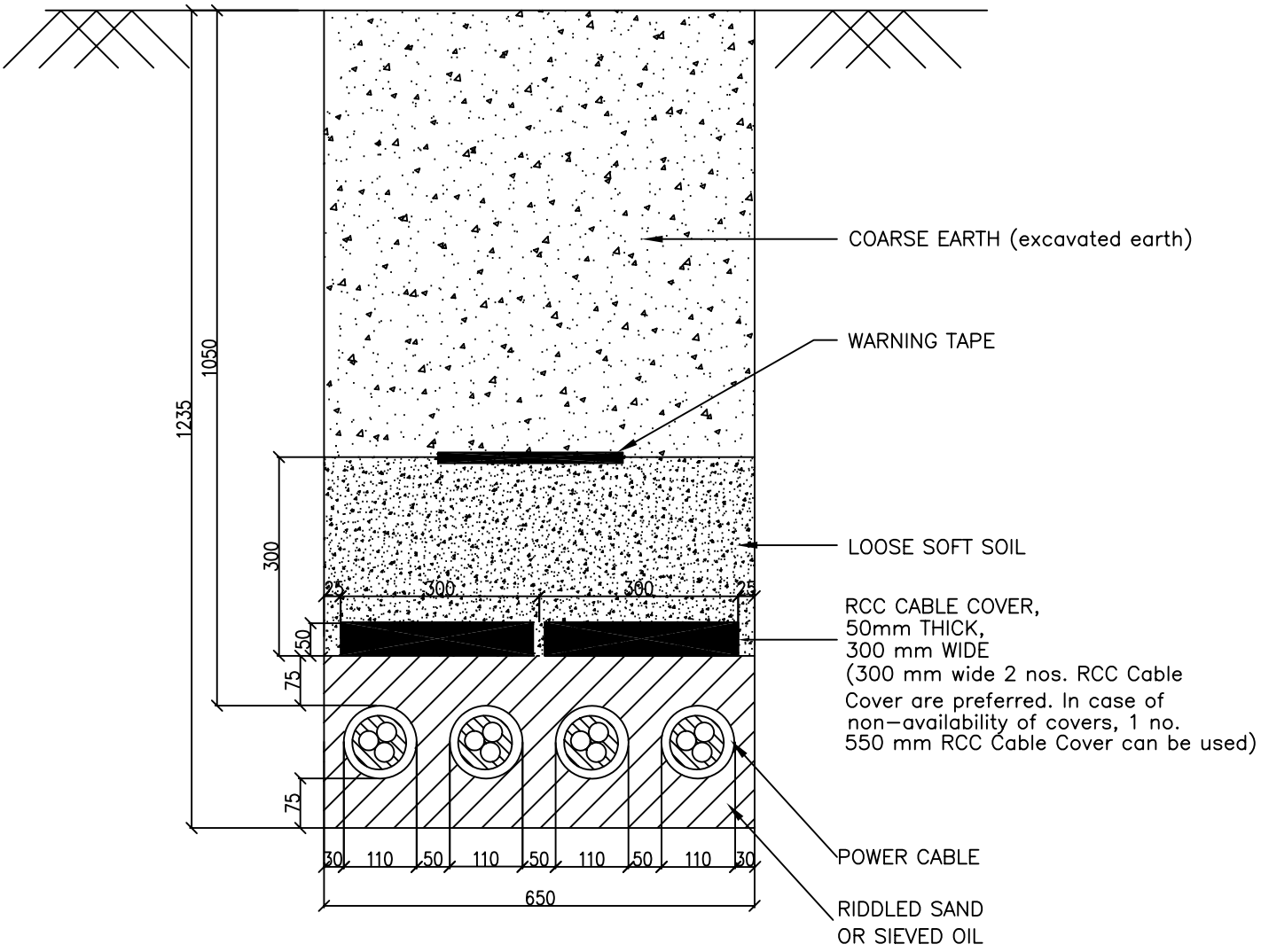
DRAWING # 5 B




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

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

DRAWING # 5 A




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

| | | | |
|---|---|---|---|
| DRAWN | DS | TITLE:– | BSES |
| CHECKED | SGD | TRENCH DRAWING FOR | |
| APPD. | D.GUHA | 3C X 400MM2, 33KV | |
| DATE | | FOUR CIRCUIT | REV. 00 |
| SCALE | | XLPE CABLE | |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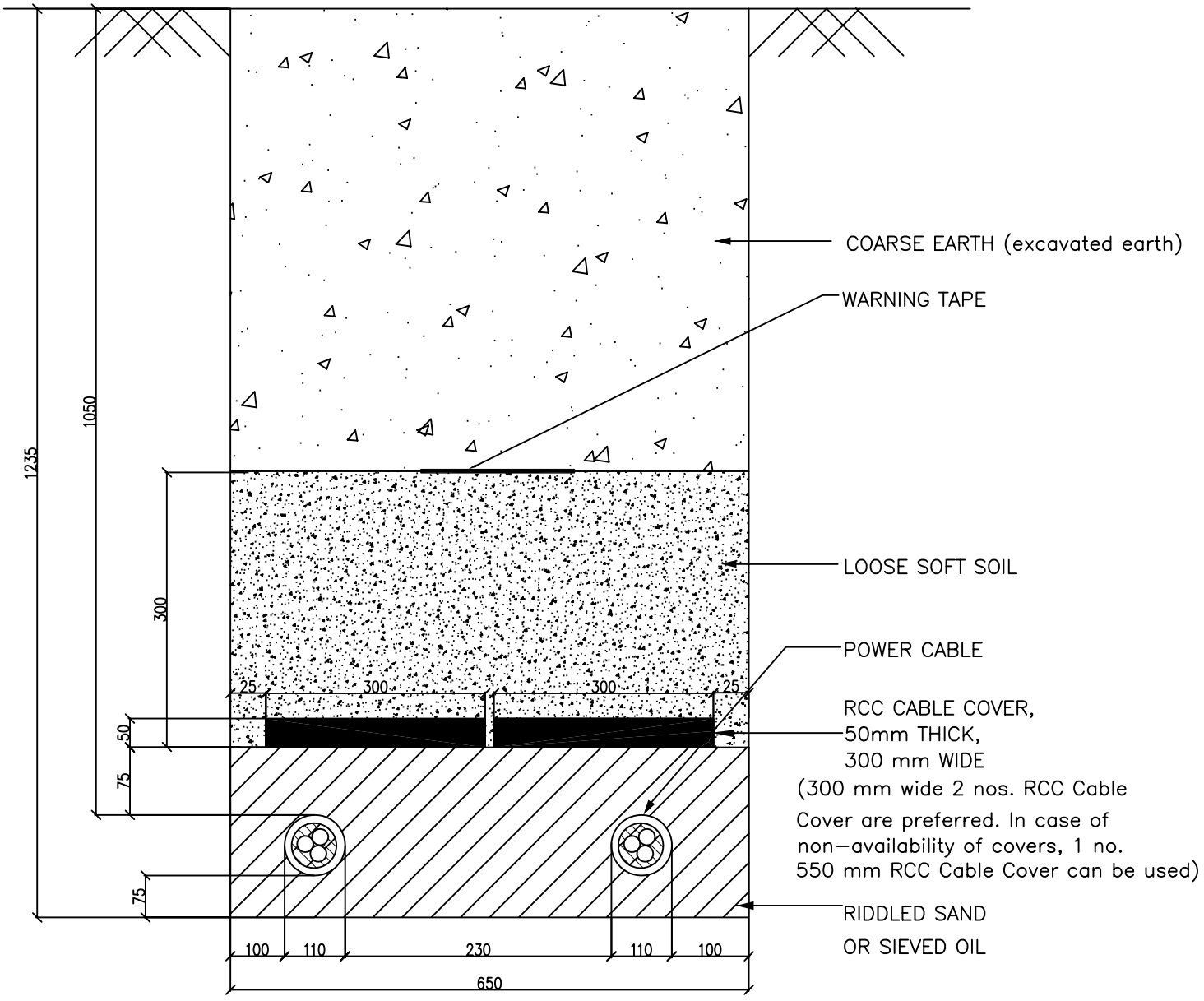
DRAWING # 4

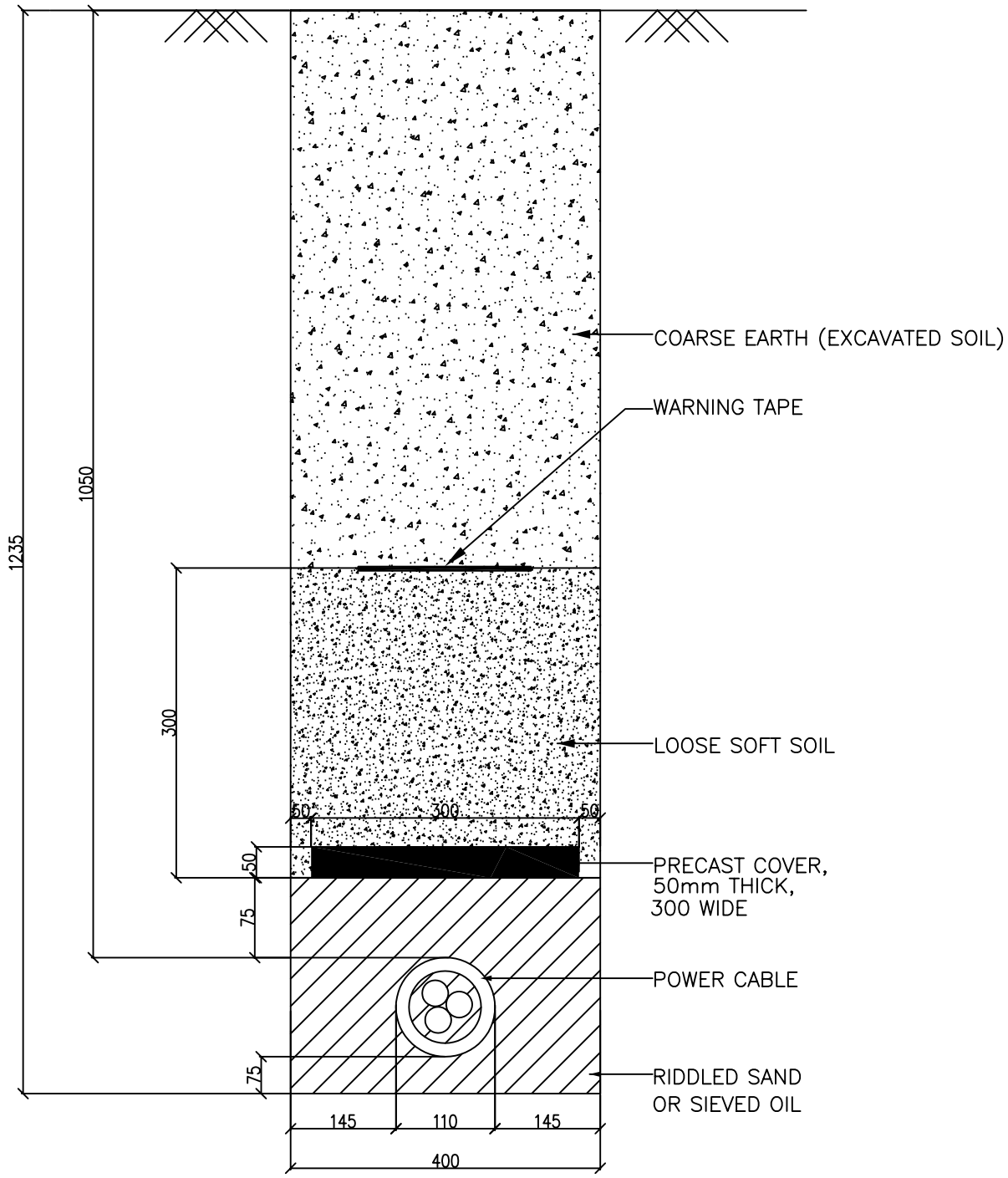



TYPICAL DETAILS FOR 33KV BURRIED CABLE FOR TWO CIRCUIT

TYPE – B–2

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

DRAWING # 3

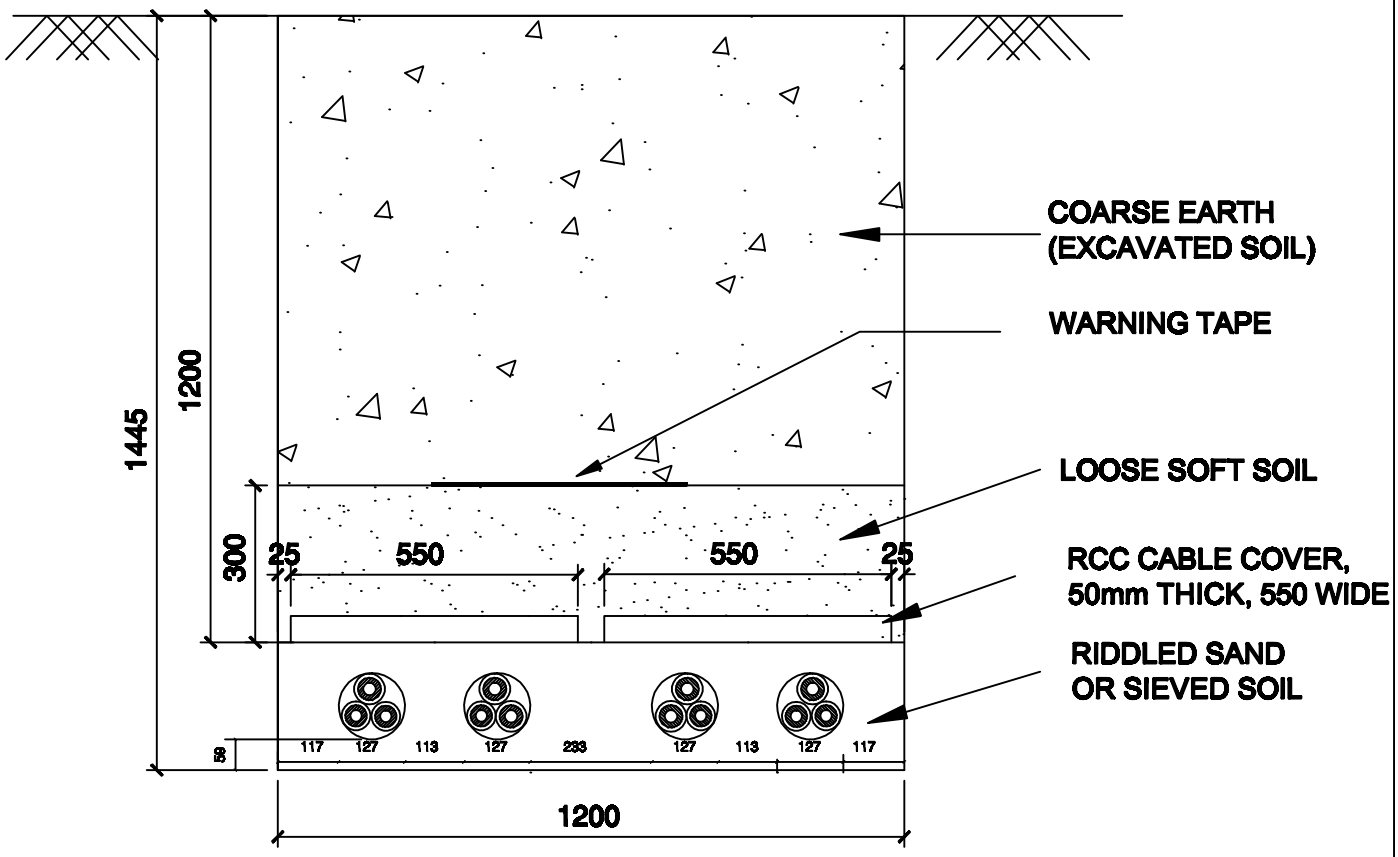



TYPICAL DETAILS FOR 33KV BURRIED CABLE FOR SINGLE CIRCUIT

TYPE – A 3

| | | | |
|---|---|---|---|
| DRAWN | DS | TITLE:– | BSES |
| CHECKED | SGD | TRENCH DRAWING FOR | |
| APPD. | D.GUHA | 33KV 3CX 400 mm sq. | |
| DATE | | SINGLE CIRCUIT | REV. 00 |
| SCALE | | XLPE CABLE | |

# DRAWING # 2 A

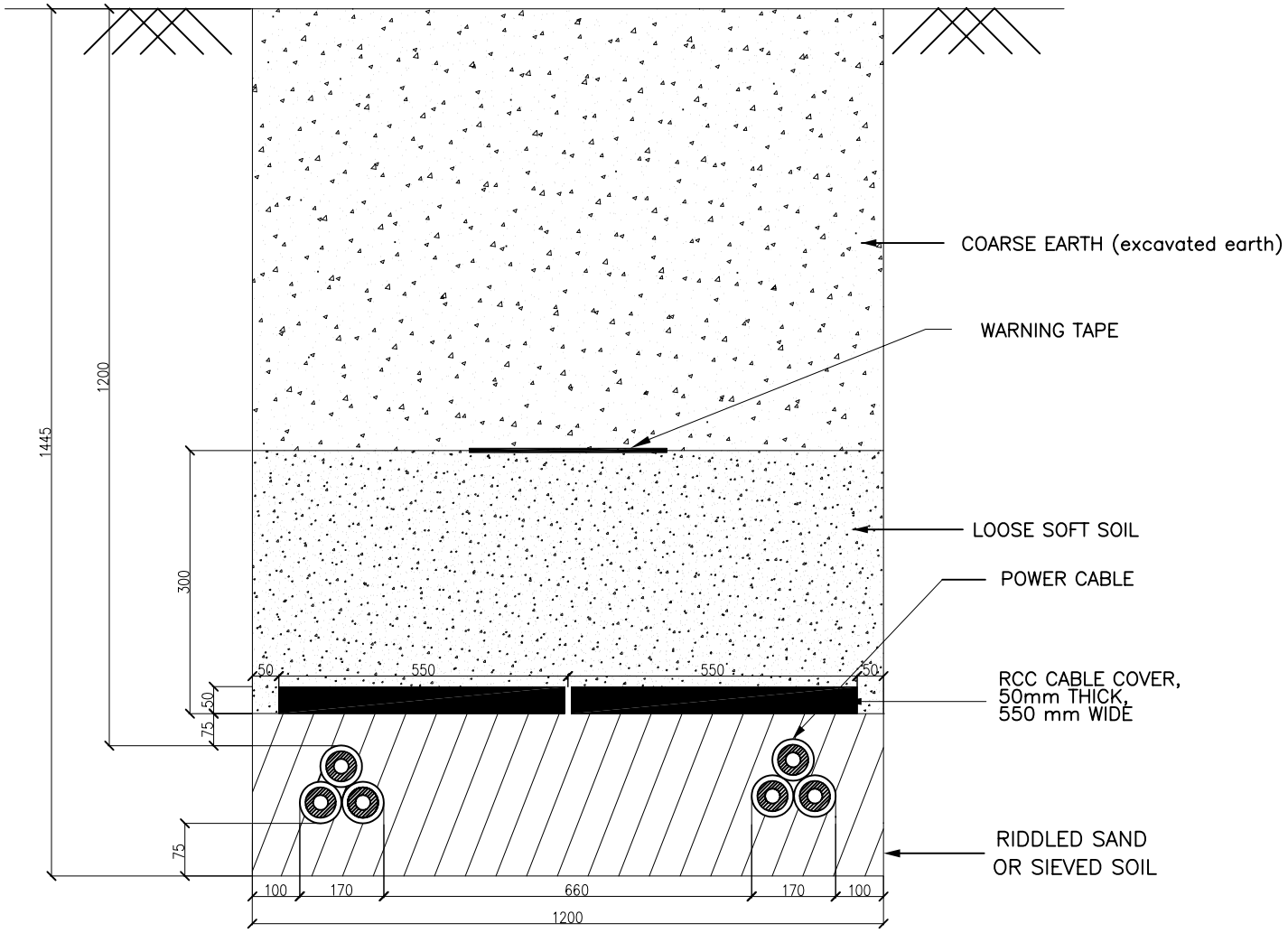



## TYPICAL TRENCH SECTION DETAILS FOR 66KV SINGLE CORE 300 Sq. mm. BURRIED CABLE FOR DOUBLE CIRCUIT

## TYPE - C 2

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

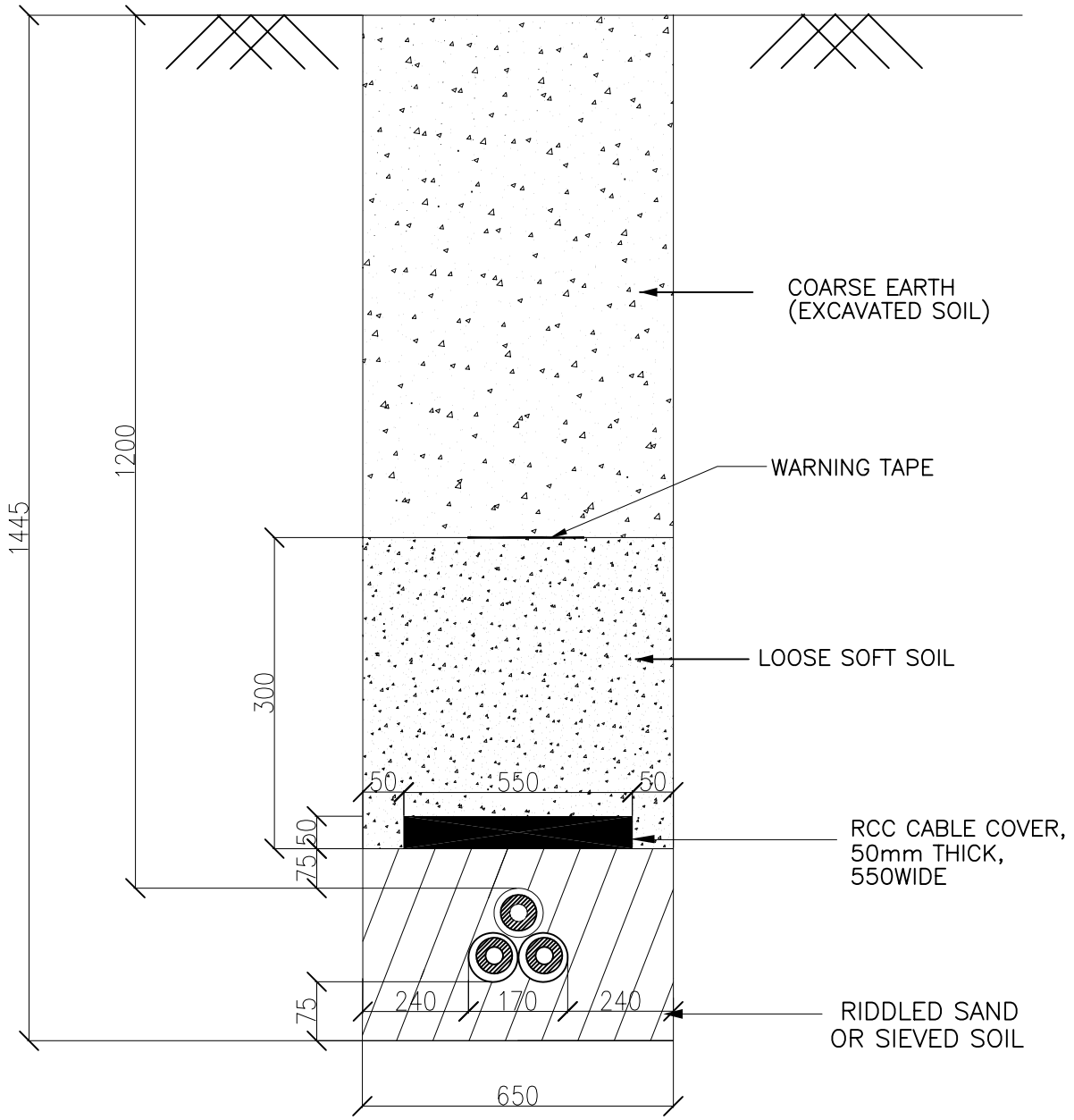
DRAWING # 2




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 # 1




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

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

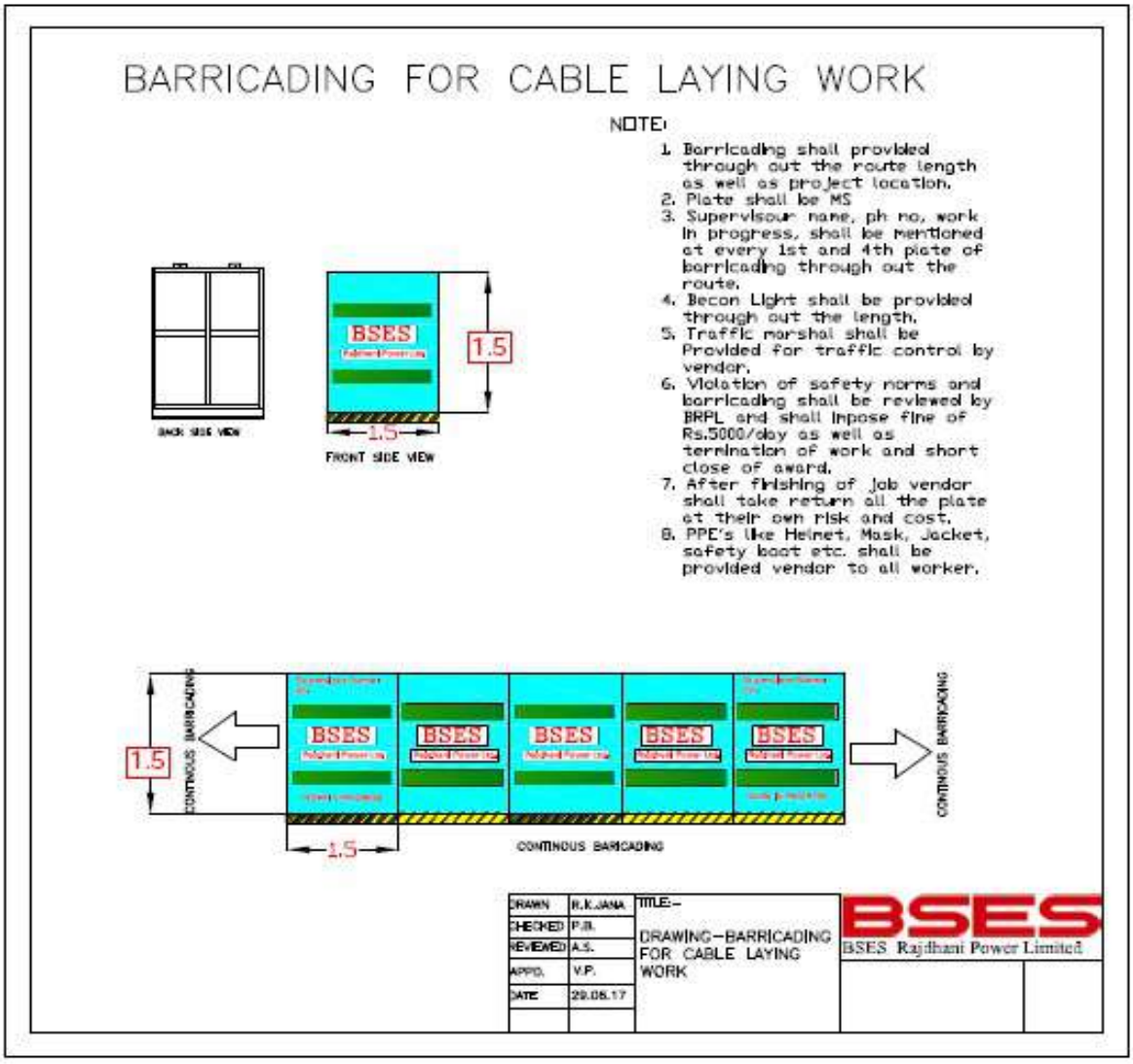
## Annexure-7: Barricading and Safety

1. Dimensions of barricading- Height min - 1.5 mtr, Length- 1.5 mtr or more of one single piece. 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, cleanness 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 within 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 (Annexure-04 for IS references)
    - Helmets
    - Mask
    - First Aid Box
    - Safety shoes / Gum boot
    - Fluorescent Jacket

- Safety gloves 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. EPR/Scanning shall be done by vendor of whole the route and same shall be submitted to BYPL/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. BYPL/BRPL inspector/engineer in-charge shall be empowered to impose the above penalty.
23. Keep Gas cylinders at safe distance.



**Annexure- 8 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 from the NGL (single and double run) | Width (Single Run) | Width (Double Run) |
| 1 | 33 kV | 1235 | 400 | 650 |
| 2 | 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) 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 |

   c) In-case of using lower size of HDPE pipe/no 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.
   d) First priority shall be to lay cable through open trench. However, cable laying through trenchless method can be done as per permission by road owning agency (RoA), site condition and tendered BoQ.
   e) Maintain and submit proper trenchless data i.e. Offset, Depth, length, Route marking during execution work. (Refer Fig 5& Fig 6)
   f) Laying more than one cable in same pilot drilling is not allowed because cable will de rate up to 70% in case of touch together/Laid in touching portion.

g) HDPE pipe of adequate size (as per Annexure-8 of BSES Technical Specification) shall be installed during trenchless laying. If installing HDPE pipe is not possible, deviation shall be taken in format (Annexure-2)
h) HDPE pipe (PN6, PE80) of only BYPL/BRPL approved make shall be used
i) If Co-extruded Cable in Duct (EHV CCD) is used, separate HDPE pipe is not required.

Annexure- 9 (RCC Cable cover)

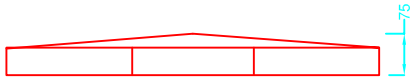



PLAN

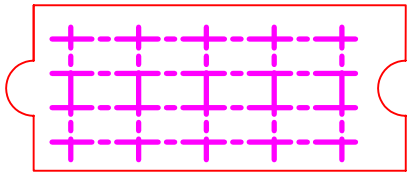
1. STEEL ROD - AS PER IS 432/1139
2. CONCRETE MIX SHALL BE NOT LESS THAN M200 GRADE AS PER IS 456.
3. MOULDING SHALL BE WITH COMPACTION NOT LESS THAN 7 MN/Sq.m.( 70 kgf/Sqcm)




ELEVATION




SIDE VIEW



NOTE -

(i) All dimensions are in MM.

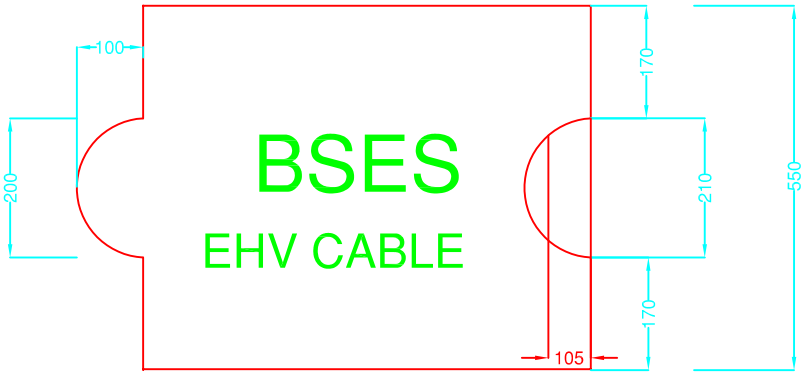
(ii) Concrete Mix 1 : 2 : 4

(iii) MS rod - 6 MM Ø

# CABLE COVER FOR EHV CABLES TYPE B.



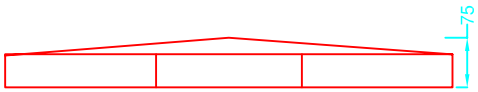
| | | | |
|---|---|---|---|
| DRAWN | | TITLE:– CABLE COVER FOR EHV CABLES TYPE – B | BSES |
| CHECKED | | | |
| APPD. | | | |
| DATE | | | REV. 00 |
| SCALE | | | |



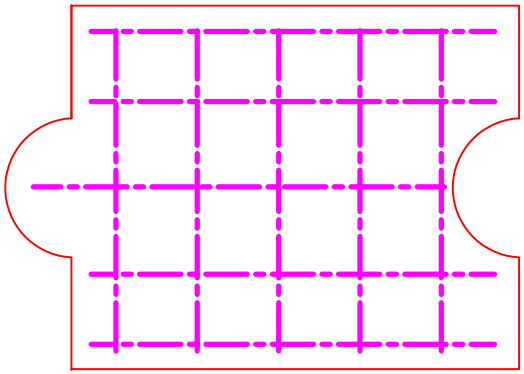

PLAN




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)



| | | | |
|---|---|---|---|
| DRAWN | | TITLE:– CABLE COVER FOR EHV CABLE TYPE – A | BSES |
| CHECKED | | | |
| APPD. | | | |
| DATE | | | REV. 00 |
| SCALE | | | |

BSES

# Technical Specification of Aluminum Lugs and Ferrules

## Specification no – BSES-TS-11-ALF-R0

| | | |
|---|---|---|
| Rev: | | 0 |
| Date: | | 04 Apr 2022 |
| Pages: | | 11 |
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## 1.0 SCOPE OF SUPPLY

The specification covers design, manufacturing, testing of Aluminum Lugs and ferrules at manufacturers works before dispatch. Packing, delivery of material and submission of documents/test reports to purchaser.

## 2.0 STANDARDS & CODES

| | | |
|---|---|---|
| 2.1 | IS: 8308 -1993 | Compression type tubular in-line connectors for Aluminum conductors of insulated cable |
| 2.2 | IS:5082 - 1998 | Wrought Aluminum & Aluminum alloy bars, rods, tubes, sections, plates & sheets for electrical Applications |
| 2.3 | IEC: 61394 | Overhead lines - Requirements for greases for aluminum, aluminum alloy and steel bare conductors |
| 2.4 | IS:8309 -1993 | Compression type tubular terminal ends for aluminum conductors of Insulated cables |
| 2.5 | IS: 191- 2007 | Specification for copper |

## 3.0 SERVICE CONDITIONS

| | | |
|---|---|---|
| 3.1 | Location | Outdoor |
| 3.2 | Average grade atmosphere | Heavily polluted, Dry |
| 3.3 | Maximum altitude above sea level | 1000M |
| 3.4 | Ambient air temperature | Highest 50Deg C<br>Average 40Deg C |
| 3.5 | Minimum ambient air temperature | 0 Deg C |
| 3.6 | Relative Humidity | 100% |
| 3.7 | Rainy month | June to October |
| 3.8 | Maximum Rainfall (mm) | 1450 |
| 3.9 | Wind Pressure (Kg/Sq.m) | 195 |
| 3.10 | Seismic Zone | Zone IV as per IS : 1893 |

## 4.0 MAJOR DESIGN PARAMETERS

| | | |
|---|---|---|
| 4.1 | Ferrule | An aluminum ferrule is an aluminum compression type tubular inline connector for aluminum conductors of insulated cables for rated voltages up to and including 1.1 kV.<br>a) **In-Line Connector -** A connecting device accommodating two electrical conductors to form straight joint.<br>b) **Transition/Reducer Connector -** A connecting device accommodating two electrical conductors of different sizes to form a transition joint. |

| | | |
|---|---|---|
| 4.2 | General Design Parameters of Ferrule | a) Electrical conductivity: More than 60 % IACS Cleaning after manufacturing: Caustic soda cleaning<br>b) Ferrule should be filled with oxidation inhibiting paste & sealed with caps |
| 4.3 | LT Aluminum Ferrule | a) Machine marking: Clear and distinct machine marking as specified in drawing on outer surface of ferrule to facilitate crimping. Total number of crimps should be as per drawing.<br>b) No Knurling on inner surface of ferrule.<br>c) Internal, external diameter & length of ferrule shall be as per drawing.<br>d) Ferrule design suitable for conductor of type: Compacted Sector Shape |
| 4.4 | Lug | A connecting device with barrel accommodating respective conductor. Size of electrical cables for rated voltages up to and including 1.1kV.<br><br>Aluminum Lug: An aluminum lug is essentially a connecting device for connecting aluminum conductor with aluminum bus bars. |
| 4.5 | General Design Parameters for Lug | a) Cleaning after manufacturing: Caustic soda cleaning.<br>b) Barrels of the Lugs should be filled with oxidation inhibition paste & sealed with caps. |
| 4.6 | Aluminum LT lug | Size to be used for 10, 25, 50, 95, 150, 300, 630, 1000 sqmm:<br><br>a) Machine Marking: Clear and distinct marking at specified distance on outer surface of lug to facilitate better crimping.<br>b) No knurling on inner surface of the lug<br>c) Internal diameter, external diameter, length of barrel, length of palm & other dimensions shall as per drawing.<br>d) Electrical conductivity: Min. 60% IACS<br>e) All corners shall be rounded off.<br><br>All dimensions are in mm.<br>Refer Drawing for dimension and permissible tolerances. |

## 5.0 MATERIAL

| | | |
|---|---|---|
| 5.1 | Material for Lug and ferrule | a) Material of Lug and Ferrule shall be 99% Electrolytic grade Aluminum conforming to Aluminum of grade 19501 (Temper Designation-M) of IS 5082/1981.<br>b) Hardness of the material used shall be between 18-21 Vickers Hardness Numbers. |
| 5.2 | Make | Raw Material make shall be Hindalco/Banco/Jindal Aluminum/BSES approved Reputed make |

## 6.0 MARKING

| | | |
|---|---|---|
| 6.1 | Identification | For Ferrule:<br>Type of cable to be connected, size and make shall be engraved on each ferrule.<br><br>For aluminum Lug:<br>Size of cable and make shall be engraved on each lug for Aluminum lug/Street light lug. |

## 7.0 TESTING & INSPECTION

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

| | | |
|---|---|---|
| 7.1 | Visual Check | The Ferrule & lug shall be visually checked and shall free from external defects. |
| 7.2 | Dimensional Check | The dimensional requirements shall be checked for Ferrule & Lug as per the drawing. |
| 7.3 | Acceptance Test | Following tests needs to be conducted by the vendor during inspection (value shall be followed as per IS/IEC)<br>1. Flattening<br>2. Electrical Conductivity<br>3. Resistivity<br>4. Physical properties (Tensile Strength and Hardness)<br>5. Two samples of similar size to be sampled for Temperature Rise test and chemical composition from the offered lot and shall be carried out from NABL approved Lab. |

## 8.0 DEVIATION

| |
|---|
| Deviations from this Specification shall be stated in writing with the tender by reference to the Specification clause/GTP/Drawing and a description of the alternative offer. In absence of such a statement, requirements of the Specification shall be met without exception. |

## 9.0 PACKING & DELIVERY

| | | |
|---|---|---|
| 9.1 | Packing | Packing to be done in transparent polythene bags of min.150 micron thickness so as to not get torn due to handling during packing/transit of lugs. Sealing should be done essentially with Heat sealers only. |
| 9.2 | Identification Labels | The pack should have a label indicating the<br>a) Manufacturer's name<br>b) SAP code number & PO. No. with date<br>c) Month & year of manufacturing<br>d) Size of Ferrule/lug with type<br>e) Number of items<br>f) "BSES Yamuna Power Ltd." |

## 10.0 DOCUMENTS SUBMISSION

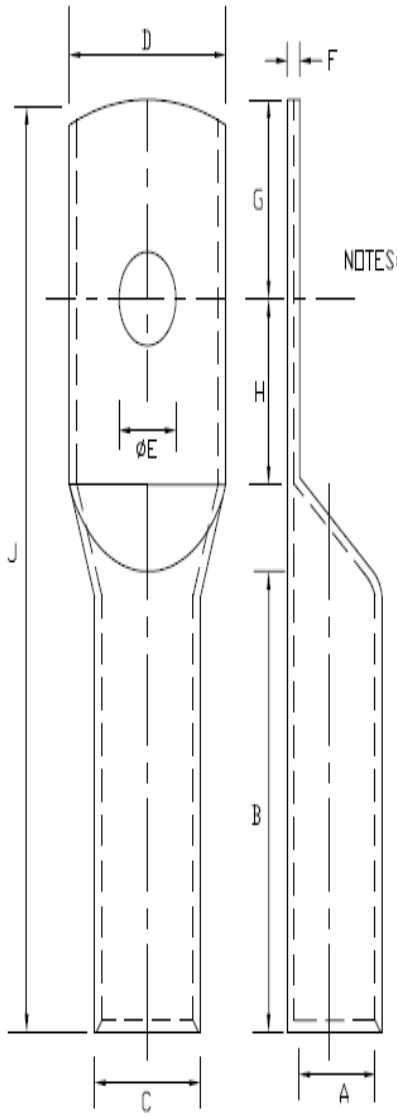
Document submission shall be as per the matrix given below. All documents/drawing shall be provided in soft copy for each section. Language of the documents shall be English only. Deficient/improper drawing submission may liable for rejection.

| S.No. | Detail of Document | For Tender | For Approval/Review | Final Submission |
|---|---|---|---|---|
| 10.1 | Guaranteed Technical Particulars (GTP) | Required | Required | Required |
| 10.2 | Deviation Sheet, if any | Required | Required | Required |
| 10.3 | GA and Dimensional Drawing | Required | Required | Required |
| 10.4 | Manufacturer's quality assurance plan and certification for quality standards | | Required | Required |
| 10.5 | Make of Raw Materials | Required | Required | Required |
| 10.6 | Inspection and test reports, carried out in manufacturer's works | | | Required |
| 10.7 | Routine Test Certificates | | | Required |
| 10.8 | Test certificates of all the raw materials | | | Required |

## 11.0 DRAWINGS

### ALUMINIUM TERMINAL LUGS

| SNO. | SIZEMM$^2$ | E ±0.1 | A ±0.1 | C ±0.1 | D ±0.5 | F ±0.1 | B ±0.2 | H ±0.5 | G ±0.5 | J ±0.6 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. | 10MM$^2$ | 6.4 | 4.4 | 7.2 | 10 | 2.8 | 9 | 9 | 8 | 30 |




NOTES:- 1 ALL THE DIMENTIONS ARE IN MM

2 LUGS MATERIAL SHALL CONFIRM TO ALUMINUM OF GREAD 19501 AS PER IS 5082

3 LUGS SHALL HAVE MARKING AS PER RESPECTIVE SIZE AND 'BSES LOGO'

4 BARREL SHALL BE CAPED & FILLED WITH OXIDATION INHIBITENT SO AS TO AVOID OXIDATION OF THE ALUMINUM

5 CLEAR AND DISTINCT MARKING TO BE SPECIFIED ON BARREL LUG TO FACILITATE BETTER CRIMPING.

6 TWO SAMPLES OF SIMILAR SIZE TO BE SAMPLED FOR TEMPERATURE RISE TEST AND CHEMICAL COMPOSITION TEST ON EVENT OF ORDER.

7 ALL CORNERS SHALL BE ROUNDED OFF.

BSES

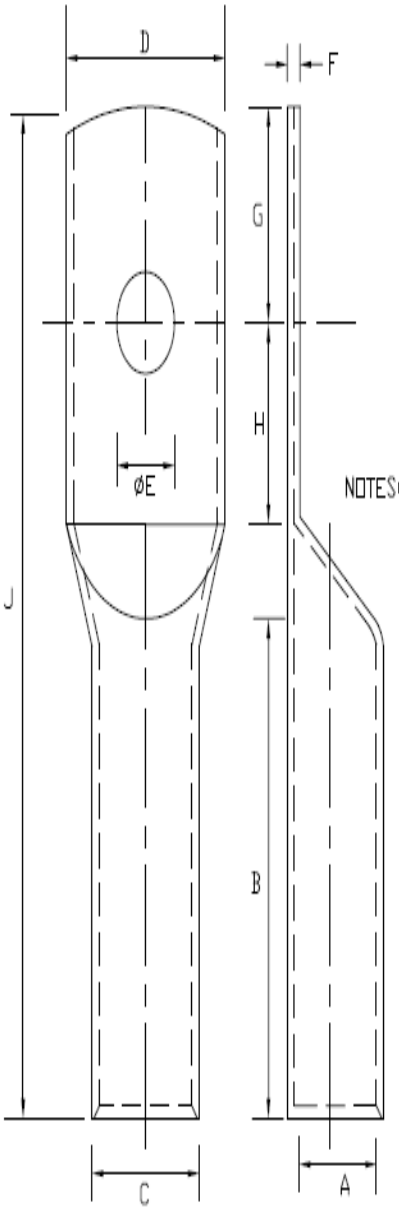
TITLE:-

Aluminum Tube Terminal Lug Long Barrel 10mm round conductor–Single Hole

DWG No.:-

## ALUMINUM TERMINAL LUGS

| SNO. | SIZEMM$^2$ | E ±0.1 | A ±0.2 | C ±0.2 | D ±1 | F ±0.1 | B ±1 | H ±0.5 | G ±0.5 | J ±1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. | 25MM$^2$ | 8.4 | 6.8 | 12 | 18 | 5 | 32 | 12 | 9.5 | 60 |
| 2. | 50MM$^2$ | 10.5 | 10 | 16 | 25 | 6 | 42 | 14.5 | 14 | 80 |
| 3. | 95MM$^2$ | 13 | 13.5 | 22 | 32 | 8 | 56 | 18 | 15.5 | 102 |
| 4. | 150MM$^2$ | 13 | 16.5 | 25 | 35 | 8 | 65 | 25 | 25 | 125 |




NOTES:- 1 ALL THE DIMENTIONS ARE IN MM

2 LUGS MATERIAL SHALL CONFIRM TO ALUMINUM OF GREAD 19501 AS PER IS 5082

3 LUGS SHALL HAVE MARKING AS PER RESPECTIVE SIZE AND 'BSES LOGO'

4 BARREL SHALL BE CAPED & FILLED WITH OXIDATION INHIBITENT SO AS TO AVOID OXIDATION OF THE ALUMINUM

5 CLEAR AND DISTINCT MARKING TO BE SPECIFIED ON BARREL LUG TO FACILITATE BETTER CRIMPING.

6 TWO SAMPLES OF SIMILAR SIZE TO BE SAMPLED FOR TEMPERATURE RISE TEST AND CHEMICAL COMPOSITION TEST ON EVENT OF ORDER.

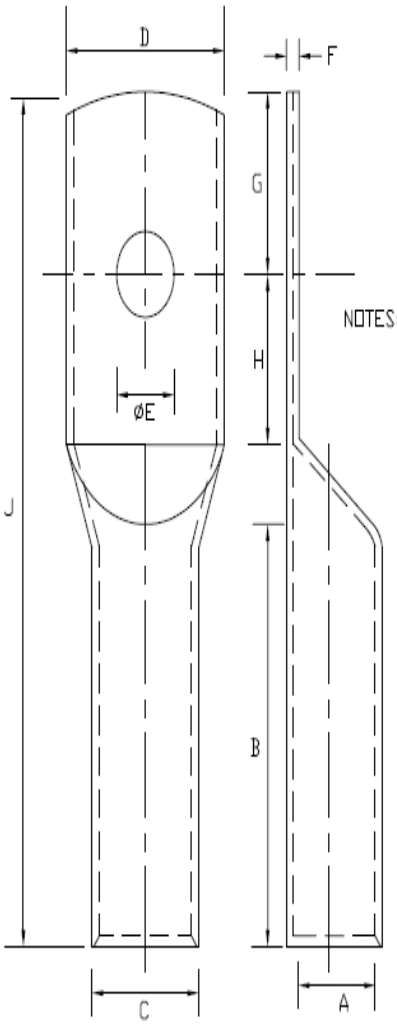
7 ALL CORNERS SHALL BE ROUNDED OFF.

BSES

TITLE:-
Aluminum Tube Terminal Lug Long Barrel For Round conductor-Single Hole

DWG No.:

## ALUMINIUM TERMINAL LUGS




| SNO. | SIZEMM² | E ±0.1 | A | C | D | F ±0.2 | B | H | G | J ±1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. | 1CX 300MM² | 17 | 21.5-22 | 32-32.5 | 47.5-48 | 10 | 79-80 | 39.5-40 | 29.5-30 | 165 |
| 2. | 4CX 300MM² | 17 | 24.3-24.7 | 33.8-34.2 | 47.5-48 | 10 | 79-80 | 39.5-40 | 29.5-30 | 165 |
| 3. | 400MM² | 17 | 26-26.4 | 38.5-39 | 53.5-54 | 125 | 115 | 39.5-40 | 29.5-30 | 200 |

NOTES:- 1 ALL THE DIMENTIONS ARE IN MM

2 LUGS MATERIAL SHALL CONFIRM TO ALUMINUM OF GREAD 19501 AS PER IS 5082

3 LUGS SHALL HAVE MARKING AS PER RESPECTIVE SIZE AND 'BSES LOGO'

4 BARREL SHALL BE CAPED & FILLED WITH OXIDATION INHIBITENT SO AS TO AVOID OXIDATION OF THE ALUMINUM

5 CLEAR AND DISTINCT MARKING TO BE SPECIFIED ON BARREL LUG TO FACILITATE BETTER CRIMPING.

6 TWO SAMPLES OF SIMILAR SIZE TO BE SAMPLED FOR TEMPERATURE RISE TEST AND CHEMICAL COMPOSITION TEST ON EVENT OF ORDER.

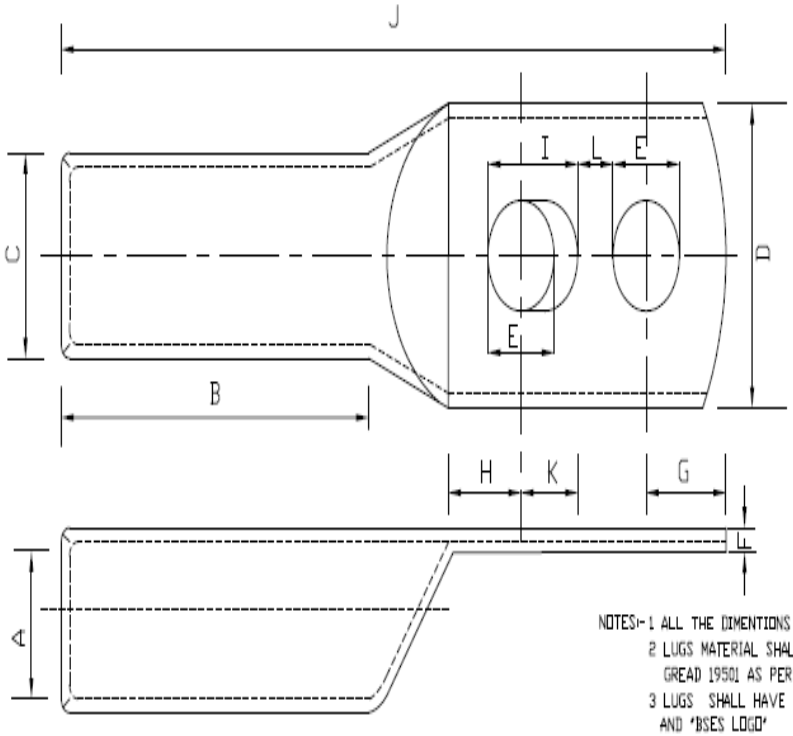
7 ALL CORNERS SHALL BE ROUNDED OFF.

BSES

TITLE:-
Aluminum Tube Terminal Lug Long Barrel for 300sqmm & 400sqmm cable round and sector-Single Hole

DWG No.:

## ALUMINIUM DIN TYPE TERMINAL LUGS




NOTES:- 1 ALL THE DIMENTIONS ARE IN MM
2 LUGS MATERIAL SHALL CONFIRM TO ALUMINUM OF GREAD 19501 AS PER IS 5082
3 LUGS SHALL HAVE MARKING AS PER RESPECTIVE SIZE AND 'BSES LOGO'
4 BARREL SHALL BE CAPED & FILLED WITH OXIDATION INHIBITENT SO AS TO AVOID OXIDATION OF THE ALUMINUM
5 CLEAR AND DISTINCT MARKING TO BE SPECIFIED ON BARREL LUG TO FACILITATE BETTER CRIMPTING
6 TWO SAMPLES OF SIMILAR SIZE TO BE SAMPLED FOR TEMPERATURE RISE TEST AND CHEMICAL COMPOSITION TEST ON EVENT OF ORDER.
7. ALL CORNERS SHALL BE ROUNDED OFF.

| SNO. | SIZEMM$^2$ | E ±0.1 | A | C | D | B ±1 | H | K | I | L | G | J ±1 | F ±0.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | 630MM$^2$ | 18 | 31.5-32 | 44.5-45 | 63-63.5 | 120 | 36-36.2 | 25-25.2 | 34-34.2 | 16-16.2 | 24-24.2 | 245 | 12.5 |
| 2. | 1000MM$^2$ | 20 | 43-43.5 | 56-56.5 | 77-77.5 | 140 | 38 | 26-26.2 | 36-36.2 | 16-16.2 | 25 | 270 | 13 |

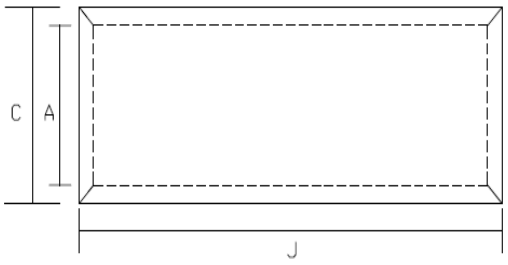
BSES

TITLE:-
Aluminum Tube Terminal Lug Long Barrel–
for 630 & 1000 sqmm round conductor–Double holes

DWG No.:-

COMPRESSION TYPE ALUMINIUM TUBULAR IN-LINE CONNECTORS FOR NON TENSION CONNECTORS OF ALUMINIUM CONDUCTORS

| SIZE | A | C | J |
|---|---|---|---|
| 25 | 6.8–7.1 | 12.0–12.5 | 65–75 |
| 50 | 9.3–9.6 | 16–16.5 | 80–90 |
| 95 | 13.2–13.6 | 22–22.5 | 100–110 |
| 150 | 16.3–16.7 | 25–25.5 | 120–130 |
| 300 | 23.3–23.7 | 34–34.5 | 140–150 |
| 400 | 26–26.4 | 38.5–39 | 205–215 |
| 630 | 34–34.4 | 50–50.5 | 235–245 |




NOTES:-

1. ALL THE DIMENTIONS ARE IN MM
2. REFERANCE : SPECIFICATION AS PER TABLE 2 OF IS-8308
3. MATERIAL : ELECTROLYTIC GRADE ALUMINIUM AS PER IS: 5082
4. FINISH : NATURAL

BSES

TITLE:-
ALUMINIUM IN-LINE
CONNECTORS HEAVY DUTY

DWG No.:-

BSES

# Technical Specification

## For Heat Shrinkable &

## GIS Cable Termination Kit

## (11 kV, 33 kV, 66 kV XLPE Insulated Cables)

Specification no – BSES-TS-45-TERM-R0

| | | |
|---|---|---|
| Rev: | | 0 |
| Pages | | 22 |
| Date: | | 19 Apr 2022 |
| Prepared by | Abhishek Vashistha | |
| | Gautam Deka/Pronab Bairagi | 19/4/22 |
| Reviewed by | Puneet Duggal | |
| | Amit Tomar | |
| Approved by | Gaurav Sharma | |
| | Gopal Nariya | |

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## Record of Revision

| Item/Clause No. | Change in Specification | Approved By | Rev |
| --- | --- | --- | --- |
| | | | |
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## 1.0.0 Scope of work

Heat Shrinkable & GIS Termination Kits, suitable for 11 kV & 33 kV, 66 kV XLPE / PILC cables, shall be designed, manufactured, tested, packed and delivered by the Vendor, as per Purchaser's requirements.

## 2.0.0 Codes & standards

2.1.0 National Standards:

| SL | Standard Number | Title |
| --- | --- | --- |
| 2.1.1 | IS – 13573: 2011 | Joints & Terminations of Polymeric Cables for working voltages from 6.6 kV up to and including 33 kV Performance Requirements and Type Tests |
| 2.1.2 | IS – 7098 Part 2 : 2011 | Cross-linked Polyethylene (XLPE) Insulated PVC sheathed cables : Part 2 : For working voltages from 3.3 kV up to and including 33 kV |
| 2.1.3 | IS – 692: 1994 | Paper insulated lead-sheathed cables (PILC) for rated voltages up to and including 33 kV specification |
| 2.1.3 | IS – 10810: 1984 | Methods of test for cables |
| 2.1.4 | IS – 7098 Part 3 : 2019 | Cross-linked polyethylene insulated thermoplastic sheathed Cables specification: Part 3 - For working voltages from 66 kV up to and including 220 KV |

2.1.1 International Standards:

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

### 3.0.0 Cable Construction

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

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

PILC type Cables:

3-core 240 or 300 sq. Mm. Al

| | | |
|---|---|---|
| 3.1.0 | Conductor | For XLPE :<br>a) Electrolytic Grade stranded Aluminium Conductor / Annealed Copper Conductor<br>b) Grade: H2/ H4 as per IS: 8130/84 (For Al)<br>c) Shape: Compacted Circular<br>d) Class 2<br>For PILC :<br>a) 11 kV : sector-shaped<br>b) 33Kv: oval-shaped |
| 3.2.0 | Conductor Screen | For XLPE :<br>Extruded Semi Conducting material<br>For PILC :<br>11 kV : no conductor screen<br>33 kV : carbon paper |
| 3.3.0 | Insulation | For XLPE: Extruded TR XLPE<br>For PILC: Layers of impregnated papers |

| | | |
|---|---|---|
| 3.4.0 | Insulation Screen | **Non Metallic Screen:**<br>For XLPE Insulated cable:<br>a) For 11, 33 U/G cable and HTAB cable - Freely strippable Semi Conducting ( without application of heat)<br>b) For 66kV cable - Firmly bonded semi conducting<br>**Metallic Screen:**<br>a) For For 11, 33 & 66 Kv U/G cable – Copper Tape<br>b) For HTAB – option 1 – Copper Tape (old installations) and option 2 – Aluminium wire (new installations)<br>For PILC :<br>a) 11 kV : absent (Belted)<br>b) 33kV: metallised paper tape |
| 3.5.0 | Water Swellable Tape | For XLPE: Semi-conducting Water Swellable Tape shall be provided under the copper tape on each core.<br>For PILC : not applicable |
| 3.6.0 | Filler | For XLPE: All interstices, including centre interstices filled by PP filler. Note- In special cases, for 66kV 3CX300 sqmm, 33kV, 3CX400 and 11kV 3CX400 cable are with-36 nos. Single mode and 12 nos. Multi modes OFC are also inbuilt as filler.Requirement of cable joint kit with OFC shall be fulfilled as per tender requirement<br>For PILC :<br>a) 11 kV : Crushed paper filler<br>b) 33kV: Jute twine |
| 3.7.0 | Over all three cores | XLPE : Binder tape<br>PILCA :<br>11 kV : belt paper<br>33kV: Copper Woven Fabric tape |
| 3.8.0 | Inner Sheath | For XLPE: Extruded Inner Sheath of Black PVC type ST-2.<br>For PILC : Lead alloy sheath |
| 3.9.0 | Bedding Tape | For XLPE: not applicable<br>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<br>For PILC :<br>a) 11 kV : absent (Belted cable)<br>b) 33 kV : applicable for screened cable |
| 3.11.0 | Armour | For XLPE :<br>a) Galvanised Steel round Wires/ Galvanised steel flat strip armour (For 3 core cables)<br>b) Hard drawn Aluminium Wire (For 1 core cables)<br>c) Aluminium or lead sheathed for 1Core 66kV cables<br>For PILC :<br>a) 11 kV double steel tape armour |
| 3.12.0 | Binder Tape | For XLPE: Rubberised cotton tape |

| | | |
|---|---|---|
| 3.13.0 | Outer Sheath | For XLPE:<br>Extruded outer sheath of PVC (ST-2) for 11 kV/ 33 KV and HDPE for 66kV Cable with termite- repellent.<br>For 66kV Cable- HDPE extruded semicon layer or HDPE with graphite layer.<br>For PILC :<br>compounded (bituminised) Jute/PVC |
| 3.14.0 | HTAB Cable (1CX150 and 1CX95) core construction | Aluminium conductor-conductor semicon screen- TR XPLE insulation-insulation semicon screen–Water Swell-able tape –Round wire armou installation) / Copper Tape (old installation) )<br>Water Swell-able tape-outer sheath |

## 4.0.0 Cable Termination Kits

General Technical Requirements for Cable Termination Kits are as follows:

| | | |
|---|---|---|
| 4.1.0 | Scope | Design, manufacture, testing and supply of Cable Termination Kits for H. T. Power Cables. |
| 4.2.0 | Functional Requirements | |
| 4.2.1 | Conductor Connection | |

| Voltage Grade | Cable Size | Application | Material of Lug | Connection Method |
|---|---|---|---|---|
| 11 kV | 3Cx150, 3Cx300 and 3Cx400 sq mm | Indoor | Bi-Metal | Crimping |
| | | Outdoor | Bi-Metal/ Aluminium as per tender requirement | Crimping |
| | 1Cx1000 sq mm | Indoor | Aluminium | Crimping |
| | | Outdoor | Aluminium | Crimping |
| HTAB (indoor not required) | 1Cx95 | Outdoor | Aluminium | Crimping |
| | 1Cx150 | Outdoor | Aluminium | Crimping |
| 33 kV | 3Cx400 sq mm | Indoor | Aluminium | Crimping |
| | | Outdoor | Aluminium | Crimping |
| | 1Cx1000 sq mm | Indoor | Aluminium | Crimping |
| | | Outdoor | Aluminium | Crimping |
| 66 kV | 3Cx300 | Indoor | Aluminium | Crimping |
| | | Outdoor | Aluminium | Crimping |
| | 1Cx630, 1Cx1000 sq mm | Indoor | Aluminium | Crimping |
| | | Outdoor | Aluminium | Crimping |

* For Bimetallic Lug Copper portion shall be tinned

| | | |
|---|---|---|
| | | a) For GIS cable termination kits: Plug in type, Conductor connection assembly shall be by standard method of split, silver-plated copper cone and pressure-fit contact assembly or as per manufacturer's standard.<br><br>b) Top corners of all lugs shall be circular shape not rectangular. Refer Annexure F for details.(Except GIS kit) |
| 4.2.2 | Stress Control System | a) The earthed insulation screen of an XLPE cable is terminated at a suitable distance from the conductor.<br>b) The tube is in electrical contact with insulation screen.<br>c) Impedance of the tube shall be constant up to an operating temperature and shall be within the range $1x10^{08}$ ohm-cm to $8x10^{08}$ ohm-cm.<br>d) Length of stress control tube for 11 kV and 33 kV shall be 130 mm and 260 mm respectively or according to insulation tube length. For 66kV termination kits, stress control tube shall be as per type tested design.<br>e) The physical and electrical properties shall conform to ESI 09: 13.<br>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. |
| 4.2.3 | Insulation Protection | a) XLPE insulation shall be protected by means of an outer tube, resistant to tracking and weathering.<br>b) One end of the tube shall be coated internally with red sealant mastic for a length of 50 mm.<br>c) Physical and Electrical properties shall conform to ESI 09: 13.<br>d) Insulation Tube length for termination- shall be 650 mm for both Indoor and Outdoor Termination kits of 11kV, 3CX150, 3CX300 and 3CX400 sqmm cable. All other accessories related to termination shall be according to 650mm insulation tube length. |
| 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. |
| 4.2.3.2 | OFC (66kV, 3CX300 sqmm , 33kV, 3Cx400 sqmm and 11kV, 3Cx400 sqmm cable) | Termination kit for OFC (36 single mode and 12 nos. Multi mode ) shall be supplied along with termination kit. |

| Cable System | | Length of tube (mm) | | Creepage Extension Shed (No.) | |
|---|---|---|---|---|---|
| Voltage | Cores | Indoor | Outdoor | Indoor | Outdoor |
| 11 kV | 3 – core | 650 | 650 | Nil | 2 |

| | | | | | |
|---|---|---|---|---|---|
| | 1 – core | 340 | 340 | NIL | 2 |
| 33 kV | 3 – core | 800 | 1200 | 2 | 5 |
| | 1 – core | 600 | 600 | 2 | 5 |

| | | |
|---|---|---|
| 4.2.3.3 | Oil Barrier Tube (applicable for PILC cable termination) | a) Transparent tube is used for restoring the insulation provided by belt paper, which is terminated at the crotch.<br>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. |
| 4.2.4 | Environmental Sealing System | 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.<br>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.<br>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.<br>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. |

| | | |
|---|---|---|
| 4.2.5 | Earth Bond System | Minimum Armour Fault Current Carrying capacity of cbles is as following:<br>11 kV U/G Cable – 11 kA for 1 sec<br>33 kV Cable – 31.5 kA for 1 sec<br>66 kV Cable – 31.5 kA for 1 sec<br>11 kV HTAB Cable – 11 kA for 1 sec<br><br>Fault current requirement shall be met by Tinned copper braid as per following:<br>11 kV U/G cables – Three No's 25 sq mm each<br>33 kV Cable – Four No's of 50 sq mm each<br>66 kV Cable – Four No's of 50 sq mm each<br>HTAB Cable with copper tape metallic screen – Three No's of 25 sq mm each<br><br>Length of the copper braided conductor shall be 750 mm.<br><br>Each copper braided conductor shall be supplied with copper lug, crimped at one end<br><br>For HTAB Cable with Aluminium wire metallic screen – Tinned copper braid is not required. 1 No's of Aluminium crimping lug of 120 sq mm cross section area shall be provided instead |
| 4.2.6 | Suppression of electrical discharges | Following materials are required for use during cable termination :<br>a) Silicone-based compound Required for filling-in minute services/ surface cracks over XLPE insulation.<br>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. |
| 4.2.7 | Installation. Instruction Sheet | It shall be in English and Hindi language and shall be provided inside every kit. |
| 4.2.8 | Paper Measuring Tap | Required for use during cable preparation / terminations. |
| 4.2.9 | Identification Tag (for traceability) | a) An aluminum pouch with paper tag & sealing arrangement at one end shall be provided.<br>b) This tag is required to be tied over the cable at one side of the joint.<br>c) The paper tag shall give following information<br>1) Vendor kit designation<br>2) Division<br>3) Breakdown ID/Shutdown ID/Scheme No.<br>4) Cable section<br>5) Type of joint<br>6) Size of Joint<br>7) Make of joint<br>8) Voltage class |

| | | |
|---|---|---|
| | | 9) Serial no. of kit<br>10) Vendor lot & batch no<br>11) Month & year of manufacturing<br>12) Date of installation<br>13) Name of jointer<br>14) Name of vendor supervisor<br>15) Name of BSES supervisor<br>16) Remarks<br>In addition to above Stainless Steel Tag shall be provided with following details for straight through joint<br><br>a. Manufacturing month and year (MM/YY format)<br>b. Manufacturer name i.e Comp<br>c. Manufacturer own sl no for future tracing |
| 4.3.0 | Technical Particulars | Vendor shall submit Guaranteed Technical Particulars (GTP) as per Annexure A. |
| 4.4.0 | Type Tests | i. Termination Kit shall be of type-tested quality from CPRI/ERDA/KEMA/CESI as per the BIS/IEC/IEEE within last 5 years.<br>ii. In case of type test is more than 5 years old but less than 10 years old, bidder has to give undertaking that there is no changes in design.<br>iii. In case of type test report is more than 10 years old, bidder has to conduct type test from CPRI/ERDA/KEMA/CESI as per the BIS/IEC/IEEE without any cost implications to BSES |
| 4.5.0 | Testing & Inspection | |
| | a) Tests | All the routine and acceptance tests shall be carried out as per ESI guidelines. (Also refer Annexure -C) |
| | b) Inspection | 1) Buyer reserves the right to witness all tests specified on individual H. S. components, Moulded components or completed Cable Termination Kit.<br>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.<br>3) In-process and final inspection call intimation shall be given in 10 days advance to purchaser. |
| | c) Test Certificates | Three sets of complete Test Certificates (Routine & Acceptance tests) shall be submitted along with the delivery of Cable Termination Kits. |
| 4.6.0 | Documents | "Documents" refer to Documents, Data, Manuals, etc. (Scanned copy of signed documents also shall be part of entire soft file (e-file) or CD.) |

| | | |
|---|---|---|
| 4.6.1 | Along with the Bid | Vendor shall submit signed 3 sets (plus 1 set of soft copy) of following documents:<br>a) GTP (duly filled-in) (as per Annexure - A).<br>b) Cross-sectional drawings for components Assembly<br>c) Type Test Certificates<br>d) Complete Catalogue and Instructions.<br>e) Any other document. |
| 4.6.2 | After Award of Contract | Vendor shall submit signed 2 sets (plus 1 set of soft copy) of above mentioned documents within 15 days, for Purchaser's approval. |
| 4.6.3 | "As-Built" documents | Final signed "As-built" documents for the equipment in 3 sets (hard copy), 1 no. soft copy and 1 no. CD. These documents shall include signed Routine & Acceptance Test Certificates also. |
| 4.7.0 | Packing, Marking, Shipping, Handling and Storage | Every component/kit/box shall be properly sealed/ packed for protection against damage. |
| a) | Identification Labels: | Markings / Labels shall be on both sides of every packed box.<br>1) Identification number/type designation (as per manufacturer's standard)<br>2) Voltage grade, size, description of the Kit (including the voltage grade, size, type of the cables, for which it is to be used)<br>3) Batch no., lot no., etc.<br>4) Quantity<br>5) a) Purchase Order no. & date<br>b) Purchaser's name<br>c) BSES's SAP code number<br>6) Weight (kg) of each Cable Termination Kit and of each box containing kits.<br>7) Manufacturer's name<br>8) Month & Year of Manufacturing<br>9) Date of packing, Shelf life (if applicable)<br>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..<br>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.<br>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. |

## 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. |

## 8.0.0 Inspection Expenses

Not Applicable

## 9.0.0 Penalty

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

## Annexure – A: Guaranteed Technical Particulars (GTP)

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

| S No. | Description | Purchase requirement | Vendor's data |
|---|---|---|---|
| 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<br>a) Size and no. of braids<br>b) Size of armour support<br>c) No. of hose clips | | |
| 7.4 | Method of mechanical protection<br>a) for 3-core Cable<br>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<br>a) For crimping connector<br>b) For mechanical connector | | |

| | | | |
|---|---|---|---|
| 8 | Description of items in the Kit, which are imported /sourced From Principal /Sub-suppliers | | |
| 9 | Names of items in the Kit and their respective shelf life (months I years) | | |
| 10 | Kit Content Table (KCT) enclosed? (Refer Annexure — B) | Yes / No | |
| 11 | Drawing for connector (ferrule) enclosed | Yes / No<br>(If yes, mention the document reference) | |
| 12 | Is Annexure - D (Technical Deviation Sheet) duly filled-in? | | |
| 13 | Packing (Qty)<br>i) Packing of every Kit<br>h) Group Packing | 1 no<br>-- No. of Kits per Box<br>-- No. of Boxes | |
| 14 | Installation Procedure enclosed? | Yes / No<br>(If yes, mention the document reference) | |
| 15 | Quality Assurance Plan<br>(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<br>(If yes, details of test report no. /Date /name of test laboratory to be mentioned.) | |
| 17 | Type Test Reports (TTR)<br>(Relevant test report no. & date, With type, size, other details of each type of Kit.)<br><br>a) Prepared Joint:<br><br>CPRI TTR as per BIS / IEC enclosed?<br><br>b) Loose Components:<br><br>CPRI TTR as per EA TS 09-13 enclosed? | <br><br><br><br>Yes/No<br><br><br><br>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 (For OFC embedded cable only 66Kv, 3CX300 sqmm , 33Kv, 3cx400 sqmm and 11kv, 3cx400 sqmm) | Yes/no | |

## Annexure – B: Kit Content Table (KCT)

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

**A. Heading**

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

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

**B. Details / Parameters**

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

**C. Notes on the KCT**

Markings, printings, other details for individual/group of components are to be mentioned on KCT. For example:
a) Printing of item code, size, batch no., etc.
b) Printing on components
c) Other embossing or engraving, it 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

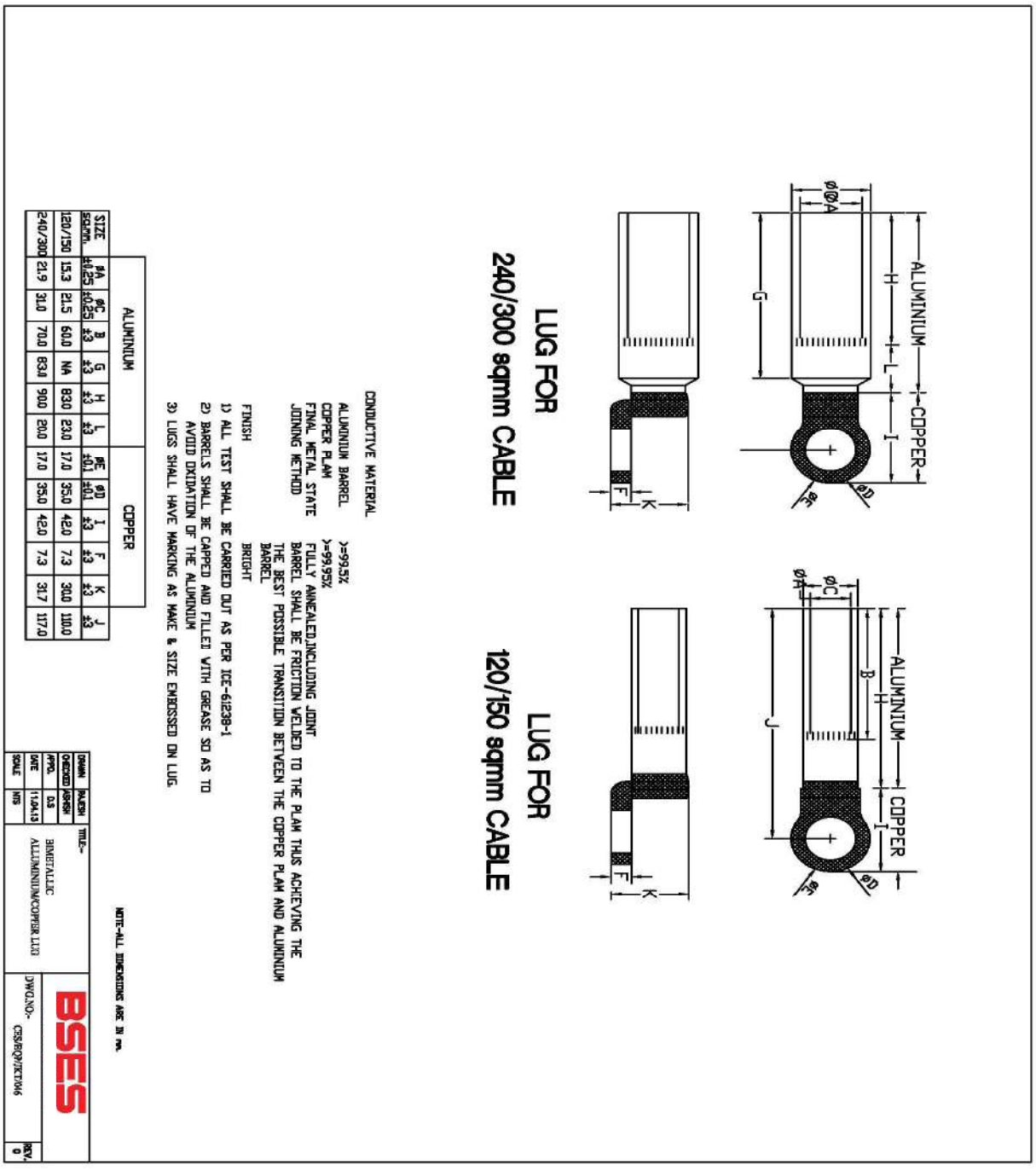
| Sr No. | Clause No. | Deviation |
| --- | --- | --- |
| | | |
| | | |
| | | |
| | | |
| | | |

## Annexure – E: Service Conditions

(Atmospheric conditions at Site)

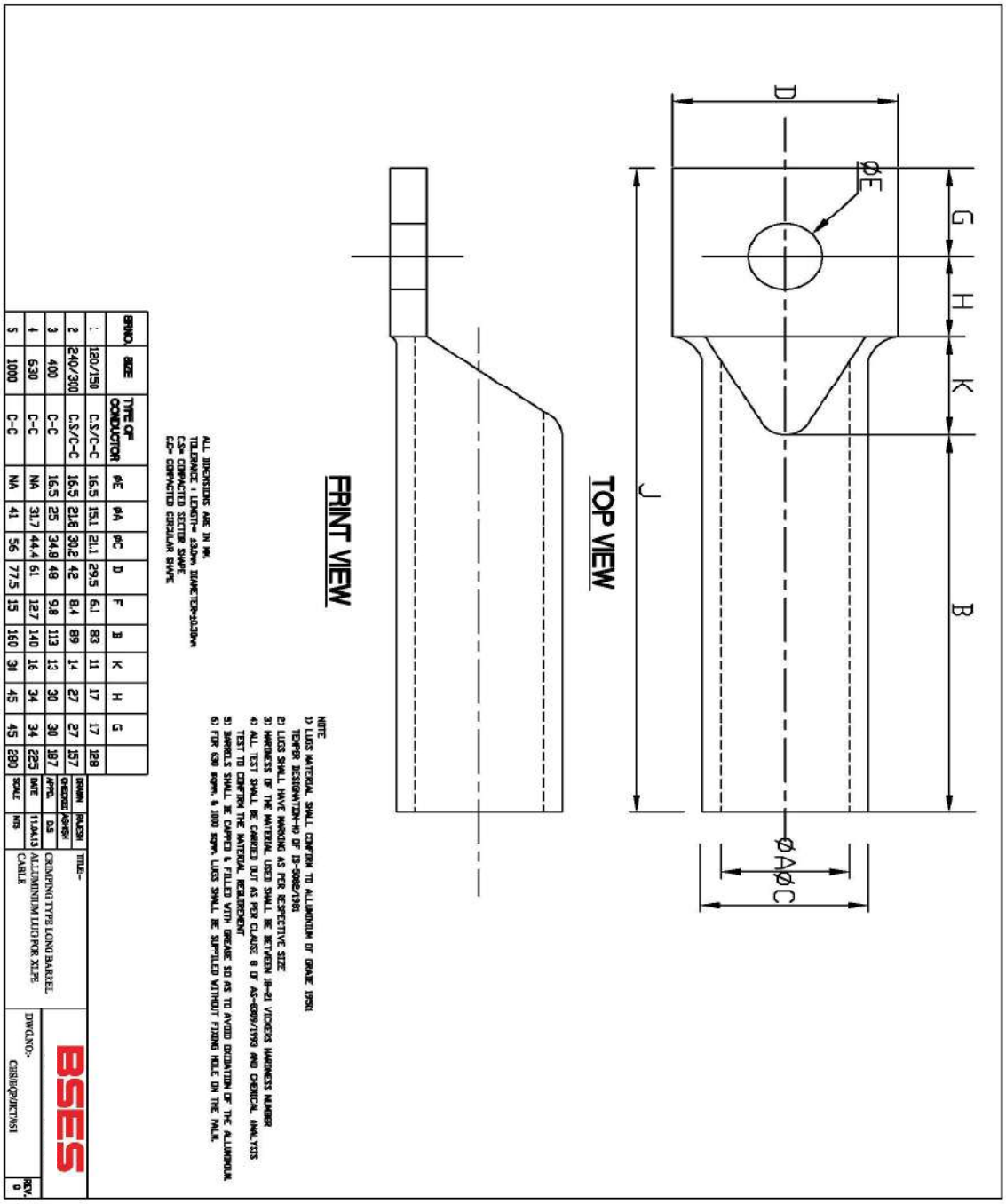
| | | |
| --- | --- | --- |
| 1 | Delhi | |
| a) | Average grade Atmospheric Condition: | Heavily Polluted, Dry |
| b) | Maximum altitude above sea level | 1000 M |
| c) | Ambient Air temperature | Highest 50 deg C, Average 40 deg C |
| d) | Minimum ambient air temperature | 0 deg C |
| e) | Relative 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: Bimetallic Aluminium / Copper Lug




| SIZE sq.mm. | ALUMINIUM | | | | | | | COPPER | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | øA ±0.25 | øC ±0.25 | B ±3 | G ±3 | H ±3 | L ±3 | øE ±0.1 | øD ±0.1 | I ±3 | F ±3 | K ±3 | J ±3 |
| 120/150 | 15.3 | 21.5 | 60.0 | NA | 830 | 230 | 17.0 | 35.0 | 42.0 | 7.3 | 30.0 | 110.0 |
| 240/300 | 21.9 | 31.0 | 70.0 | 834 | 900 | 200 | 17.0 | 35.0 | 42.0 | 7.3 | 31.7 | 117.0 |

## Annexure – G: Aluminum/Copper Lug For XLPE Cable




NOTE
1) LUGS MATERIAL SHALL CONFORM TO ALUMINIUM OF GRADE 19201 TEMPER DESIGNATION-H0 OF IS-5082/1981
2) LUGS SHALL HAVE MARKING AS PER RESPECTIVE SIZE
3) HARDNESS OF THE MATERIAL USED SHALL BE BETWEEN 28-32 VICKERS HARDNESS NUMBER
4) ALL TEST SHALL BE CARRIED OUT AS PER CLAUSE 8 OF AS-6809/1990 AND CHEMICAL ANALYSIS TEST TO CONFIRM THE MATERIAL REQUIREMENT
5) BARRELS SHALL BE CAPPED & FILLED WITH GREASE SO AS TO AVOID OXIDATION OF THE ALUMINIUM
6) FOR 630 sqmm & 1000 sqmm, LUGS SHALL BE SUPPLIED WITHOUT FIXING HOLE ON THE PALM.

ALL DIMENSIONS ARE IN MM.
TOLERANCE : LENGTH= ±3.0mm DIAMETER=±0.50mm
CS= COMPACTED SECTOR SHAPE
CC= COMPACTED CIRCULAR SHAPE

| SRNO. | SIZE | TYPE OF CONDUCTOR | ØE | ØA | ØC | D | F | B | K | H | G | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 120/150 | C.S./C-C | 16.5 | 15.1 | 21.1 | 29.5 | 6.1 | 83 | 11 | 17 | 17 | 128 |
| 2 | 240/300 | C.S./C-C | 16.5 | 21.8 | 30.2 | 42 | 8.4 | 89 | 14 | 27 | 27 | 157 |
| 3 | 400 | C-C | 16.5 | 25 | 34.8 | 48 | 9.8 | 113 | 13 | 30 | 30 | 197 |
| 4 | 630 | C-C | NA | 31.7 | 44.4 | 61 | 127 | 140 | 16 | 34 | 34 | 225 |
| 5 | 1000 | C-C | NA | 41 | 56 | 77.5 | 15 | 160 | 36 | 45 | 45 | 280 |

| DRAWN | RAJESH | TITLE- |
|---|---|---|
| CHECKED | ASHISH | CRIMPING TYPE LONG BARREL ALUMINIUM LUGS FOR XLPE CABLE |
| APPD. | DJS | |
| DATE | 11/04/13 | |
| SCALE | NTS | DWG.NO- CESI/EQP/ELECT/051 |

BSES

REV- 0

## Annexure-H

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

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

Special Note-

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

BSES

# Technical Specification

## For Heat Shrinkable &

## GIS Cable Termination Kit

## (11 kV, 33 kV, 66 kV XLPE Insulated Cables)

Specification no – BSES-TS-45-TERM-R0

| | | |
|---|---|---|
| Rev: | | 0 |
| Pages | | 22 |
| Date: | | 19 Apr 2022 |
| Prepared by | Abhishek Vashistha | |
| | Gautam Deka/Pronab Bairagi | 19/4/22 |
| Reviewed by | Puneet Duggal | |
| | Amit Tomar | |
| Approved by | Gaurav Sharma | |
| | Gopal Nariya | |

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## Record of Revision

| Item/Clause No. | Change in Specification | Approved By | Rev |
| --- | --- | --- | --- |
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## 1.0.0 Scope of work

Heat Shrinkable & GIS Termination Kits, suitable for 11 kV & 33 kV, 66 kV XLPE / PILC cables, shall be designed, manufactured, tested, packed and delivered by the Vendor, as per Purchaser's requirements.

## 2.0.0 Codes & standards

2.1.0 National Standards:

| SL | Standard Number | Title |
| --- | --- | --- |
| 2.1.1 | IS – 13573: 2011 | Joints & Terminations of Polymeric Cables for working voltages from 6.6 kV up to and including 33 kV Performance Requirements and Type Tests |
| 2.1.2 | IS – 7098 Part 2 : 2011 | Cross-linked Polyethylene (XLPE) Insulated PVC sheathed cables : Part 2 : For working voltages from 3.3 kV up to and including 33 kV |
| 2.1.3 | IS – 692: 1994 | Paper insulated lead-sheathed cables (PILC) for rated voltages up to and including 33 kV specification |
| 2.1.3 | IS – 10810: 1984 | Methods of test for cables |
| 2.1.4 | IS – 7098 Part 3 : 2019 | Cross-linked polyethylene insulated thermoplastic sheathed Cables specification: Part 3 - For working voltages from 66 kV up to and including 220 KV |

2.1.1 International Standards:

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

### 3.0.0 Cable Construction

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

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

PILC type Cables:

3-core 240 or 300 sq. Mm. Al

| | | |
|---|---|---|
| 3.1.0 | Conductor | For XLPE :<br>a) Electrolytic Grade stranded Aluminium Conductor / Annealed Copper Conductor<br>b) Grade: H2/ H4 as per IS: 8130/84 (For Al)<br>c) Shape: Compacted Circular<br>d) Class 2<br>For PILC :<br>a) 11 kV : sector-shaped<br>b) 33Kv: oval-shaped |
| 3.2.0 | Conductor Screen | For XLPE :<br>Extruded Semi Conducting material<br>For PILC :<br>11 kV : no conductor screen<br>33 kV : carbon paper |
| 3.3.0 | Insulation | For XLPE: Extruded TR XLPE<br>For PILC: Layers of impregnated papers |

| | | |
|---|---|---|
| 3.4.0 | Insulation Screen | **Non Metallic Screen:**<br>For XLPE Insulated cable:<br>a) For 11, 33 U/G cable and HTAB cable - Freely strippable Semi Conducting ( without application of heat)<br>b) For 66kV cable - Firmly bonded semi conducting<br>**Metallic Screen:**<br>a) For For 11, 33 & 66 Kv U/G cable – Copper Tape<br>b) For HTAB – option 1 – Copper Tape (old installations) and option 2 – Aluminium wire (new installations)<br>For PILC :<br>a) 11 kV : absent (Belted)<br>b) 33kV: metallised paper tape |
| 3.5.0 | Water Swellable Tape | For XLPE: Semi-conducting Water Swellable Tape shall be provided under the copper tape on each core.<br>For PILC : not applicable |
| 3.6.0 | Filler | For XLPE: All interstices, including centre interstices filled by PP filler. Note- In special cases, for 66kV 3CX300 sqmm, 33kV, 3CX400 and 11kV 3CX400 cable are with-36 nos. Single mode and 12 nos. Multi modes OFC are also inbuilt as filler.Requirement of cable joint kit with OFC shall be fulfilled as per tender requirement<br>For PILC :<br>a) 11 kV : Crushed paper filler<br>b) 33kV: Jute twine |
| 3.7.0 | Over all three cores | XLPE : Binder tape<br>PILCA :<br>11 kV : belt paper<br>33kV: Copper Woven Fabric tape |
| 3.8.0 | Inner Sheath | For XLPE: Extruded Inner Sheath of Black PVC type ST-2.<br>For PILC : Lead alloy sheath |
| 3.9.0 | Bedding Tape | For XLPE: not applicable<br>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<br>For PILC :<br>a) 11 kV : absent (Belted cable)<br>b) 33 kV : applicable for screened cable |
| 3.11.0 | Armour | For XLPE :<br>a) Galvanised Steel round Wires/ Galvanised steel flat strip armour (For 3 core cables)<br>b) Hard drawn Aluminium Wire (For 1 core cables)<br>c) Aluminium or lead sheathed for 1Core 66kV cables<br>For PILC :<br>a) 11 kV double steel tape armour |
| 3.12.0 | Binder Tape | For XLPE: Rubberised cotton tape |

| | | |
|---|---|---|
| 3.13.0 | Outer Sheath | For XLPE:<br>Extruded outer sheath of PVC (ST-2) for 11 kV/ 33 KV and HDPE for 66kV Cable with termite- repellent.<br>For 66kV Cable- HDPE extruded semicon layer or HDPE with graphite layer.<br>For PILC :<br>compounded (bituminised) Jute/PVC |
| 3.14.0 | HTAB Cable (1CX150 and 1CX95) core construction | Aluminium conductor-conductor semicon screen- TR XPLE insulation-insulation semicon screen–Water Swell-able tape –Round wire armou installation) / Copper Tape (old installation) )<br>Water Swell-able tape-outer sheath |

## 4.0.0 Cable Termination Kits

General Technical Requirements for Cable Termination Kits are as follows:

| | | |
|---|---|---|
| 4.1.0 | Scope | Design, manufacture, testing and supply of Cable Termination Kits for H. T. Power Cables. |
| 4.2.0 | Functional Requirements | |
| 4.2.1 | Conductor Connection | |

| Voltage Grade | Cable Size | Application | Material of Lug | Connection Method |
|---|---|---|---|---|
| 11 kV | 3Cx150, 3Cx300 and 3Cx400 sq mm | Indoor | Bi-Metal | Crimping |
| | | Outdoor | Bi-Metal/ Aluminium as per tender requirement | Crimping |
| | 1Cx1000 sq mm | Indoor | Aluminium | Crimping |
| | | Outdoor | Aluminium | Crimping |
| HTAB (indoor not required) | 1Cx95 | Outdoor | Aluminium | Crimping |
| | 1Cx150 | Outdoor | Aluminium | Crimping |
| 33 kV | 3Cx400 sq mm | Indoor | Aluminium | Crimping |
| | | Outdoor | Aluminium | Crimping |
| | 1Cx1000 sq mm | Indoor | Aluminium | Crimping |
| | | Outdoor | Aluminium | Crimping |
| 66 kV | 3Cx300 | Indoor | Aluminium | Crimping |
| | | Outdoor | Aluminium | Crimping |
| | 1Cx630, 1Cx1000 sq mm | Indoor | Aluminium | Crimping |
| | | Outdoor | Aluminium | Crimping |

* For Bimetallic Lug Copper portion shall be tinned

| | | |
|---|---|---|
| | | a) For GIS cable termination kits: Plug in type, Conductor connection assembly shall be by standard method of split, silver-plated copper cone and pressure-fit contact assembly or as per manufacturer's standard.<br><br>b) Top corners of all lugs shall be circular shape not rectangular. Refer Annexure F for details.(Except GIS kit) |
| 4.2.2 | Stress Control System | a) The earthed insulation screen of an XLPE cable is terminated at a suitable distance from the conductor.<br>b) The tube is in electrical contact with insulation screen.<br>c) Impedance of the tube shall be constant up to an operating temperature and shall be within the range $1x10^{08}$ ohm-cm to $8x10^{08}$ ohm-cm.<br>d) Length of stress control tube for 11 kV and 33 kV shall be 130 mm and 260 mm respectively or according to insulation tube length. For 66kV termination kits, stress control tube shall be as per type tested design.<br>e) The physical and electrical properties shall conform to ESI 09: 13.<br>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. |
| 4.2.3 | Insulation Protection | a) XLPE insulation shall be protected by means of an outer tube, resistant to tracking and weathering.<br>b) One end of the tube shall be coated internally with red sealant mastic for a length of 50 mm.<br>c) Physical and Electrical properties shall conform to ESI 09: 13.<br>d) Insulation Tube length for termination- shall be 650 mm for both Indoor and Outdoor Termination kits of 11kV, 3CX150, 3CX300 and 3CX400 sqmm cable. All other accessories related to termination shall be according to 650mm insulation tube length. |
| 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. |
| 4.2.3.2 | OFC (66kV, 3CX300 sqmm , 33kV, 3Cx400 sqmm and 11kV, 3Cx400 sqmm cable) | Termination kit for OFC (36 single mode and 12 nos. Multi mode ) shall be supplied along with termination kit. |

| Cable System | | Length of tube (mm) | | Creepage Extension Shed (No.) | |
|---|---|---|---|---|---|
| Voltage | Cores | Indoor | Outdoor | Indoor | Outdoor |
| 11 kV | 3 – core | 650 | 650 | Nil | 2 |

| | | | | | |
|---|---|---|---|---|---|
| | 1 – core | 340 | 340 | NIL | 2 |
| 33 kV | 3 – core | 800 | 1200 | 2 | 5 |
| | 1 – core | 600 | 600 | 2 | 5 |

| | | |
|---|---|---|
| 4.2.3.3 | Oil Barrier Tube (applicable for PILC cable termination) | a) Transparent tube is used for restoring the insulation provided by belt paper, which is terminated at the crotch.<br>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. |
| 4.2.4 | Environmental Sealing System | 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.<br>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.<br>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.<br>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. |

| | | |
|---|---|---|
| 4.2.5 | Earth Bond System | Minimum Armour Fault Current Carrying capacity of cbles is as following:<br>11 kV U/G Cable – 11 kA for 1 sec<br>33 kV Cable – 31.5 kA for 1 sec<br>66 kV Cable – 31.5 kA for 1 sec<br>11 kV HTAB Cable – 11 kA for 1 sec<br><br>Fault current requirement shall be met by Tinned copper braid as per following:<br>11 kV U/G cables – Three No's 25 sq mm each<br>33 kV Cable – Four No's of 50 sq mm each<br>66 kV Cable – Four No's of 50 sq mm each<br>HTAB Cable with copper tape metallic screen – Three No's of 25 sq mm each<br><br>Length of the copper braided conductor shall be 750 mm.<br><br>Each copper braided conductor shall be supplied with copper lug, crimped at one end<br><br>For HTAB Cable with Aluminium wire metallic screen – Tinned copper braid is not required. 1 No's of Aluminium crimping lug of 120 sq mm cross section area shall be provided instead |
| 4.2.6 | Suppression of electrical discharges | Following materials are required for use during cable termination :<br>a) Silicone-based compound Required for filling-in minute services/ surface cracks over XLPE insulation.<br>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. |
| 4.2.7 | Installation. Instruction Sheet | It shall be in English and Hindi language and shall be provided inside every kit. |
| 4.2.8 | Paper Measuring Tap | Required for use during cable preparation / terminations. |
| 4.2.9 | Identification Tag (for traceability) | a) An aluminum pouch with paper tag & sealing arrangement at one end shall be provided.<br>b) This tag is required to be tied over the cable at one side of the joint.<br>c) The paper tag shall give following information<br>1) Vendor kit designation<br>2) Division<br>3) Breakdown ID/Shutdown ID/Scheme No.<br>4) Cable section<br>5) Type of joint<br>6) Size of Joint<br>7) Make of joint<br>8) Voltage class |

| | | |
|---|---|---|
| | | 9) Serial no. of kit<br>10) Vendor lot & batch no<br>11) Month & year of manufacturing<br>12) Date of installation<br>13) Name of jointer<br>14) Name of vendor supervisor<br>15) Name of BSES supervisor<br>16) Remarks<br>In addition to above Stainless Steel Tag shall be provided with following details for straight through joint<br><br>a. Manufacturing month and year (MM/YY format)<br>b. Manufacturer name i.e Comp<br>c. Manufacturer own sl no for future tracing |
| 4.3.0 | Technical Particulars | Vendor shall submit Guaranteed Technical Particulars (GTP) as per Annexure A. |
| 4.4.0 | Type Tests | i. Termination Kit shall be of type-tested quality from CPRI/ERDA/KEMA/CESI as per the BIS/IEC/IEEE within last 5 years.<br>ii. In case of type test is more than 5 years old but less than 10 years old, bidder has to give undertaking that there is no changes in design.<br>iii. In case of type test report is more than 10 years old, bidder has to conduct type test from CPRI/ERDA/KEMA/CESI as per the BIS/IEC/IEEE without any cost implications to BSES |
| 4.5.0 | Testing & Inspection | |
| | a) Tests | All the routine and acceptance tests shall be carried out as per ESI guidelines. (Also refer Annexure -C) |
| | b) Inspection | 1) Buyer reserves the right to witness all tests specified on individual H. S. components, Moulded components or completed Cable Termination Kit.<br>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.<br>3) In-process and final inspection call intimation shall be given in 10 days advance to purchaser. |
| | c) Test Certificates | Three sets of complete Test Certificates (Routine & Acceptance tests) shall be submitted along with the delivery of Cable Termination Kits. |
| 4.6.0 | Documents | "Documents" refer to Documents, Data, Manuals, etc. (Scanned copy of signed documents also shall be part of entire soft file (e-file) or CD.) |

| | | |
|---|---|---|
| 4.6.1 | Along with the Bid | Vendor shall submit signed 3 sets (plus 1 set of soft copy) of following documents:<br>a) GTP (duly filled-in) (as per Annexure - A).<br>b) Cross-sectional drawings for components Assembly<br>c) Type Test Certificates<br>d) Complete Catalogue and Instructions.<br>e) Any other document. |
| 4.6.2 | After Award of Contract | Vendor shall submit signed 2 sets (plus 1 set of soft copy) of above mentioned documents within 15 days, for Purchaser's approval. |
| 4.6.3 | "As-Built" documents | Final signed "As-built" documents for the equipment in 3 sets (hard copy), 1 no. soft copy and 1 no. CD. These documents shall include signed Routine & Acceptance Test Certificates also. |
| 4.7.0 | Packing, Marking, Shipping, Handling and Storage | Every component/kit/box shall be properly sealed/ packed for protection against damage. |
| a) | Identification Labels: | Markings / Labels shall be on both sides of every packed box.<br>1) Identification number/type designation (as per manufacturer's standard)<br>2) Voltage grade, size, description of the Kit (including the voltage grade, size, type of the cables, for which it is to be used)<br>3) Batch no., lot no., etc.<br>4) Quantity<br>5) a) Purchase Order no. & date<br>b) Purchaser's name<br>c) BSES's SAP code number<br>6) Weight (kg) of each Cable Termination Kit and of each box containing kits.<br>7) Manufacturer's name<br>8) Month & Year of Manufacturing<br>9) Date of packing, Shelf life (if applicable)<br>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..<br>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.<br>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. |

## 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. |

## 8.0.0 Inspection Expenses

Not Applicable

## 9.0.0 Penalty

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

## Annexure – A: Guaranteed Technical Particulars (GTP)

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

| S No. | Description | Purchase requirement | Vendor's data |
|---|---|---|---|
| 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<br>a) Size and no. of braids<br>b) Size of armour support<br>c) No. of hose clips | | |
| 7.4 | Method of mechanical protection<br>a) for 3-core Cable<br>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<br>a) For crimping connector<br>b) For mechanical connector | | |

| | | | |
|---|---|---|---|
| 8 | Description of items in the Kit, which are imported /sourced From Principal /Sub-suppliers | | |
| 9 | Names of items in the Kit and their respective shelf life (months I years) | | |
| 10 | Kit Content Table (KCT) enclosed? (Refer Annexure — B) | Yes / No | |
| 11 | Drawing for connector (ferrule) enclosed | Yes / No<br>(If yes, mention the document reference) | |
| 12 | Is Annexure - D (Technical Deviation Sheet) duly filled-in? | | |
| 13 | Packing (Qty)<br>i) Packing of every Kit<br>h) Group Packing | 1 no<br>-- No. of Kits per Box<br>-- No. of Boxes | |
| 14 | Installation Procedure enclosed? | Yes / No<br>(If yes, mention the document reference) | |
| 15 | Quality Assurance Plan<br>(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<br>(If yes, details of test report no. /Date /name of test laboratory to be mentioned.) | |
| 17 | Type Test Reports (TTR)<br>(Relevant test report no. & date, With type, size, other details of each type of Kit.)<br><br>a) Prepared Joint:<br><br>CPRI TTR as per BIS / IEC enclosed?<br><br>b) Loose Components:<br><br>CPRI TTR as per EA TS 09-13 enclosed? | <br><br><br><br>Yes/No<br><br><br><br>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 (For OFC embedded cable only 66Kv, 3CX300 sqmm , 33Kv, 3cx400 sqmm and 11kv, 3cx400 sqmm) | Yes/no | |

## Annexure – B: Kit Content Table (KCT)

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

**A. Heading**

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

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

**B. Details / Parameters**

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

**C. Notes on the KCT**

Markings, printings, other details for individual/group of components are to be mentioned on KCT. For example:
a) Printing of item code, size, batch no., etc.
b) Printing on components
c) Other embossing or engraving, it 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

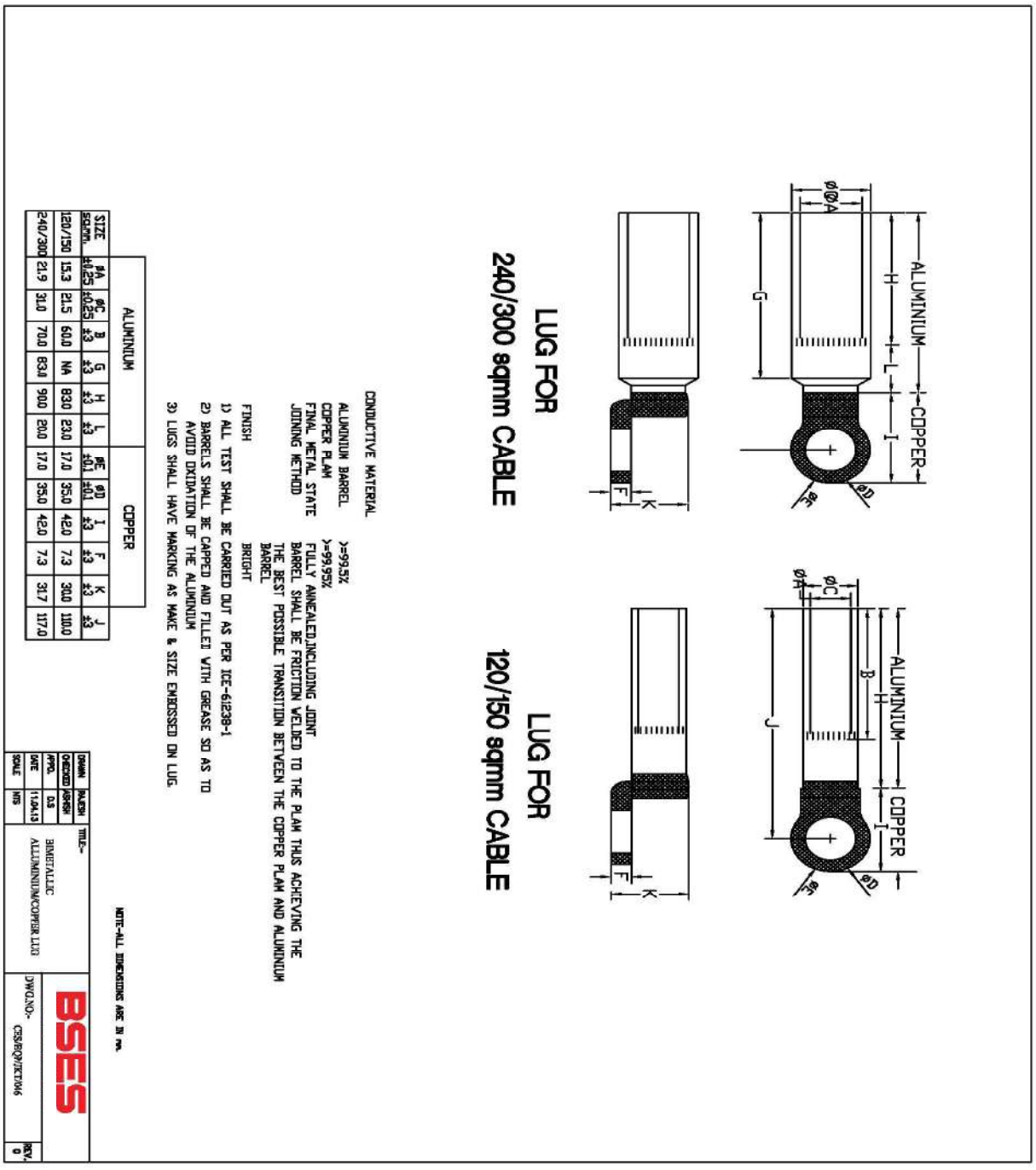
| Sr No. | Clause No. | Deviation |
| --- | --- | --- |
| | | |
| | | |
| | | |
| | | |
| | | |

## Annexure – E: Service Conditions

(Atmospheric conditions at Site)

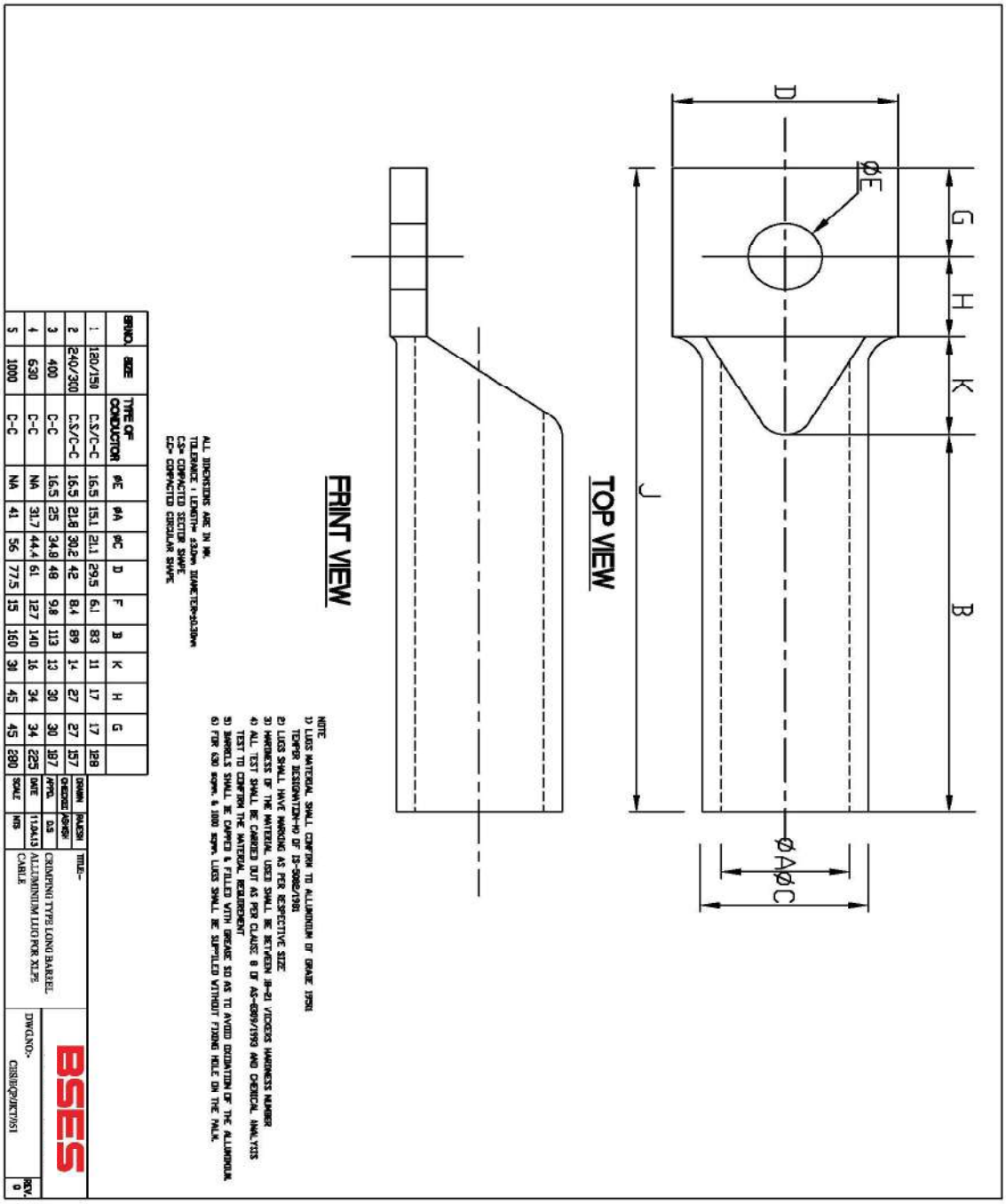
| | | |
| --- | --- | --- |
| 1 | Delhi | |
| a) | Average grade Atmospheric Condition: | Heavily Polluted, Dry |
| b) | Maximum altitude above sea level | 1000 M |
| c) | Ambient Air temperature | Highest 50 deg C, Average 40 deg C |
| d) | Minimum ambient air temperature | 0 deg C |
| e) | Relative 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: Bimetallic Aluminium / Copper Lug




| SIZE sq.mm. | ALUMINIUM | | | | | | | COPPER | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | øA ±0.25 | øC ±0.25 | B ±3 | G ±3 | H ±3 | L ±3 | øE ±0.1 | øD ±0.1 | I ±3 | F ±3 | K ±3 | J ±3 |
| 120/150 | 15.3 | 21.5 | 60.0 | NA | 830 | 230 | 17.0 | 35.0 | 42.0 | 7.3 | 30.0 | 110.0 |
| 240/300 | 21.9 | 31.0 | 70.0 | 834 | 900 | 200 | 17.0 | 35.0 | 42.0 | 7.3 | 31.7 | 117.0 |

## Annexure – G: Aluminum/Copper Lug For XLPE Cable




NOTE
1) LUGS MATERIAL SHALL CONFORM TO ALUMINIUM OF GRADE 19201 TEMPER DESIGNATION-H0 OF IS-5082/1981
2) LUGS SHALL HAVE MARKING AS PER RESPECTIVE SIZE
3) HARDNESS OF THE MATERIAL USED SHALL BE BETWEEN 28-32 VICKERS HARDNESS NUMBER
4) ALL TEST SHALL BE CARRIED OUT AS PER CLAUSE 8 OF AS-6809/1990 AND CHEMICAL ANALYSIS TEST TO CONFIRM THE MATERIAL REQUIREMENT
5) BARRELS SHALL BE CAPPED & FILLED WITH GREASE SO AS TO AVOID OXIDATION OF THE ALUMINIUM
6) FOR 630 sqmm & 1000 sqmm, LUGS SHALL BE SUPPLIED WITHOUT FIXING HOLE ON THE PALM.

ALL DIMENSIONS ARE IN MM.
TOLERANCE : LENGTH= ±3.0mm DIAMETER=±0.50mm
CS= COMPACTED SECTOR SHAPE
CC= COMPACTED CIRCULAR SHAPE

| SRNO. | SIZE | TYPE OF CONDUCTOR | ØE | ØA | ØC | D | F | B | K | H | G | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 120/150 | C.S./C-C | 16.5 | 15.1 | 21.1 | 29.5 | 6.1 | 83 | 11 | 17 | 17 | 128 |
| 2 | 240/300 | C.S./C-C | 16.5 | 21.8 | 30.2 | 42 | 8.4 | 89 | 14 | 27 | 27 | 157 |
| 3 | 400 | C-C | 16.5 | 25 | 34.8 | 48 | 9.8 | 113 | 13 | 30 | 30 | 197 |
| 4 | 630 | C-C | NA | 31.7 | 44.4 | 61 | 127 | 140 | 16 | 34 | 34 | 225 |
| 5 | 1000 | C-C | NA | 41 | 56 | 77.5 | 15 | 160 | 36 | 45 | 45 | 280 |

| DRAWN | RAJESH | TITLE- |
|---|---|---|
| CHECKED | ASHISH | CRIMPING TYPE LONG BARREL ALUMINIUM LUGS FOR XLPE CABLE |
| APPD. | DJS | |
| DATE | 11/04/13 | |
| SCALE | NTS | DWG.NO- CESI/EQP/ELECT/051 |

BSES

REV- 0

## Annexure-H

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

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

Special Note-

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