

TENDER DOCUMENT FOR

**SUPPLY, LAYING, TESTING & COMMISSIONING OF
33KV 3CX400 MM² CABLE WITH REQUIRED
ACCESSORIES AS PER THE SCOPE OF WORK AT
VARIOUS LOCATIONS FOR BYPL, DELHI (INDIA)**

ON

TURNKEY BASIS

IN

BSES YAMUNA POWER LTD.

NIT NO CMC/BY/19-20/RB/SV/019

Due Date for Submission: 10.06.2019, 14:30 HRS

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

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

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VOLUME – I

INFORMATION TO BIDDER (ITB)

OF

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VOLUME – I: INFORMATION TO BIDDER (ITB)

1.00 EVENT INFORMATION

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

Sr.	Scheme Description	Location	Scheme Description	Estimate Cost Value In INR	EMD Value In INR	Length
						KM
1	SUPPLY, LAYING, TESTING & COMMISSIONING OF 33KV 3CX400 MM2 CABLE WITH REQUIRED ACCESSORIES & DISMANTLING AS PER THE SCOPE OF WORK	Dwarka puri	2 nos. ckt from 220kV Preet Vihar to 33 kV Dwarkapuri Grid double circuit	25.00 Crore	25.00 Lakh	22
2		CBD-II	1 nos. 33KV ckt from 220kv Preet Vihar to CBD-II Grid			5
3		Kanti Nagar	220kV Preet Vihar to Kanti Nagar and Karkardooma By LILO of Karkardooma to Kanti nagar ckt at Garg Hospital			7
4		DSIDC	220kV preet vihar to DSIDC Jhilmil and GT road by LILO of existing DSIDC GT road ckt			18
5		Stores	9 KM of 33KV 3Cx400 Cable (Supply Only)			9

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

All envelopes shall be duly super scribed “INSTALLATION OF GIS GRID SUBSTATION ALONG WITH ASSOCIATED INFEEED AND OUTGOING CABLES LAYING WORK ON TURNKEY BASIS in BYPL, NEW DELHI (INDIA)”.

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

Part A – Techno Commercial Bid

Part B – Price Bid

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

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

- 1.2. Bids will be received up to **10.06.2019, 14:30 PM.** at the address given below.

Part A of the Bid shall be opened on **10.06.2019, 15:30 PM.**

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

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

- 1.3 BSES Yamuna Power Ltd reserves the right to accept/reject any or all tenders without assigning any reason thereof in the event of following:
- Tender fee of requisite value.
 - Earnest Money Deposit (EMD) of value 1% of the estimated value of quoted package is not deposited in shape of Demand Draft/Pay Order/Banker's Cheque /Bank Guarantee drawn in favor of BSES Yamuna Power Ltd, payable at Delhi.
 - The offer does not contain prices indicating break-up towards all taxes & duties in prescribed format
 - Complete Technical details are not enclosed.
 - Tender is received after due date and time.
 - Technical offer contains any prices
 - Prices are not FIRM and subject to Price Variation.

2.00 QUALIFICATION CRITERIA

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

2.02 Technical Criteria:

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SI No.	Criteria	Documents to be submitted by bidder
1	The bidder should have own manufacturing facility for 33KV or higher voltage grade Power Cable from last 3 years through Dry Cure CCV line.	Cable manufacturing CCV line details and factory incorporation certificate
2	The bidder should have supplied at least 100 km of 33KV or higher grade cable in last 3 years to Utilities/SEB/PSU	i. Summary list of executed Purchase orders ii. Purchase order copies iii. Material delivery clearance certificate copy
3	Bidder should have experience of turnkey execution including design, supply, installation, testing & commissioning project of 33KV or higher voltage grade cables in at least one utility/SEB/PSU having minimum 10 KM cable quantity in last 3 years.	i. Turnkey Purchase order/Work order copy ii. Work completion certificate copy
4	Performance certificate for minimum 1 year satisfactory performance from at least two utilities/SEB/PSUs of 33KV or higher voltage grade power cables, out of which one certificate should be of more than 10KM cable quantity.	Performance certificate
5	Bidder should have valid CPRI/ERDA Type test report of offered cable design as well as offered straight through joint and end termination joints	Relevant Type test report
6	The bidder must possess valid ISO 9001:2000 certification and valid BIS License or Equivalent International License.	Valid copy of BIS License or Equivalent International License.
7	The bidder should possess valid Electrical Contractor License issued by competent statutory agency to undertake work in NCT Delhi. In case bidder is not having this license, Bidder to give the undertaking that it will be obtained by them before the start of the work at site or suitable sub-contractor having the valid license shall be engaged for works at site where copy of valid license shall be submitted to BYPL before the start of the work.	Valid copy of Electrical Contractor License or undertaking meeting the qualifying criteria

2.02 **Commercial Criteria:**

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

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SI No.	Criteria	Documents to be submitted by bidder
	License issued by competent statutory agency to undertake work in NCT Delhi. In case bidder is not having this license, Bidder to give the undertaking that it will be obtained by them before the start of the work at site or suitable sub-contractor having the valid license shall be engaged for works at site where copy of valid license shall be submitted to BYPL before the start of the work.	License Copy ii. Undertaking if not available
3	An undertaking (self certificate) that the bidder has not been blacklisted/debarred by any central/state government institution including electricity boards.	Undertaking
4	The bidder should have registered under GST ACT and shall submit PAN, EPF and GST Registration Number, in addition to other statutory compliances. The bidder must submit the copy of registrations and submit an undertaking that the bidder shall comply all the statutory compliances as per the applicable laws/rules etc before the start of the work.	Relevant Statutory Documents Copy

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

3.00 BIDDING AND AWARD PROCESS

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

3.01 BID SUBMISSION

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

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

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

Sr. No	Descriptions	Type of Documents
Commercial :		

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Sr. No	Descriptions	Type of Documents
1	Tender Fee - Demand Draft (Rs.1180/-) (Incl GST)	Non-refundable demand draft for Rs 1180/- in case the forms are downloaded from website
2	EMD	In prescribed format
3	Power-of-Attorney	In prescribed stamp paper & format
4	PQR Compliances	Documentary evidence in support of qualifying criteria like : 1. Details of constitution of the company (Proprietary/Limited/etc along with the details), Memorandum of Association of the company 2. Bidders shall submit the certified annual Balance sheets for the last completed three (3) financial years 3. Supportive document on Positive Net worth. Credit rating/solvency certificate from competent authority. 4. Copies of Orders, Execution /Performance Certificate & Other Documents to support qualification Criteria
5	Signed Tender document	Original Tender documents duly stamped & signed on each page as token of acceptance
6	Black listing undertaking	Bidder should submit a Self undertaking signed by its Authorized Signatories that the Bidder or any of their sub contractor has not been blacklisted/barred by any Govt. Organization or Regulatory Agencies in India or abroad.
7	No litigation Certificate	Duly signed No Litigation Certificate as per attached format.
8	Commercial Terms and Conditions	Acceptance on Commercial Terms and Conditions viz Delivery schedule/period, Payment terms, PBG etc.
9	Acceptance on Reverse Auction	Duly signed Acceptance Form For Participation In Reverse Auction Event as per attached format
10	Bid Form (Unpriced) Duly Signed	Duly Signed Bid Form as per attached format
11	Un price Bid Duly Signed	Duly Signed Un price Bid as per attached format
Technical:		
12	Technical Details/ Filled in GTP/Drawings	Bidder shall submit duly filled GTP with all Technical documents and Drawings.
13	Field Quality and assurance Plan (QAP)	Bidder shall submit the detailed QAP plan in their technical proposal.
14	Type Test Reports	Bidders shall submit the copy of type test reports in their technical bids in support of PQR conditions

Sr. No	Descriptions	Type of Documents
15	Project Implementation Plan and Methodology	Bidder shall submit detail Project Implementation plan and methodology in their technical bid.
16	Testing Facilities	Bidder shall submit the details of testing facilities available at their works/factory.
17	Organization Chart & Manpower Details.	Bidder shall submit the details of Manpower to be deployed for project management with qualification and experience.
18	List of Current Commitments/ Work In Progress.	Bidder shall submit the list of projects (Current Commitments/Work in Progress)

PART B :: FINANCIAL BID comprising of (01 original only)

- Price strictly in the Format enclosed indicating Break up of basic price, taxes & duties, transportation etc

3.02 TIME SCHEDULE

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

S.No.	Steps	Due date
1	Last Date of Sale of Bid Documents	07.06.2019
2	Last Date of Queries, if any	31.05.2019
3	Pre-Bid Meeting	31.05.2019, 15:00HRS
4	Last Date of Receipt of Bid Documents	10.06.2019, 14:30HRS
5	Date & Time of Opening of PART A - Technical and Commercial Bid	10.06.2019, 15:30HRS

This is a two part bid process. Bidders are to submit the bids in 2(Two) parts

Both these parts should be furnished in separate sealed covers super scribing NIT no. DUE DATE OF SUBMISSION, with particulars as **PART-A TECHNICAL BID & COMMERCIAL TERMS & CONDITIONS** and **Part-B FINANCIAL BID** and these sealed envelopes should again be placed in another sealed cover which shall be submitted before the due date & time specified.

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

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

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

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

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

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

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

4.00 AWARD DECISION

- 4.01 Purchaser intends to award the business on a lowest bid basis, so suppliers are encouraged to submit the bid competitively. The decision to place purchase order/LOI solely depends on purchaser on the cost competitiveness across multiple lots, quality, delivery and bidder's capacity, in addition to other factors that Purchaser may deem relevant.
- 4.02 In the event of your bid being selected by purchaser (and / or its affiliates) and you subsequent DEFAULT on your bid; you will be required to pay purchaser (and / or its affiliates) an amount equal to the difference in your bid and the next lowest bid on the quantity declared in NIT/RFQ.
- 4.03 In case any bidder is found unsatisfactory during the Project execution, the award will be cancelled and BYPL reserves the right to award other bidders who are found fit.
- 4.05 The purchaser reserves all the rights to award the contract to one or more bidders so as to meet the Project execution requirement or nullify the award decision without citing any reason.
- 4.06 Qty Variation: The purchaser reserves the rights to vary the quantities to +/- 30%

5.00 MARKET INTEGRITY

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

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

6.00 SUPPLIER CONFIDENTIALITY

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

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

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

7.00 CONTACT INFORMATION

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

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

8.00 BID FORM

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

9.00 EMD

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

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

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

The EMD may be forfeited in case of:

- the Bidder withdraws its bid during the period of specified bid validity

or

- the case of a successful Bidder, if the Bidder does not

- accept the Purchase Order, or

- furnish the required contract performance BG.

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10.00 BID PRICES

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

11.00 BID CURRENCIES

- 11.01 Prices shall be quoted in Indian Rupees Only.

12.00 PERIOD OF VALIDITY OF BIDS

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

13.00 ALTERNATIVE BIDS

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

14.00 FORMAT AND SIGNING OF BID

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

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

15.00 SEALING AND MARKING OF BIDS

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

16.00 DEADLINE FOR SUBMISSION OF BIDS

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

17.00 ONE BID PER BIDDER

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

18.00 LATE BIDS

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

19.00 MODIFICATIONS AND WITHDRAWAL OF BIDS

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

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

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

21.00 AWARD OF CONTRACT

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

22.00 LETTER OF INTENT/ NOTIFICATION OF AWARD

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

23.00 CONTRACT PERFORMANCE BANK GAURANTEEE

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

24.00 PACKAGE COMPLETION PERIOD (PROJECT)

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

Package Number	Package Name	Total Months for Handling over of the Package, From Zero Date	Total No. of Day for Handling over of the Package From Zero Date
Package No A	Dwarka Puri	6 months	180 days
Package No B	CBD -II	6 months	180 days
Package No C	Kanti Nagar	6 months	180 days

Package No D	DSIDC	6 months	180 days
Package No E	Stores	4 months	120 days

25.00 GENERAL

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

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

APPENDIX I

(FORMAT FOR EMD BANK GUARANTEE)

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

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

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

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

The conditions of this obligation are:

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

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

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

(Stamp & signature of the bank)

Signature of the witness

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BID FORM

To

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

Sir,

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

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

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

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

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

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

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

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

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

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

Signature..... In the capacity of

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

(IN BLOCK CAPITALS)

ACCEPTANCE FORM FOR PARTICIPATION IN REVERSE AUCTION EVENT

(To be signed and stamped by the bidder)

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

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

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

Signature & seal of the Bidder

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

CURRENT CONTRACT COMMITMENTS / WORK IN PROGRESS

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

FINANCIAL DATA

(Duly Certified by Chartered Accountant)

	Actual in previous 5 financial years				
	FY 17-18	FY 16-17	FY 15-16	FY 14-15	FY 13-14
Total assets					
Current assets					
Total Liability					
Current Liability					
Profit before taxes					
Profit after taxes					

VENDOR CODE OF CONDUCT

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

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

I. Labour and Human Rights

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

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

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

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

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

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

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

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

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

II. Health and Safety

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

The health and safety standards are:

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

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

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

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

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

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

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

III. Environmental

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

The environmental standards are:

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

IV. Ethics

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

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

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

V. Management System

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

The management system should contain the following elements:

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

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

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**SPECIAL CONDITIONS OF CONTRACT
(SCC)**

OF

**SUPPLY, LAYING, TESTING & COMMISSIONING OF
33KV 3CX400 MM² CABLE WITH REQUIRED
ACCESSORIES AS PER THE SCOPE OF WORK AT
VARIOUS LOCATIONS FOR BYPL, DELHI (INDIA)**

ON

TURNKEY BASIS

IN

BSES YAMUNA POWER LTD.

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

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

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SPECIAL CONDITIONS OF CONTRACT

1.0 PRIORITY OF CONTRACT DOCUMENTS:

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

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

2.0 SCOPE OF WORK:

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

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

Scope of work shall mainly include:

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

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

14. R&R clearance shall also be part of contractors scope of work , However all Statutory payment shall be borne by BYPL.
15. Electrical inspection clearance certification from Chief Electrical Inspector of Delhi and any other statutory authority for charging the substation are in scope of Contractors.

3.0 CONTRACT PRICES:

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

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

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

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

4.0 QUANTITIES VARIATION UNDER THE AWARDED CONTRACT:

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

For Cable feed: Quantities may vary up to (+/-) 30%

5.0 FIRM CONTRACT PRICES:

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

6.0 STATUARY VARIATION IN TAXES:

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

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

7.0 COMPLETION TIME:

Package Number	Package Name	Total Months for Handling over of the Package, From Zero Date	Total No. of Day for Handling over of the Package From Zero Date
Package No A	Dwarka Puri	6 months	180 days
Package No B	CBD -II	6 months	180 days
Package No C	Kanti Nagar	6 months	180 days
Package No D	DSIDC	6 months	180 days
Package No E	Stores	4 months	120 days

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

8.0 BANK GUARANTEE:

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

9.0 LIQUIDATED DAMAGES:

9.1 LD FOR DELAY IN COMPLETION OF WORK:

Time is essence of the Contract.

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

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

Maximum LD for delay is 10% of Contract Value.

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

9.2 LD ON INTERMEDIATE MILESTONE:

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

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

9.3 OVER ALL LIQUIDATED DAMAGES:

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

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

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

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

10.0 LIABILITY & DAMAGES:

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

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

11.0 WARRANTEE/DEFECT LIABILITY PERIOD:

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

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

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

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

12.0 LATENT DEFECT LIABILITY PERIOD:

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

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

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

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

13.0 INSURANCE:

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

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

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

Any loss or damage to the equipment during handling, transportation, storage, erection, putting into satisfactory operation and all activities to be performed till the successful completion of and handling over Performance Guarantee tests of the plant shall be to the account of the Contractor. The Contractor shall be responsible for preference of all claims and make good for the damage or loss by way of repairs and/or replacement of the equipment, damaged or lost.

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

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

14.0 DRAWINGS/DOCUMENTS:

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

15.0 TERMS OF PAYMENT:

A) FOR SUPPLY OF EQUIPMENT AND MATERIALS:

- A. 65% prorata of supply value item wise shall be payable against R/A bills for supply of equipments and materials within 45 days against receipt & acceptance of material at site and submission of following documents duly certified by BYPL Project-in-charge, complete in all respects:
- a) Signed copy of accepted Purchase Order (for first payment)
 - b) LR / RR / BL as applicable
 - c) Challan as applicable
 - d) Two (02) copies of Supplier's detailed Recipient Invoice showing Commodity description, quantity, unit price, total price and basis of delivery, and being 100% of the value of the consignment claimed.

- e) Two (02) copies of Supplier's transporter invoice duly receipted by BYPL Stores & Original certificate issued by BYPL confirming receipt of the subject material at Stores/Site and acceptance of the same as per the provisions of the contract.
 - f) Two (02) copies Packing List / Detailed Packing List
 - g) Approved Test certificates / Quality certificates, if applicable
 - h) Certificate of Origin, if applicable
 - i) Material Dispatch Clearance Certificate (MDCC)
 - j) Insurance Policy / Certificate, if applicable
 - k) Warranty / Guarantee Certificate, if applicable
 - l) Check list for bill submission.
 - m) Performance Bank Guarantee equivalent to 10% of Supply value of the Contract valid upto Defect Liability period for 36 months from the date of handing over of the scheme plus 3 months Claim period.
- B. 20% prorata on account of supply value of the actual executed value after installation/erection of material duly certified by BYPL Project-in- charge.
- C. Balance 15% on account of supply value of the actual executed value shall be paid in 30 days after completion of successful acceptance testing, commissioning and handing over of complete systems duly certified by BYPL Engineer-in-Charge specified in the tender and on submission of performance Bank Guarantee of 10% amount, in our format valid up to a defect liability period from the date of handing over of the scheme including submission of Electrical Inspector Clearance Certificate, Compliance of final punch point, No Demand Certificate, Letter of Indemnity by the supplier (The format of No Demand Certificate and Letter of Indemnity are attached as Annexure) and after reconciliation & adjustments of payments, if any towards quantities of materials issued from purchaser's stock and consumed by the contractor for expeditious completion of the job.

B) FOR ERECTION, INSTALLATION AND TESTING & COMMISSIONING:

Payment shall be made to you as under:

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

Special Conditions of Contract - SCC (CMC/BY/19-20/RB/SV/019)	Page 10 of 15	33KV CABLE WORKS ON TURNKEY BASIS
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16.0 ARBITRATION:

The venue of arbitration shall be New Delhi.

17.0 UNFORESEEABLE SUB-SURFACE CONDITIONS:

Notwithstanding anything contained elsewhere in the contract, if during the execution stage, the Contractor encounters on the Site any sub-surface conditions that are different from those envisaged from the soil testing / data available at the site, or the Contractor's own testing, which necessitates corrective action / changes in the method(s) of work, all costs related with such changes shall be borne by the Contractor. These conditions shall no way be compensated either for time, or costs, by the Purchaser.

18.0 FORCE MAJEURE:

Force Majeure Events:

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

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

18.1 Political Force Majeure Events:

Which shall comprise the following acts, events and circumstances:

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

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

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

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

- i) Flood, cyclone, lightning, earthquake, drought, storm or any other extreme effect of the natural elements;
- ii) Epidemic, or plague;
- iii) Fire or explosion;
- iv) Strikes, lockouts or other labour difficulties not included above (excluding such events which are Site specific and attributable only to the contractor)
- v) Air crash, shipwreck or trainwreck or loss of or damage to any major component of the Facility arising in the course of transit.

18.3 Burden of Proof:

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

18.4 Excused Performance:

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

(a) The Party claiming Force Majeure shall give notice to the other Party of:

- i) The cessation of the relevant Force Majeure Event; and
 - ii) The cessation of the effects of such Force Majeure Event on the enjoyment by such Party of its rights or the performance by it of its obligations under this Agreement;
- as soon as practicable after becoming aware thereof.

(b) The suspension of performance shall be of no greater scope and of no longer duration than is reasonably required by the Force Majeure Event.

(c) No liability of either Party which arose before the occurrence of the Force Majeure Event causing the suspension of performance shall be excused as a result of the occurrence, including, without limitation, liability for the timely payment of money otherwise due and earned by performance of tasks required under this Agreement by any Party.

(d) Any Party claiming Force Majeure shall use its reasonable efforts to mitigate and overcome the effects of any act, event or circumstance of Force Majeure as soon as practicable after the occurrence of a Force Majeure Event, including by mutual agreement the expenditure of reasonable sums of money, and to co-operate with the other Party to develop and implement a plan of remedial and reasonable alternative measures to remove the Force Majeure Event, provided, however, that no Party shall be required under this provision, to settle any strike or other labour dispute on terms it reasonably considers to be unfavourable to it. The Party claiming Force Majeure shall furnish weekly written reports to the other Party with respect to its progress in overcoming the effects of the act, event or circumstance of Force Majeure together with such supporting documentation and information as the other Party reasonably requires regarding the claim of Force Majeure.

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

18.5 Limitations:

Anything in this Agreement to the contrary notwithstanding:

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

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

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

18.6 Consequences of Force Majeure

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

19.0 SUSPENSION OF WORK:

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

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

20.0 FINAL TAKING OVER OF THE PACKAGES:

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

21.0 OPERATION:

Contractor shall operate the complete package awarded for a period of 6 months post handing over of the site to purchaser. Contractor shall depute necessary trained manpower for O&M of the project as per the requirement as specified in the Technical specification

22.0 CONSTRUCTION WATER AND POWER:

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

ANNEXURE - I**EXECUTION SCHEDULE**

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

However the major milestone shall be as under:

SL NO	DESCRIPTION OF MATERIAL	TIMELINE
1	Zero Date (Letter of Award)	Zero Date
2	Mobilization of manpower	15 days from Zero Date
3	Submission of Drawings/Documents/calculations for	30 days from Zero Date
4	Engineering Approval	60 days from Zero Date
6	Procurement/Supplies	100 days from Zero Date
6	Testing & Commissioning of 33kV line	160 days from Zero Date
8	Handing Over	180 days from Zero Date

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

OF

**SUPPLY, LAYING, TESTING & COMMISSIONING OF
33KV 3CX400 MM² CABLE WITH REQUIRED
ACCESSORIES AS PER THE SCOPE OF WORK AT
VARIOUS LOCATIONS FOR BYPL, DELHI (INDIA)**

ON

TURNKEY BASIS

IN

BSES YAMUNA POWER LTD.

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

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

General Conditions of Contract – GCC SUPPLY (CMC/BY/19-20/RB/SV/019)	Page 1 of 16	33KV CABLE WORKS ON TURNKEY BASIS
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GENERAL CONDITIONS OF CONTRACT (GCC)-SUPPLY

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

1. PRIORITY AND CONTENT OF CONTRACT DOCUMENTS:

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

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

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

2. CONTRACT LANGUAGE:

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

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

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

3. DEFINITIONS AND INTERPRETATION:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

4. EXAMINATION OF SITE AND LOCAL CONDITIONS:

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

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

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

5. LANGUAGE AND MEASUREMENT:

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

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

General Conditions of Contract – GCC SUPPLY (CMC/BY/19-20/RB/SV/019)	Page 6 of 16	33KV CABLE WORKS ON TURNKEY BASIS
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6. TIME – THE ESSENCE OF CONTRACT:

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

7. PROGRESS REPORT:

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

8. SCOPE OF WORK:

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

Package Number	Package Name	Total Months for Handling over of the Package, From Zero Date	Total No. of Day for Handling over of the Package From Zero Date
Package No A	Dwarka Puri	6 months	180 days
Package No B	CBD -II	6 months	180 days
Package No C	Kanti Nagar	6 months	180 days
Package No D	DSIDC	6 months	180 days
Package No E	Stores	4 months	120 days

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

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

9. QUANTITY VARIATION AND EXTRA ITEM/WORK:

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

General Conditions of Contract – GCC SUPPLY (CMC/BY/19-20/RB/SV/019)	Page 7 of 16	33KV CABLE WORKS ON TURNKEY BASIS
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a) For Cable feed: Quantity may vary up to (+/-) 30%.

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

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

10. FIRM CONTRACT PRICES:

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

11 CONTRACT RATES:

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

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

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

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

12 TAXES AND DUTIES:

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

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

13 STATUTORY VARIATION:

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

14 CHANGE OF LAW:

"Change in Law" means:

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

15 SPECIFICATIONS AND STANDARDS:

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

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

16 QUALITY ASSURANCE AND INSPECTION:

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

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

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

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

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

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

17 ERRORS AND OMISSIONS:

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

18 PACKING, PACKING LIST & MARKING:

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

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

19 PRICE BASIS FOR SUPPLY OF MATERIALS:

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

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

20 TERMS OF PAYMENT AND BILLING – SUPPLY:

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

21 COMMISSIONING SPARES AND TOOLS & TACKLES:

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

22 RETURN, REPLACEMENT OR SUBSTITUTION:

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

23 PERFORMANCE GUARANTEE:

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

24 WARRANTY/DEFECTS LIABILITY PERIOD:

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

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

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

25 SUPPORT BEYOND THE GUARANTEE PERIOD:

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

26 DOCUMENTATION:

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

27 FORFEITURE:

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

28 SUSPENSION OR EXTENSION:

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

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

29 TERMINATION DUE TO CONTRACTORS DEFAULT:

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

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

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

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

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

31 CONSEQUENCES OF DEFAULT:

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

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- (d) Purchase the same or similar Commodities from any third party; and/or
- (e) Recover any losses and/or additional expenses BYPL may incur as a result of Supplier's default

32. RISK & COST:

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

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

33. ARBITRATION:

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

34. TERMINATION FOR CONVENIENCE OF BYPL:

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

35. LIQUIDATED DAMAGES:

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

36. TRANSFER AND SUB-LETTING:

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

37 RECOVERIES:

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

38 WAIVER:

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

39 INDEMNIFICATION:

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

40 PATENT RIGHTS AND ROYALTY:

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

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

41 CONFIDENTIALITY:

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

Documents

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

Geographical Data

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

Violation

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

42 DISPUTE RESOLUTION & ARBITRATION:

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

Suspension of Work on Account of Arbitration

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

The laws and jurisdiction of contract

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

**ERECTION CONDITIONS OF CONTRACT
(ECC)**

OF

**SUPPLY, LAYING, TESTING & COMMISSIONING OF
33KV 3CX400 MM² CABLE WITH REQUIRED
ACCESSORIES AS PER THE SCOPE OF WORK AT
VARIOUS LOCATIONS FOR BYPL, DELHI (INDIA)**

ON

TURNKEY BASIS

IN

BSES YAMUNA POWER LTD.

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

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

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GENERAL TERMS & CONDITIONS - ERECTION, TESTING & COMMISSIONING

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

1. PRIORITY OF CONTRACT DOCUMENTS:

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

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

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

2. DEFINITIONS AND INTERPRETATION:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

3 EXAMINATION OF SITE AND LOCAL CONDITIONS:

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

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

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

4 LANGUAGE AND MEASUREMENT:

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

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

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5 SCOPE OF WORK:

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

Package Number	Package Name	Total Months for Handling over of the Package, From Zero Date	Total No. of Day for Handling over of the Package From Zero Date
Package No A	Dwarka Puri	6 months	180 days
Package No B	CBD -II	6 months	180 days
Package No C	Kanti Nagar	6 months	180 days
Package No D	DSIDC	6 months	180 days
Package No E	Stores	4 months	120 days

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

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

- ☐ Schedule of work shall be as mentioned in the Bill of quantity attached herewith.
- ☐ After completion of Erection, Testing & Commissioning of the package awarded, contractor has to obtain the Electrical Inspectorate's Clearance from the Electrical Inspector of Delhi Govt.
- ☐ Contractor shall arrange any permission like Road cutting clearance etc. from the Delhi Civic authorities. All Statutory charges and direct fees shall be borne by BYPL.
- ☐ All the Labour, plant appliance, ladder, scaffoldings, materials, tool, tackles etc are included in your scope of work.

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- ☐ Adequate number of engineers, supervisors and labours shall be posted at site and the list of the same along with certificate of Qualification of technical staff should be submitted by the Contractor to the Engineer In Charge for checking the adequacy immediately (with in seven days) after award of contract. Detailed Organisation chart , along with the qualification of the manpower to be deployed shall submitted along with Bid.
- ☐ The Contractor shall also make his own arrangement for the accommodation/conveyance requirements for its staff at site.
- ☐ Contractor shall arrange storage for storing the materials, tools, tackles etc. Contractor shall be responsible for all the unloading of the material, marking, staking and storage at site. The insurance for all the storage material shall be included in the policy taken by Contractor. Contractor shall submit the copy of insurance policy to BYPL. In case of any mishappening/damage to the storage material contractor shall be responsible to lodge the claim. Under no circumstances no delay in execution shall be allowed and contractor shall immediately arrange for the replacement without waiting for the settlement.
- ☐ All the incoming and outgoing materials, equipment, tools, tackles and any other items related to said work shall be entered into the register kept for this purpose and shall be in the custody of Contractor, however company does not hold any responsibility for any loss or damage of Contractor's material etc.
- ☐ All loading/unloading, of materials at work-site shall be contractors responsibility. Involvement of Crane/Hydra/Tractor/Trailer for this type of work shall be in contractors scope. Adequate weather protection shall be provided by the contractor to keep the materials safe from sun & rain by providing covered storage space as well as using tarpaulins.

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

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

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

Special Instruction for cable laying related works:-

- a . Contractor need to conduct sheath voltage test after finishing the cable laying

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to check integrity of outer sheath in presence of project engineer.

- b. All cable laying tools and tackles and testing equipment shall be available with contractor in event of order.
- c. Contractor shall submit copy of cable laying schedule to BSES in event of order so that quality checks can be done on sample basis.

6 CONTRACT RATES:

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

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

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

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

7 TAXES AND DUTIES:

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

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

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

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

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

CHANGE OF LAW:

"Change in Law" means:

- a) any enactment or issue of any new Applicable Law,
- b) any amendment, alteration, modification, or repeal of any existing Applicable Law or

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any new or modified directive or order there under,

c) any change or variation in taxes payable in connection with and under this

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

8 ACCOMODATION & CONVEYENCE FOR THE STAFF:

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

9 STORAGE AT SITE:

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

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

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

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

10 SECURITY, WATCH & WARD:

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

11 DEFECT LIABILITY PERIOD:

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

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

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

12 PERFORMANCE GUARANTEE:

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

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

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

13 COMPLETION PERIOD:

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

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

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

13.2 The entire work under this order as indicated in the scope of work shall be carried out and completed within 300 days for entire package as defined in SCC. Total completion schedule for Engineering, manufacturing, inspection & testing, packing and forwarding and Transportation till site and Erection Testing & Commissioning shall be as per the milestones timelines defined in SCC.

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

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13.4 Progress Review Meeting between the Contractor and the Engineer In charge shall be held at site at least once in a week. Also a weekly progress report giving the details of the manpower engaged at site and the details of the major job completion shall be submitted to Engineer In-charge.

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

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

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

14 CLEANLINESS & PRECAUTIONS AT SITE TO PREVENT DUST POLLUTION:

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

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

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

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

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

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

14.5 Over loading of vehicles shall be strictly prohibited.

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

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

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

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

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

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

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

15 COMMISSIONING & ACCEPTANCE TEST:

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

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

16 WORK COMPLETION CERTIFICATION, HANDING OVER:

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

The contractor shall be solely responsible for any shortage or damage of materials issued to them handling of and / or in storage and erection at site and cost of the

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same will be recovered from the contractor as certified by Engineer In-Charge. Contractor must submit a periodical material reconciliation statement in the approval format with every Running Bill raise by him or end of every month whichever is earlier. The contractor shall maintain an accurate and exhaustive record detailing out the list of all items received by him for the purpose of erection and keep such record open for the inspection of the company.

17 PENALTY AND LIQUIDATED DAMAGES

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

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

18 SAFETY CODE:

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

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

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

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

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

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19. STATUTORY OBLIGATIONS:

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

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

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

The Contractor must follow:

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

20. WORKMAN COMPENSATION:

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

The contractor shall keep the company indemnified at all times, against all claims of compensation under the provision of Workmen Compensation Act 1923 and as amended from time to time or any compensation payable under any other law

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for the time being workman engaged by the contractor/sub-contractor/sub-agent in carrying out the job involved under this work order and against costs and expenses, if any, incurred by the company in connection therewith and without prejudice to make any recovery.

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

21. STAFF AND WORKMAN:

It shall be responsibility of contractor

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

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

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

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

The records shall be in the prescribed formats only.

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

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

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

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

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

22. HUMAN RESOURCE ISSUES:

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

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

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

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

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

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

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

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22.8 The CONTRACTOR shall be directly responsible for any / all disputes arising between him and his persons and keep the COMPANY indemnified against all losses, damages and claims arising thereof. The CONTRACTOR shall resolve any dispute of their manpower. All the legal dues of their manpower is to be paid on due date or within 8 days on the termination of manpower.

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

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

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

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

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

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

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

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

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

22.17 The CONTRACTOR shall be responsible and shall comply with the provision of all the STATUTORY ACTS APPLICABLE. Special attention of the CONTRACTOR is drawn towards the compliance of provision of the following statutes: (along with the latest amendments/additions):

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

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

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

23. INSURANCE:

23 a) THIRD PARTY INSURANCE:

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

23 b) ACCIDENTAL INSURANCE POLICY FOR LIFE COVER:

Before commencing the execution of the work the CONTRACTOR shall take Accidental insurance policy for the staff engaged by him for this work to insure against any loss of life which may occur during the contract for the work of the COMPANY. The policy shall have coverage of Rs. 10 Lacs (Table C- Death +

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Permanent Total Disability + Partial permanent Disability due to external accidents). The Contractor shall be responsible for on the spot same day claim settlement with the victim's legal heirs without waiting for settlement by insurance claim without any liability on BYPL. The premium amount for such life cover policy shall be borne by the contractor. The contractor shall furnish copy of policy when demanded by BYPL.

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

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

24. SECURITY

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

25. ENVIRONMENTAL, HEALTH & SAFETY PLAN:

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

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

All contractors staff is accountable for the following:

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1. Use the correct tools and equipment for the job and use safety equipment and protective clothing supplied, e.g. helmets, goggles, ear protection, etc. as instructed
2. Keep tools in good condition
3. Report to the Supervisor any unsafe or unhealthy condition or any defects in plant or equipment
4. Develop a concern for safety for themselves and for others
5. Prohibit horseplay
6. Not to operate any item of plant unless they have been specifically trained and are authorized to do so.

26. TEST CERTIFICATE & QUALITY ASSURANCE:

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

27. SUB-CONTRACTING / SUBLETTING:

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

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

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

28. INDEMNITY:

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

- a) any breach non-observance or non-performance by contractor or its employees or agents of any of the provisions of this Work Order.
- b) any act or omission of contractor or its employees or agents.
- c) any negligence or breach of duty on the part of contractor, its employees or

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- agents including any wrongful use by it or them of any property or goods belonging to or by COMPANY.
- d) The vendor shall submit an Indemnity Bond against any damages / loss of free issued materials.

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

29. EVENTS OF DEFAULTS:

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

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

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

30. RISK & COST:

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

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31. ARBITRATION:

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

32. SECRECY CLAUSE:

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

These technical information, drawing and other related documents shall be returned to the Company with all approved copies and duplicates including drawing/plans as are prepared by the Contractor during the executions of this work order, if any, immediately after they have been used for agreed purpose.

In the event of any breach of this provision, the contractor shall indemnify the Company against any loss, cost or damage or claim by any party in respect of such breach.

33. TERMINATION DUE TO NON PERFORMANCE:

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

34. TERMINATION BY EOMPLOYER CONVENIENCE:

The owner at any time terminate the contract for any reason, by giving the contractor a notice of termination. Upon receipt of the notice of termination, the contractor shall

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either within 14 days of receipt of such notice, or on the date specified in the notice of termination, carry out the following : Cease all further work, except for such work as the owner may specify in the notice of termination for the sole purpose of protecting that part of the facilities already executed, or any work required to leave the site in a clean and safe condition.

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

35. QUALITY:

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

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

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

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

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

36. CONSTRUCTION WATER & POWER:

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

37. PROGRESS REPORTS OF WORK EXECUTION:

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

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

a) Executive summary

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

c) Necessary photographs of work done in the manufacturer's shop and erection site which shall be taken when and where indicated by the Purchaser. Photographs shall be approximately 100 x 125 mm in size including a margin of 5 mm side for fixing. Adequate numbers of photographs shall be submitted indicating

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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.

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

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

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

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

38. FREE ISSUES OF MATERIAL AND /OR EQUIPMENT:

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

39. PROTECTION OF PROPERTY:

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

The Contractor shall ensure provision of necessary safety equipment such as barriers, sign boards, warning lights and alarms, etc to provide adequate protection to persons and property. The Contractor shall be responsible to give reasonable notice to the PURCHASER & the PURCHASER of public or private property and utilities

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when such property and utilities are likely to get damaged or injured during the performance of his works and shall make all necessary arrangements with such PURCHASER, related to removal and/or replacement or protection of such property and utilities.

40. VARIATIONS / AMEDEMEMENTS:

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

41. ACCEPTANCE

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

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

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

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

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Annexure - I

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

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

The Contractor must follow:

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

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**CIVIL CONDITIONS OF CONTRACT
(CCC)**

OF

**SUPPLY, LAYING, TESTING & COMMISSIONING OF 33KV
3CX400 MM² CABLE WITH REQUIRED ACCESSORIES &
DISMANTLING AS PER THE SCOPE OF WORK, AT
DIFFERENT LOCATION FOR BYPL, DELHI (INDIA)**

ON

TURNKEY BASIS

IN

BSES YAMUNA POWER LTD.

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

*This document is a property of BYPL. This is not transferable and shall not be
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CIVIL CONDITIONS OF CONTRACT

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

1. PRIORITY OF CONTRACT DOCUMENTS:

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

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

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

2. DEFINITIONS AND INTERPRETATION:

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

The following terms & expressions as used in this Tender shall have the meaning defined and interpreted here under: Company: The terms "Company" shall mean BSES YAMUNA Power Ltd, a company incorporated under the Companies Act 1956 and having its office at Shaktikiran Building, Karkardooma, Delhi -110032, which expression shall include its authorized representatives, agents, successors and assigns.

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2.1 Package: Package shall comprise of all the work, as defined in the scope of work as well as technical specifications, for the GIS grid substation, Cable In-feed as well as outgoing feeder.

2.2 Contractor: The terms "Contractor" shall mean the successful Tenderer / vendor to whom the contract has been awarded.

2.3 Purchaser: The terms "Purchaser" shall mean BSES YAMUNA Power Ltd who purchase the grid from the successful contractor.

2.4 Owner: The terms "Owner" shall mean BSES YAMUNA Power Ltd who own the grid.

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

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

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

2.8 Engineer In Charge: "Engineer In-charge" means the Company's authorized representative for the purpose of carrying out the work.

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

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

2.11 Defect Liability Period: Shall mean the period during which the contractor shall remain liable for repair or replacement of any defective part of the work performed under the contract, free of cost.

3. EXAMINATION OF SITE AND LOCAL CONDITIONS:

The contractor is deemed to have visited the site of the work and ascertained therefore all site conditions and information pertaining to his work. Before submitting the bid, all bidders will at their expenses make or obtain any additional informations, investigations, explorations, test and studies and obtain any additional

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information and data which pertains to the physical conditions at or contiguous to the site or otherwise which may affect cost, progress, performance of the work and which the bidder deems necessary to determine its Bid for performing the work in accordance with the time and other terms and conditions of the tender/contract documents.

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

4. LANGUAGE AND MEASUREMENT:

The Tender issued to the contractor by the company and all correspondence and documents relating to the Tender placed on the Contractor shall be written in English language. Metric System shall be followed for all dimension, units etc., the mode of measurement shall be as per IS 1200.

5. SCOPE OF WORK:

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

Package Number	Package Name	Total Months for Handling over of the Package, From	Total No. of Day for Handling over of the Package
Package No A	Dwarka Puri	6 months	180 days
Package No B	CBD -II	6 months	180 days
Package No C	Kanti Nagar	6 months	180 days
Package No D	DSIDC	6 months	180 days
Package No E	Stores	4 months	120 days

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

5.1 Survey, design, engineering, manufacture, shop testing, inspection, packing, dispatch, loading, unloading and storage at site including comprehensive SCE (Storage cum Erection) insurance, assembly, erection, civil structural, architectural work, complete pre-commissioning checks, testing & commissioning at site, also includes all statutory clearances & certification from State Electrical Inspector, Municipal corporation department, Fire officer, Horticulture department , various local

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bodies like RWA and handing over to the Owner after satisfactory commissioning of complete Packages as defined above for **Grid Substation, Cable In feed, Outgoing Feeder** on Turnkey Basis.

Schedule of work shall be as mentioned in the Bill of quantity attached herewith.

- ☐ After completion of E/T/C work of the scheme, contractor has to obtain the Electrical Inspectorate's Clearance from the Electrical Inspector of Delhi Govt.
- ☐ Contractor shall arrange any permission like Road cutting clearance etc. from the Delhi Civic authorities. All Statutory charges and direct fees shall be borne by BYPL.
- ☐ All the Labour, plant appliance, ladder, scaffoldings, materials, tool, tackles etc are included in your scope of work.
- ☐ Adequate number of engineers, supervisors and labours shall be posted at site and the list of the same along with certificate of Qualification of technical staff should be submitted by the Contractor to the Engineer In Charge for checking the adequacy immediately (within seven days) after award of contract. Detailed Organization chart, along with the qualification of the manpower to be deployed shall be submitted along with Bid.
- ☐ The Contractor shall also make his own arrangement for the accommodation/conveyance requirements for its staff at site.
- ☐ Contractor shall arrange storage for storing the materials, tools, tackles etc. Contractor shall be responsible for all the unloading of the material, marking, staking and storage at site. The insurance for all the storage material shall be included in the policy taken by Contractor. Contractor shall submit the copy of insurance policy to BYPL. In case of any mis-happening/damage to the storage material contractor shall be responsible to lodge the claim. Under no circumstances no delay in execution shall be allowed and contractor shall immediately arrange for the replacement without waiting for the settlement.
- ☐ All the incoming and outgoing materials, equipment, tools, tackles and any other items related to said work shall be entered into the register kept for this purpose and shall be in the custody of Contractor, however company does not hold any responsibility for any loss or damage of Contractor's material etc.
- ☐ All loading/unloading, of materials at work-site shall be contractors responsibility. Involvement of Crane/Hydra/Tractor/Trailer for this type of work shall be in contractors scope. Adequate weather protection shall be provided by the contractor to keep the materials safe from sun & rain by providing covered storage space as well as using tarpaulins.

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

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

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

6. FIRM CONTRACT PRICES:

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

7. QUANTITY VARIATION AND EXTRA ITEM/WORK:

7.1. The Contractor shall carry out and complete the works in every respect in accordance with this Contract and in accordance with the directions and to the satisfaction of the Engineer in charge.

7.2. The Engineer In Charge may, at his discretion, from time to time, issue further drawings and/ or written instructions, details, directions and explanations which are herein after referred to as "EIC's Instructions" in regard to:

- a) The variation or modification of the design, quality, specification or quantity of works or the omission or substitution of any work.
- b) The timing or sequencing of work.
- c) Any discrepancy between the drawing and / or the Bill of Quantities and / or Specifications.
- d) The removal from the site of any materials/ equipment/ resources brought thereon by the Contractor and the substitution of the same thereof.
- e) The Execution of additional works of any kind necessary of the completion of the work.
- f) The removal and /or re-execution of any works executed by the Contractor.

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- g) The substitution from the site of the works of any person employed there upon.
- h) The amending and making good of any defects under clause "Defects Liability".
- i) The opening up for inspection of any work covered up.
- j) Changes in lines, levels, positions and dimensions of any part of the Work.

7.3. The Contractor shall forthwith comply with and duly execute any work comprised in such EIC's instructions provided always that verbal instructions, directions and explanations given to the Contractor or his supervisor upon the works by the Engineer In Charge shall if involving a variation be confirmed in writing by the Contractor within seven days and the Engineer in charge's written approval is obtained.

7.4. If compliance with the Engineer In Charge's Instructions as aforesaid involves work beyond that contemplated by the Contract, then unless the same were issued owing to some breach of this Contract by the Contractor, the EIC shall pay to the Contractor the cost of the said work as an extra to be valued and as hereinafter provided.

7.5. No such variation shall in any way vitiate or invalidate the Contract but the value, if any, of all such variations shall be taken into account in ascertaining the amount of the final certification.

7.6. No such variations shall be carried out by the Contractor without instructions, in writing from the Engineer in charge. Provided that no instructions in writing shall be required for increase or decrease in the quantity of any work where such increase or decrease is not the result of an instruction given under this clause, but is the result of the quantities exceeding or being less than those stated in the Bill of Quantities. If the Engineer in charge shall consider it desirable to give any instructions verbally, the Contractor shall comply with such an instruction and any confirmation in writing of such verbal instruction given by the Engineer in charge whether before or after the carrying out of such work, shall be deemed to be an instruction in writing within the meaning of this clause. Provided further that if the Contractor shall within 7 days confirm in writing to the Engineer in charge and such confirmation shall not be contradicted in writing within 30 days by the Engineer in charge, it shall be deemed to be an instruction in writing by the Engineer in charge.

7.7. All extra or additional work done on the instructions of the Engineer In Charge shall be valued at the rates and prices set out in the Contract. If the Contract does not contain any rates or prices applicable to the extra or additional work, then suitable rates or prices shall be agreed upon between Company and the Contractor as per the following, in the order of preference:

- (i) The rate shall be derived from any one of the quoted rates for similar items of work in the tender.

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(ii) In case similar items are not available in the tender, then rates shall be worked out as per the following:

a) The direct cost of labour including indirect charges thereon. The labour components shall be computed wherever possible from the related BIS Codes and the quantity of materials to be based on consumption factor as per standard norms or as accepted by the EIC.

b) The material cost inclusive of taxes, levies, fees, duties etc. as delivered to the site. Proof of cost in form of an invoice to be submitted along with the extra work claim along with other working documents.

c) The Plant & Equipment cost inclusive of hire charges of plant & equipment and operational charges as per standard norms or as accepted by the EIC.

d) In addition the Contractor shall be entitled to payment towards overheads and profit.

7.8. In cases where the items of works are not accepted as complete, or not fully in accordance with the Specification, the Engineer in Charge shall make payments of such items at such reduced rates, as he may consider reasonable in approval of Interim Bills and the Final Bill.

7.9. In all cases the Contractor shall furnish detailed Rate Analysis along with necessary details as and when required by the Engineer in Charge. The Engineer in Charge on establishing the validity of such claims shall certify the amount payable for such work and rates so determined shall be final and binding on the Contractor.

7.10. The quantities of the various kinds of work to be done and materials to be furnished under this Contract as listed in the Bill of Quantities are estimated and approximate only and shall be subject to re-measurement upon completion. The Contractor shall make no claim for anticipated profits, for loss of profits or for damages because no work is ordered under certain items or because of a difference between the quantities of the various kinds of work to be done or materials actually delivered and the estimated quantities set forth in the Bill of Quantities.

7.11. The rate/prices quoted by the Contractor in the Bills of Quantities shall be firm irrespective of any variation in the quantities of individual items of work and / or in the Total Contract Sum.

8. TAX & DUTIES:

Prices are inclusive of all taxes, duties, GST shall be to contractor's account including any duties which may be levied by the Govt. during currency of this order.(except service tax). However, IT as per applicable rate will be deducted from your bills as Tax Deduction at Source (TDS). The total order value shall remain FIRM within stipulated delivery period and shall not be adjusted on account of any price

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increase/variations in labour & materials. However Statutory Taxes, duties and Levies imposed by Competent Authorities by way of fresh notification(s) within the stipulated delivery period shall be borne by BYPL on submission of necessary documents claiming such variation. Service tax as applicable shall be paid on submission of Service Tax Registration and self declaration on your letter head stating that you have deposited/or will deposit the Tax as per the applicable service tax laws.

STATUARY VARIATION IN TAXES:

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

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

9. CHANGE OF LAW:

"Change in Law" means:

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

10. ACCOMMODATION & CONVEYANCE FOR THE STAFF:

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

11. STORAGE AT SITE:

Company will be provided at site the adequate open space for contractor's site store for storing the materials, tools, tackles etc.

All the Contractor's storage will be within the site premises. All the incoming and outgoing materials, equipment, tools, tackles and any other items related to said work shall be entered

into the register kept for this purpose and shall be in the custody of Contractor, however company does not hold any responsibility for any loss or damage of Contractor's material etc. All loading/unloading, of materials at work-site shall be

your responsibility. Involvement of Crane/Hydra/Tractor/Trailer for this type of work shall be in your scope.

Adequate weather protection shall be provided by the contractor to keep the materials safe from sun & rain by providing covered storage space as well as using tarpaulins. Water and Electricity Power shall be arranged by the Contractor at his own. The cost of insurance during loading/unloading of materials/ equipments during its storage and handling/erection at site for installation is included in the contractor's scope and value is including in the above mentioned Tender value. The unit rates mentioned in annexure is inclusive of barricading and watch & ward during execution and no separate charges shall be paid for the same.

12. SECURITY, WATCH & WARD:

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

13. DEFECT LIABILITY PERIOD:

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

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

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

14. PERFORMANCE GUARANTEE:

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

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

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

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15. COMPLETION PERIOD:

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

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

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

15.2 The entire work under this order as indicated in the scope of work shall be carried out and completed within 300 days for entire package as defined in SCC. Total completion schedule for Engineering, manufacturing, inspection & testing, packing and forwarding and Transportation till site and Erection Testing & Commissioning of all the identified package shall be as under.

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

15.4 Progress Review Meeting between the Contractor and the Engineer In charge shall be held at site at least once in a week. Also a weekly progress report giving the details of the manpower engaged at site and the details of the major job completion shall be submitted to Engineer In-charge.

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

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

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

16. TEST CERTIFICATE & FIELD QUALITY ASSURANCE:

The Contractor shall procure all equipment from genuine sources as approved by the Company & as per Company specifications. 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 conform to IS 383, reinforcement for cold twisted bars shall conform to IS 1786, the bricks for brick work shall correspond to IS 1077,

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Structural steel shall confirm to relevant IS code, water to be used shall comply with requirement of IS 456. Contractor 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 Contractor shall maintain mandatory Test Register with Engineer-in-Charge as provide in latest Indian Standard Specifications.

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

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

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

17. SUB-CONTRACTING / SUBLETTING:

CONTRACTOR shall not assign or transfer the whole or any part of this Work Order or any other benefits accruing there from nor shall it subcontract / sublet the whole or any part of the Works without the prior written consent of COMPANY. In the event the contractor assigns this work order, contractor's assignees shall be bound by the terms and conditions of this work order and shall , if deemed necessary by COMPANY at the time of such assignment, undertake in writing to be so bound by this Work Order. Notwithstanding the subletting / subcontracting of any portion of the works, contractor shall remain wholly responsible for the carrying out, completion and satisfactory execution of Works in all respects in accordance with this Work Order, specification, approved drawings and data sheets.

18. CLEANLINESS & PRECAUTIONS AT SITE TO PREVENT DUST POLLUTION:

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

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

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

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

18.3 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.

18.4 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.

18.5 Over loading of vehicles shall be strictly prohibited.

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

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

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

18.9 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.

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

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

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

19. INDEMNITY:

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

a) any breach non-observance or non-performance by contractor or its employees or agents of any of the provisions of this Work Order.

b) any act or omission of contractor or its employees or agents.

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c) any negligence or breach of duty on the part of contractor, its employees or agents including any wrongful use by it or them of any property or goods belonging to or by COMPANY.

d) The vendor shall submit an Indemnity Bond against any damages / loss of free issued materials.

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

20. EVENTS OF DEFAULTS:

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

a) Failing to complete execution of work within the terms specified in this work order.

b) Failing to complete works in accordance with the approved schedule of works.

c) Failing to meet requirements of specifications, drawings, and designs as approved by COMPANY.

d) Failing to comply with any reasonable instructions or orders issued by COMPANY in connection with the works.

e) Failing to comply with any of the terms or conditions of this work order. In the event COMPANY terminates this work order, in whole or in part, on the occurrence of any event of default, COMPANY reserves the right to engage any other subcontractor or agency to complete

the work or any part thereof, and in addition to any other right COMPANY may have under this work order or in law including without limitation the right to penalize for delay under clause 15.0 of this work order, the contractor shall be liable to COMPANY for any additional costs that may be incurred by COMPANY for the execution of the Work.

21. RISK & COST:

If the Contractor or fails to execute the work as per specification / as per the direction of Engineer's In-charge within the scheduled period and even after the

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extended period, the contract shall get cancel and company reserves the right to get the work executed from any other source at the Risk & Cost of the Contractor. The Extra Expenditure so incurred shall be debited to the Contractor.

22. ENVIRONMENTAL, HEALTH & SAFETY PLAN:

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

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

All contractors' staff are accountable for the following:

- 1. Use the correct tools and equipment for the job and use safety equipment and protective clothing supplied, e.g. helmets, goggles, ear protection, etc. as instructed.
- 2. Keep tools in good condition.
- 3. Report to the Supervisor any unsafe or unhealthy condition or any defects in plant or equipment.
- 4. Develop a concern for safety for themselves and for others.
- 5. Prohibit horseplay.
- 6. Not to operate any item of plant unless they have been specifically trained and are authorized to do so.

23. GENERAL CONDITIONS:

a) 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 reason resulting in contractors' labour or equipments being rendered idle due to any cause at any time.

b) The LOI followed by Work Order shall supersede all other correspondence and conditions of contract if furnished earlier in the event of any ambiguity.

c) ID CARD: No contractor will issue any ID cards to their staff on their own. All ID Cards for the workforce will be issued by BYPL Security ID Card Cell only.

Contractors should maintain the records of Identity Cards of their employees and whenever any employee quits / is removed then his/her Identity card should be collected & submitted to BYPL Security ID Card Cell.

Penalty will be imposed on the vendor in case of violation of the above rule.

Contractors shall submit the detail list of the employees that they are going to be hire to BYPL Security before start of the contract.

d) SITE OFFICE AND SITE FACILITIES:

The Contractor shall also make his own arrangement for the accommodation/conveyance requirements for its staff. He shall be provided at site the adequate open space for construction of site store for storing the materials, tools, tackles etc. All the Contractor's storage will be within the site premises in a manner affording convenient access for identification and inspection at all times. The storage of arrangements shall be subject to IS: 4082. All the incoming and outgoing materials, equipment, tools, tackles and any other items related to said work shall be entered into the register kept for this purpose and shall be in the safe custody of Contractor, however company does not hold any responsibility for any loss or damage caused to Contractor's material etc.

e) The Contractor shall strictly control the labour so that the site is not polluted, made dirty or littered with debris, wastes or the likes.

f) Any person, labour found creating mess or litter or pollution shall be removed from the site immediately at the Contractors cost and shall also be subject to penalty at the discretion of the EIC.

g) WATER & POWER:

Water and Electricity Power shall be arranged by the Contractor at his own.

It shall be the responsibility of the Contractor to make arrangements at his own expense for supply of water for construction and other uses. The Contractor shall also install pumps, construct temporary storage tanks and distribute the water to various points in works Site as required. The Contractor at his own

expense shall make arrangement for operating and maintaining pumps & distribution lines, connections, which are installed by him for water.

h) WATCHING & LIGHTING:

The Contractor shall in connection with the works provide and maintain at his own cost all lights, barricading arrangements, guards, fencing and watching when and where necessary for the protection of works, or for the safety and convenience of the public or others. The care, housekeeping and safety of the materials and works within the works site shall be sole responsibility of the Contractor.

i) EXTENSION OF TIME LIMIT & TIME OVER RUN:

If delay is not attributable to the Contractor, the extension of time may be considered at the discretion of the Company without prejudice to the right of the Company for recovery of liquidated damages. This is also subject to the Contractor having taken sufficient precautions to mitigate the delay and submitted to the Company a full-detailed particular of any extension of time to which he may consider himself entitled within 10 days after such work has been commenced or such circumstances have arisen. The extension of time may be granted and without any financial increment in the contract price to the Company.

j) RELEASE OF INFORMATION AND CONFIDENTIALITY:

The Contractor shall not communicate or use in advertising, publicity, sales release or in any medium photograph or reproduction of the works under this contract, or description of the site, dimensions, quantity or any other information concerning the works unless prior written permission is obtained by Company. The Contractor shall keep all the information obtained directly or indirectly through appointment of this contract confidential and shall not reveal the same to any other party without the prior written permission of the Company. The technical information, drawing and other related documents forming part of order and the information obtained during the course of execution under this order shall be the Company's exclusive property and shall not be used for any other purpose except for the execution of the order. The technical information drawing, records and other document shall not be copied, transferred, or divulged and/or disclosed to third party in full/part, not misused in any form whatsoever except to the extent for the execution of this order.

This technical information, drawing and other related documents shall be returned to the Company with all approved copies and duplicates including drawing/plans as are prepared by

the Contactor during the executions of this order, if any, immediately after they have been used for agreed purpose.

In the event of any breach of this provision, the contractor shall indemnify the Company against any loss, cost or damage or claim by any party in respect of such breach.

k) SITE REPRESENTATIVE, SITE SUPERVISION AND ADVANCE INTIMATION:

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l) The Contractor shall have to appoint and authorize a Site In Charge/ Project Manager (PM) along with its project team, who shall be available always at site till the completion of the contract as certified by Engineer In Charge (EIC).

m) The Contractor shall be responsible for supervising the works by employing competent and experienced engineers and support teams to inspect the work and check the quality of work to ensure that the work is carried out in accordance with the drawings, specifications and instructions of the EIC. Such inspection and supervision shall not relieve the Contractor from any of his obligations towards use of material, workmanship, sequence of working and completion of project as per the stipulated period.

n) On receipt of the LOI or Work Order whichever is earlier the Contractor shall furnish to the Company, for approval, the proposed site setup with list of Engineers, Supervisors and other staff to be deployed by him with their dates of joining.

o) The Contractor's Project Manager shall obtain the written approval and instructions from the EIC prior to commencement of any works at site. The PM shall give written advance intimation for approval of all activities including deployment of resources, procurement of materials, concrete pours etc. to EIC.

24. WORK COMPLETION CERTIFICATION:

The work carried out by the Contractor under this order has to be certified as being satisfactorily completed by the Engineer In charge at work site. In case of modification/ rectification /correction to be carried out, Contractor shall carry out the said modifications/ corrections. The Contractor shall remain in close contact with Engineer In charge at site to report the general findings of the field work during the initial as well as later stage of the work at site, If required, there shall also be joint meetings at site/company office at Karkardooma, New Delhi to discuss the field findings and for revision of the method for site work if required. Work Completion Certificate shall be issued by the Engineer In charge within 10 days of satisfactory work completion subject to handing over of clear site i/c removal of Labor accommodation, stores, storage arrangements for water, plants, tackles, scaffoldings, ladders, leveling at site. The Contractor shall give undertaking that all standing dues to Labor have been paid and all the statutory obligations have been met with. Completion certificate to be submitted with the final bill issued by Engineer-in-Charge.

25. PENALTY AND LIQUIDATED DAMAGES:

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

25.2 Liquidated Damages: In the event of any delay in completion of the work beyond the stipulated time given by in order due to reasons solely attributable

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to the Contractor, the Contractor shall pay to the Company liquidated damages as per the clause defined in SCC.

26. SAFETY REGULATIONS:

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

26.2. The Contractor shall indemnify the Company from any consequence arising due to contractor's failure in respect to safety compliance.

26.3. First Aid facilities at easily accessible place shall be provided by the Contractor at his own cost as per provisions of Labor act or as advised by the Company wherever works are carried out.

26.4. All critical injuries shall be reported promptly to the Company. The report shall cover type, nature, cause, physician's report and actions for prevention of those types again.

26.5. To ensure effective enforcement of the rules and regulations relating to safety precautions, arrangements made by the Contractor shall be open to inspection by the Company.

26.6. The cost so incurred by the Contractor in providing for safety standards and requirements as above shall be deemed to be included in the rates quoted for various items under the scope of Contract and no extra amounts shall be payable to the contractor on this account.

26.7. The Contractor shall furnish to the Company within seven days from issue of LOI or Work Order whichever is earlier, for approval of Company, the proposed safety programme on how it intends to implement the safety procedures and precautions to ensure that the site is accident free.

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

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

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

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

27. WORKMEN COMPENSATION:

The Contactor shall take insurance policy under the Workman Compensation Act to cover such workers, who are not covered under ESI and PF by the Contractor however engaged to undertake the jobs covered under this order and a copy of this insurance policy will be given to Engineer-In-Charge. This insurance policy shall be kept valid at all times. In case there are no worker involve other than those who are covered under ESI and PF by the Contractor, the Contractor shall certify for the same. The Contactor shall keep the Company indemnified at all times, against all claims of compensation under the provisions of Workmen Compensation Act 1923 and as amended from time to time or any compensation payable under any other law for the time being workman engaged by the Contactor/sub-Contactor/sub-agent in carrying out the job involved under this order and against costs and expenses, if any, incurred by the Company in connection therewith and without prejudice to make any recovery. The Company shall be entitled to deduct any money due to or to become due to the Contractor, money paid or payable by way of compensation as aforesaid or cost or expenses in connection with any claims thereto and the Contactor shall abide by the decision of the Company as to the sum payable by the Contactor under the provisions of this clause.

28. BOCW ACT:

BOCW Act applies to every establishment which employs, or had employed on any day of the preceding twelve months, ten or more building workers in any building or other construction work. The Tenderer, for carrying out any construction work, must get themselves registered with the Registering Officer under Section 7 of the Building and Other Construction Workers Act, 1996 and rules made thereto by the concerned State Govt .and submit certificate of Registration, issued from the Registering Officer of the concerned State Govt. (Labour Dept.). As per this Act, the tenderer shall be levied a cess @1% of cost of construction work, which would be deducted from each bill. Cost of material, when supplied under a separate schedule item, shall be outside the purview of cess The Tender shall also comply with all provisions of the said Act applicable to him.

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29. STATUTORY OBLIGATIONS:

The Contractor shall take all steps as may be necessary to comply with the various applicable laws/rules including the provisions of contract Labor (Regulation & Abolition Act) 1970 as amended, Minimum wages Act, 1984, Workman Compensation Act, ESI Act, PF Act, Bonus Act and all other applicable laws and rules framed there under including any statutory approval required from the Central/State Governments, Ministry of Labor. Broadly, the compliance shall be as detailed in ANNEXURE I enclosed.

Before issue of order it would be mandatory for the Contractor to furnish the Company the permanent PF code no, ESI registration, registration under W.C.T Act.

30. HUMAN RESOURCE ISSUES:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

- 30.17.1 The Child Labour (Prohibition and Regulation) Act, 1986.
- 30.17.2 The Contract Labour (Regulation and Abolition) Act, 1970.
- 30.17.3 The Employee's Pension Scheme, 1995.
- 30.17.4 The Employee's Provident Funds and miscellaneous provisions Act, 1952.
- 30.17.5 The Employees State Insurance Act, 1948.
- 30.17.6 The Industrial Disputes Act, 1947.
- 30.17.7 The Maternity Benefit Act 1961.
- 30.17.8 The Minimum Wages Act, 1948.
- 30.17.9 The Payment of Bonus Act, 1965.
- 30.17.10 The Payment of Gratuity Act, 1972.
- 30.17.11 The payment of Wages Act, 1936.
- 30.17.12 The Delhi Shops & Establishment Act, 1954.
- 30.17.13 The Workmen's Compensation Act. 1923.
- 30.17.14 The Employer's Liability Act, 1938.

31. STAFF AND WORKMAN:

(I) It shall be responsibility of contractor

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

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

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

a) Register of workmen.

b) Register of muster roll.

c) Register of overtime.

d) Register of wages.

e) Any other register as per latest amendment Labor Act. The records shall be in the prescribed formats only.

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

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

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

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

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

32. INSURANCE:

The Contractor at its own cost shall also arrange, secure and maintain the following insurance covers

33. THIRD PARTY INSURANCE:

Before commencing the execution of the work the Contractor shall insure against any damage or loss or injury which may occur to any property or to any person or any employee or representative of any outside Agency/Company engaged or not engaged for the work of the

Company, by or arising out the execution of the work or temporary work or in carrying out of this work order.

34. INSURANCE OF MAN MATERIAL & MACHINERY DEPLOYED AT SITE:

Contractor shall be responsible for the insurance of all the Man , Material and Machinery deployed at site.

35. GROUP PERSONAL ACCIDENTAL INSURANCE POLICY FOR LIFE COVER:

Before commencing the execution of the work the CONTRACTOR shall take Accidental insurance policy for the staff engaged by him for this work to insure

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against any loss of life which may occur during the contract for the work of the COMPANY. The policy shall have coverage of Rs. 10 Lacs (Table C- Death + Permanent Total Disability + Partial permanent Disability due to external accidents). The premium amount for such policy shall be borne by the contractor. The contractor shall furnish copy of policy when demanded by BYPL.

The Contractor shall be responsible for on the spot same day claim settlement with the victim's legal heirs without waiting for settlement by insurance claim without any liability on BYPL.

36. PROGRESS REPORTS OF WORK EXECUTION:

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

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

a) Executive summary

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

c) Necessary photographs of work done in the manufacturer's shop and erection site which shall be taken when and where indicated by the Purchaser. Photographs shall be approximately 100 x 127 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.

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

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

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

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

37. ARBITRATION:

To the best of their ability, the parties hereto shall endeavor to resolve amicably between themselves all disputes arising in connection with this work order. If the same remain unresolved within thirty (30) days of the matter being raised by either party, either party may refer the dispute for settlement by arbitration.

The arbitration to be undertaken by two arbitrators, one each to be appointed by either party. The arbitrators appointed by both the parties shall mutually nominate a person to act as presiding arbitrator before entering upon the reference in the event of a difference between the two arbitrators and the award of the said presiding arbitrator in such a contingency shall be final and binding upon the parties. The arbitration proceeding shall be conducted in accordance with this provisions of the Indian Arbitration & Conciliation Act, 1996 and the venue of such arbitration shall be city of New Delhi only.

38. FORCE MAJEURE:

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

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

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

- (i) Effect of any natural element or other acts of God, including but not limited to storm, flood, earthquake, lightning, cyclone, landslides or other natural disasters, and
- (ii) Explosions or fires
- (iii) Declaration of the Site as war zone. Any order, regulation, directive, requirement from any Governmental, legislative, executive or judicial authority.

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

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

38.4 Mitigation of events of force majeure: The Contractor shall:

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

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

38.6 Terminations for certain events of force Majeure: If any obligation of any Party under the Contract is or is reasonably expected to be delayed or prevented by a Force Majeure event for a continuous period of more than 1 (one) month during the

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Term of the Contract the Contract shall be terminated at the discretion of the Company and neither Party shall be liable to the other for any consequences arising on account of such termination.

39. SECRECY CLAUSE:

The technical information, drawing and other related documents forming part of order and the information obtained during the course of execution under this order shall be the Company's exclusive property and shall not be used for any other purpose except for the execution of the order. The technical information drawing, records and other document shall not be copied, transferred, or divulged and/or disclosed to third party in full/part, not misused in any form whatsoever except to the extent for the execution of this order. These technical information, drawing and other related documents shall be returned to the Company with all approved copies and duplicates including drawing/plans as are prepared by the Contactor during the executions of this order, if any, immediately after they have been used for agreed purpose. In the event of any breach of this provision, the contractor shall indemnify the Company against any loss, cost or damage or claim by any party in respect of such breach.

40. PROTECTION OF PROPERTY:

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

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

41. VARIATIONS / AMENDMENTS:

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

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42. FREE ISSUES OF MATERIAL AND/OR EQUIPMENT:

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

43. TERMINATION DUE TO NON PERFORMANCE:

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

44. TERMINATION BY EMPLOYER CONVENIENCE:

The owner at any time terminate the contract for any reason, by giving the contractor a notice of termination. Upon receipt of the notice of termination, the contractor shall either within 14 days of receipt of such notice, or on the date specified in the notice of termination, carry out the following : Cease all further work, except for such work as the owner may specify in the notice of termination for the sole purpose of protecting that part of the facilities already executed, or any work required to leave the site in a clean and safe condition.

- Terminate all subcontracts, except as mentioned below.
- Remove all Contractor's equipment from the site, repatriate the contractor's and its sub-contractor's personnel from the site, remove from the site any wreckage, rubbish and debris of any kind, and leave the whole of the site in a clean and safe condition.
- Deliver to the owner the parts of the facilities executed by the contractor up to date of termination.
- To the extent legally possible, assign to the owner all right , tile and benefit of the contractor to the facilities and to the plant and equipment as at the date of termination, and as may be required by the owner, in any subcontracts concluded between the contractor and its sub-contractors.

- Deliver to the owner all non-proprietary drawings, specifications and other documents prepared by the contractor or its sub-contractors as at date of termination in connection with the facilities. In the event of termination of the contract by the owner, under this clause, the owner shall pay to the contractor the following amounts after setting off the owner's claim if any under the contract:

a) The contract price, properly attributable to the parts of the facilities executed by the contractor as of the date of termination.

b) The costs reasonably incurred by the contractor in the removal of the contractor's equipment from the site and in the repatriation of the contractor's and its sub contractors personnel.

c) Pre- approved and reasonable cost of satisfying all other obligations, commitments and claims that the contractor may in good faith have undertaken with third parties in connection with the contract and that are not covered above.

45. ACCEPTANCE:

Acceptance of this work order implies and includes acceptance of all terms and conditions enumerated in this work order in the technical specification and drawings made available to you consisting of general conditions, detailed scope of work, detailed technical specification & detailed equipment, drawing. Complete scope of work and the Contractor's and Company's contractual obligation are strictly limited to the terms set out in the work order. No amendments to the concluded work order shall be binding unless agreed to in writing for such amendment by both the parties.

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

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

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Annexure - I

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

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

The Contractor must follow:

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

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Annexure – II

ON THE LETTER HEAD OF THE CIVIL CONTRACTOR

QUARTERLY COMPLIANCE CERTIFICATE

I, _____ (Name of Proprietor/Partner/Director with DIN number) of _____ (Firm/Company Name) duly certify that the Firm/Company has duly complied with all the applicable Central & State Acts, Rules, Regulations, Orders, Guidelines and any statutory modification or re-enactment thereof for the time being in force ("the Applicable Laws) for the quarter ended _____ including but not limited to:

Sr. No. Particulars*

- 1 The Companies Act, 2013 and rules thereof;
- 2 Workmen's Compensation Act, 1923 and rules thereof;
- 3 Contract Labour (Regulation and Abolition) Act, 1970
- 4 Delhi Contract Labour (Regulation and Abolition) Rules, 1972
- 5 Employees' Compensation Act, 1923 and rules thereof;
- 6 The Delhi Shops and Establishments Act, 1954 and rules thereof;
- 7 The Employees' Provident Funds And Miscellaneous Provisions Act, 1952 and rules thereof;
- 8 Equal Remuneration Act, 1976 and rules thereof;
- 9 Minimum Wages Act, 1948 and rules thereof;
- 10 Maternity Benefits Act, 1961 and rules thereof;
- 11 Building and Other Construction Workers (Regulation of Employment And Conditions of Service) Act, 1996 and Delhi Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Rules, 2002
- 12 Employees' State Insurance Act, 1948 and rules thereof;
- 13 The Payment of Gratuity Act, 1972 and rules thereof;
- 14 Equal Remuneration Act, 1976 and rules thereof;
- 15 The Payment of Bonus Act, 1965 and rules thereof;
- 16 Delhi Labour Welfare Fund Act and rules thereof; *strikeout whichever is not applicable

Further, it is certified that a system has been devised to ensure compliance with the provisions of all applicable laws & that system is adequate & operating effectively.

DECLARATION:

This is to declare that I, the undersigned am responsible to ensure that all the compliances of the Applicable Laws, has been done within the timeframe as given under the respective Acts.

Signature:

Name:

Employee ID:

Designation:

Department:

Date:

Place: New Delhi

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APPENDIX II

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

FORMAT OF ADVANCE BANK GUARANTEE

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

1. WHEREAS M/s BSES Yamuna Power Limited, a Company incorporated under the provisions of Companies Act, 1956 having its Registered Office at Shaktikiran Building, Karkardooma, Delhi 110032, India hereinafter referred to as the " Owner ", (which expression shall unless repugnant to the context or meaning thereof include its successors, administrators, executors and assigns).
2. AND WHEREAS the Owner has entered into a contract for _____(Please specify the nature of contract here) vide Contract No. _____dated _____(hereinafter referred to as the "Contract") with M/s._____, (hereinafter referred to as "the Suppliers", which expression shall unless repugnant to the context or meaning thereof be deemed to mean and include each of their respective successors and assigns) for providing of the services on the terms and conditions as more particularly detailed therein.
3. AND WHEREAS in conformity with the provisions of clause ____ of conditions of Contract, the Suppliers has agreed to furnish a Bank Guarantee for an amount equivalent to the Advance Payment of Rs..... extended by the Owner to the Supplier for the faithful execution of the Contract.
4. AND WHEREAS the Suppliers have agreed to provide the Owner and the Owner has agreed to accept the Advance Bank Guarantee for ____ percent (____%) of the total Contract Value from [_____] (*pl. specify the name of Bank*) having its head/registered office at [_____] through its branch in _____(*pl. specify the name of Branch through which B.G is issued*) hereinafter referred to as "the Bank",

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

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

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

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

Dated this day of 2016 at

(Signature)

.....

(Name)

.....

(Designation with Bank Stamp)

Attorney as per

Power of Attorney No.....

Date.....

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

FORMAT OF PERFORMANCE BANK GUARANTEE

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

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

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

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

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

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

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

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

Dated this day of 2016 at

(Signature)

.....

(Name)

.....

(Designation with Bank Stamp)

Attorney as per

Power of Attorney No.....

Date.....

BENEFICIARY'S BANK DETAIL WITH IFSC CODE:

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

FORMAT OF WARRANTY/GUARANTEE CERTIFICATE

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

Ref. Purchase Order No. :

Dear Sir,

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

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

Vendors Name & Signature

PRICE BID FORMATS (SUPPLY & SERVICES)
OF
SUPPLY, LAYING, TESTING & COMMISSIONING OF
33KV 3CX400 MM² CABLE WITH REQUIRED
ACCESSORIES AS PER THE SCOPE OF WORK AT
VARIOUS LOCATIONS FOR BYPL, DELHI (INDIA)
ON
TURNKEY BASIS
IN
BSES YAMUNA POWER LTD.

NIT NO CMC/BY/19-20/RB/SV/019

Due Date for Submission: 10.06.2019, 14:30 HRS

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

GRAND SUMMARY OF THE QUOTED PACKAGE(S)

ALL PRICES IN INR (₹)

Package Number	Package Name	Sub-Package Name	Supply Prices-Landed	Erection, Testing and commissioning prices	Civil Work (C)	Total Package Cost (D=A+B+C)
			(A)	(B)		
Package No A	Preet Vihar - Dwarka Puri	Cable Works				
		Bay Work				
Total Package No A (₹)						
Package No B	Preet Vihar - CBD-II	Cable Works				
Total Package No B (₹)						
Package No C	Preet Vihar - Kanti Nagar & Karkardooma	Cable Works				
Total Package No C (₹)						
Package No D	Preet Vihar – DSIDC & GT Road	Cable Works				
Total Package No D (₹)						
Package No E	Stores	Supply				
Total Package No E (₹)						
Grand Total [Package No A+B+C+D+E]						
Grand Total (In words)						

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

Date:

Bidders Name:

Place:

Bidders Address:

Signature:

Designation:

Printed Name:

Common Seal:

Note:

PRICE BID FORMATS (CMC/BY/19-20/RB/SV/019)	Page 2 of 5	33KV CABLE WORKS ON TURNKEY BASIS
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- 1) All prices for the packages quoted are inclusive of taxes and duties, GST and freight etc. Bidder shall include & indicate any others taxes under the applicable law(s) for supply and services to be performed in the purchaser's country.
- 2) Bidder shall include & indicate any others taxes under the applicable law(s) for supply and services to be performed in the purchaser's country.
- 3) The bidder shall, at its own, handle all imported equipment's and handle all formalities for custom clearances, port charges, etc if any
- 4) All prices for the packages quoted are against the scope of work under the contract shall be executed strictly as per the NIT conditions and the technical specification.
- 5) Quoted prices shall be as per the Bill of quantities (BOQ) as attached. However Any items/material/machinery, not specifically mentioned In BOQ as well as in the technical specifications but required for successful completeness, Erection, Testing and Commissioning of the package awarded shall be deemed to be in the scope of the bidder.
- 6) Insurance as per the clause defined in SCC and other contract conditions, is included in the quoted prices. However Bidder shall indicate the value of the insurance taken, separately.
- 7) Operation of the Package awarded for the period of Six (6) Months is included and bidders shall quote separately for the same as per the details specified.
- 8) Kindly refer the relevant layout drawing of existing foundations in Annexure of tender document. Site visit is advisable prior to submission of quotation.

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

Price Bid needs to be submitted for as per the below format:

- Cables Work
- Bay Work (if applicable)

DESCRIPTION OF GOODS	HSN CODE	QTY	UoM	UNIT RATE	UNIT GST & CESS AS APPLICABLE (CGST & SGST/UTGST or IGST)		UNIT LANDED COST (₹)	TOTAL LANDED COST (₹)
					%	AMT		
Items as per BOQ i.e. shall be utilized to furnish price break-up.								
GRAND TOTAL LANDED COST								
In words								

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

Price Bid needs to be submitted for each as per the below format:

- Cables Work
- Bay Work (if applicable)

Day Work (If applicable)								
DESCRIPTION OF SERVICES	SAC CODE	QTY	UoM	UNIT RATE	UNIT GST & CESS AS APPLICABLE (CGST & SGST/UTGST or IGST)		UNIT LANDED COST (₹)	TOTAL LANDED COST (₹)
					%	AMT		
Items as per BOQ i.e. shall be utilized to furnish price break-up.								
GRAND TOTAL LANDED COST								
In words								

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

Price Bid needs to be submitted for each as per the below format:

- Cables Work
- Bay Work (if applicable)

DESCRIPTION OF SERVICES	SAC CODE	QTY	UoM	UNIT RATE	UNIT GST & CESS AS APPLICABLE (CGST & SGST/UTGST or IGST)		UNIT LANDED COST (₹)	TOTAL LANDED COST (₹)
					%	AMT		
Items as per BOQ i.e. shall be utilized to furnish price break-up.								
GRAND TOTAL LANDED COST								
In words								

VOLUME – II

SCOPE OF TURNKEY EXECUTION

FOR

**SUPPLY, LAYING, TESTING & COMMISSIONING OF
33KV 3CX400 MM² CABLE WITH REQUIRED
ACCESSORIES AS PER THE SCOPE OF WORK AT
VARIOUS LOCATIONS FOR BYPL, DELHI (INDIA)**

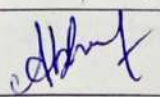
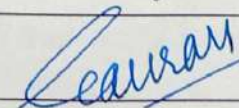
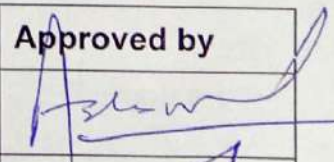
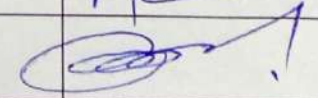
NIT NO CMC/BY/19-20/RB/SV/019

Due Date for Submission: 10.06.2019, 14:30 HRS

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

SCOPE OF WORK
FOR
SUPPLY, LAYING, TESTING AND COMMISSIONING (SLTC)
OF
33 KV 3x400 sq mm XLPE CABLE
FROM

- A. DTL PREET VIHAR to BYPL DWARKAPURI GRID
- B. DTL PREET VIHAR to BYPL CBD-II GRID
- C. DTL PREET VIHAR to BYPL KANTI NAGAR & KARKARDOOMA GRID
- D. DTL PREET VIHAR to BYPL DSIDC JHILMIL & GT ROAD GRID

Department	Prepared by	Reviewed by	Approved by
CES			
P&E			

CONTENTS

Package A : DTL Preet Vihar to BYPL Dwarkapuri Grid

1. SCOPE	3
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3. SCOPE OF WORK	8
4. SCOPE DEMARCATION	12
5. DOCUMENTATION	15

Package B: DTL Preet Vihar to BYPL CBD - II Grid

1. SCOPE	18
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4. SCOPE DEMARCATION	23
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Package C : DTL Preet Vihar to BYPL Kanti Nagar and Karkardooma Grid

1. SCOPE	29
2. SCOPE OF SUPPLY	29
3. SCOPE OF WORK	31
4. SCOPE DEMARCATION	34
5. DOCUMENTATION	37

Package D : DTL Preet Vihar to BYPL DSIDC and GT Road Grid

1. SCOPE	40
2. SCOPE OF SUPPLY	40
3. SCOPE OF WORK	42
4. SCOPE DEMARCATION	45
5. DOCUMENTATION	48

PACKAGE A - DTL PREET VIHAR to BYPL DWARKAPURI GRID

1. SCOPE

- 1.1. Scope covers supply, laying, testing and commissioning of 2 no's circuits of 33 KV 3Cx400 sq mm XLPE underground cable circuits from DTL Preet Vihar Grid to BYPL Dwarkapuri Grid – Circuit Length 5500 meter Each circuit will have 2 no's cable runs. Therefore total 4 no's cable runs will be laid.
- 1.2. Scope also covers supply, Installation, testing and commissioning of 33 KV kV bay at Dwarkapuri Grid

2. SCOPE OF SUPPLY

2.1. Scope of Supply - Cable SLTC Work

S No	Material Description	UoM	Quantity
1	Cable 33 kV 3Cx400 sq mm	Meter	22000
2	Cable End Termination kit suitable for 33 kV 3Cx400 sq mm cable outdoor termination (Make- Raychem/3M) - For Dwarkapuri Grid end	No's	4
3	Cable End Termination kit Suitable for 33 kV 3Cx400 sq mm cable Indoor GIS panel termination (Make- Raychem/3M) - For Preet Vihar Grid end	No's	4
4	Cable straight through joint kit Suitable for 33 kV 3Cx400 sq mm cable(Make- Raychem/3M)	No's	109
5	Precast RCC (1:2:4) cable cover 600x550x50 mm	No's	15583
6	HDPE PIPE 200 MM DIA PN4 PE 80	Meter	7700
7	HDPE Pipe Collar 200 mm	No's	1283
8	Weather and acid resistant PVC warning tape of 150mm width 300 micron thick Yellow colour with desired Red/Black lettering	Meter	4675
9	Route indicating stones for every 50 meter circuit length and Joint Indication stonas at every cable joint location	No's	219

SCOPE OF WORK FOR SLTC OF 33 KV 3CX400 SQ MM XLPE CABLE INFEEDS

S No	Material Description	UoM	Quantity
10	Galvanized Channel, Angle, Beam and other Structural steel with hardware's for all structures including cable support structure, drain crossing structure etc	MT	1
11	Fine Sand	Cubic Meter	1515
12	End Cap for Cable 33 KV AL 3X400 Sqmm XLPE	No's	220
13	Optical Fiber cable 48F (1 Runs with each circuit)	Meter	11000
14	Duct for Optical Fibre Cable (40mm)	Meter	11000
15	Collar for optical fiber cable duct	No's	110
16	Optical Fiber cable splice enclosure for jointing of optical fiber cable	No's	14
17	Fibre optic cable end termination distribution box	No's	4
18	Cable armour- earth link box without SVL	No's	8
19	HDPE cleat with hardware's suitable for 33 kV 3Cx400 sq mm cable	No's	8
20	Support insulators for mounting of cable on support structure	No's	8
21	Danger Plates	No's	8
22	Circuit Name Plate	No's	8
23	Anti Climbing device	No's	2
24	Cable Identification Road Stud	No's	1
25	50X6 Sq mm GI Earthing strip	MT	1
26	Aluminium Cable Identification tag with nylon string	No's	733
27	Safety barricading PVC tape	Meter	1
28	Safety barricading cone	No's	1
29	Coarse sand for PCC & RCC	Cubic meter	1
30	Burnt clay Brick - First class	No's	1
31	Cement Bags 50 kg	No's	1
32	Reinforcement steel bars	MT	1
33	Construction Aggregate	Cubic meter	1
34	Optical Fiber Cable Loop chamber for every 300 meter of cable run	No's	37
35	Phase marking Scotch Vinyl Electrical Tape 35 (Red, Yellow and Blue)	Lot	1
36	Cable sheath repair 3M Scotch 2228 Rubber mastic Tape	Lot	1

S No	Material Description	UoM	Quantity
37	Self-Fusing Silicone Rubber Electrical Tape 70	Lot	1

2.2 Scope of Supply – Bay Addition Work

S No	Material Description	Remarks	UoM	Quantity
1	33 kV Line CRP	a) For two Circuit laid from DTL Preet Vihar Grid S/S to Dwarkapuri Grid S/S. b) Line Differential Protection Relay shall be supplied as main protection of Line CRP for Dwarkapuri Grid S/S	Nos	2
2	Line Differential Relays	a) For DTL's Preet Vihar Grid S/S End b) Communication Protocol of these relays shall be IEC 61850	Nos	2
3	33 kV Lightning Arrestor		Nos	3
4	33 kV Isolator with One Earth Switch(1250A)	One for Line Side isolator & one for Bus Side Isolator	Nos	2
5	33 kV Isolator Without Earth Switch(1250A)	Bus side isolator	Nos	1
6	33 kV CVT	For Both Bays	Nos	6
7	33 kV CT(800-400/1/1/1/1A)		Nos	3
8	33 kV Circuit Breaker (1250A)		Nos	1
9	Twin ACSR Zebra Conductor	a) For extension of Existing Double Bus Arrangement b) For Jack Bus of Line Bay. c) For connecting equipment of Line Bay	LOT	1
10	Cable Sealing System	For Supplied Power and Control Cable	LOT	1

SCOPE OF WORK FOR SLTC OF 33 KV 3CX400 SQ MM XLPE CABLE INFEEDS

S No	Material Description	Remarks	UoM	Quantity
11	Cable Support Structure with HDPE Cleat and Hardware		LOT	1
12	Clamps, Connectors & Accessories		LOT	1
13	Disc Insulator		LOT	1
14	Tension string Insulator		LOT	1
15	Suspension string Insulator		LOT	1
16	Bay Marshalling Box		Nos	2
17	Post Insulators		LOT	1
18	Hardware for Tower and Beams		LOT	1
19	Control Cables	a) For Items Specified in "Grid S/S Scope of Supply" Equipment including interlocks with existing system b) It Includes proper ferruling and tagging along with glands and lugs c) Control cables for 2 CRPs (from CT, CVT,CB,Isolator MOM to Bay Marshalling Box to CRP) d) For Extra 2 Line Differential relays supplied for DTL Preet Vihar Grid S/S	LOT	1
20	LT Power Cable	a) For Items Specified in "Grid S/S Scope of Supply" b) It Includes proper ferruling and tagging along with glands and lugs c) LT power Cable from ACDB and DCDB shall be in vendor's scope.	LOT	1
21	Cable Tray including bends etc	a) For routing LT Power and Control Cables b) Each Cable tray must have 50% spare space	LOT	1

SCOPE OF WORK FOR SLTC OF 33 KV 3CX400 SQ MM XLPE CABLE INFEEDS

S No	Material Description	Remarks	UoM	Quantity
		capacity in each		
22	Earthing	a) Earthing of newly proposed line bays & connecting the earthing to existing mesh. B) Earthing shall be done at two points of all supplied equipment	LOT	1
23	Lightning Protection	For Proposed Line Bay	LOT	1
24	HDPE Pipe	For laying control cable where trench is not available	LOT	1
25	Complete SLD of Yard	Covered in Acrylic Sheet	Nos	1
26	SCADA Integration	a) Refer Specification b) Integration of Extra Two Line Differential relay with RTU at DTLs Preet Vihar Grid S/S	LOT	1
27	Civil	Refer Civil Specification	LOT	1
28	Painting of Feeder names		LOT	1
29	Licensed programming software and communication cord for offered numerical relays		No	1
30	Special Tools		LOT	1
31	Recommended/Mandatory Spares as per Specification		LOT	1

3. SCOPE OF WORK

3.1. Scope of Work - Cable SLTC Work

S No	Description	UoM	Quantity
1	Surveying of cable Route, Detailed Site Plan & Profile using Ground penetration Radar System, Excavation of trial pits as per field requirement, preparation of route drawing with location of joint chambers position and finalizing the cable route in consultation with BSES Representative	Meter	5500
2	Digging of cable trench as per specification and drawings. Rate is inclusive of digging and backfilling for Ordinary Bituminous/C.C.Road (including dewatering if any)	Cubic meter	2038
3	Digging of cable trench as per specification and drawings. Rate is inclusive of digging and backfilling for Dense Carpeted bituminous Road (including dewatering if any)	Cubic meter	1630
4	Digging of cable trench as per specification and drawings. Rate is inclusive of digging and backfilling for Footpath/tile/Rajasthani Stone/Brick work (including dewatering if any)	Cubic meter	1630
5	Digging of cable trench as per specification and drawings. Rate is inclusive of digging and backfilling for Hard Rocky Soil (including dewatering if any)	Cubic meter	1630
6	Laying of XLPE cables in the excavated trench, as per BYPL Standards (Regarding Depth, Layer formation, etc). Cable rollers to be used during Laying.	Meter	14300
7	Laying of XLPE cable in HDPE pipe in excavated trench	Meter	4400
8	Laying of cable in trenchless ducts with 200 mm dia HDPE pipe using HDD machine including laying of 200 mm dia HDPE pipe PN4 PE 80 Class	Meter	3300
9	Continuous steel Barricade for all Excavated areas, till the work is completed.	Lot	1
10	Fixing of Aluminum Cable identification tags with Nylon string at every 30 Mtrs cable length	No's	733
11	Installation of straight through joints for 33 kv 3Cx400 sq mm cables by jointing kit OEM authorized jointer	No's	109
12	Installation of outdoor End Termination for 33kv 3Cx400 sq mm cables by jointing kit OEM authorized jointer	No's	4

SCOPE OF WORK FOR SLTC OF 33 KV 3CX400 SQ MM XLPE CABLE INFEEDS

S No	Description	UoM	Quantity
13	Installation of Indoor GIS End Termination for 33kv 3Cx400 sq mm cables by jointing kit OEM authorized jointer	No's	4
14	Digging of joint pit suitable for 33 cable joint box and covering the joint box with sand and providing protection for Ordinary bituminous road/C.C. Road	No's	27
15	Digging of joint pit suitable for 33 cable joint box and covering the joint box with sand and providing protection for Dense carpeted bituminous road.	No's	27
16	Digging of joint pit suitable for 33 cable joint box and covering the joint box with sand and providing protection for Footpath/ tile/ Rajasthani Stone / Brick Works	No's	27
17	Digging of joint pit suitable for 33 cable joint box and covering the joint box with sand and providing protection for Hard Rocky Soil.	No's	27
18	Spreading of sand forming cushion and cover around the cable	Cubic meter	1515
19	Disposal of debris/surplus malba including Loading / Unloading	Cubic meter	1666
20	Digging of test pits of required size(not less than 1/2 Meter Wide at site for identification of cable route)	No's	8
21	Watch and ward of complete circuit till project handover	Lot	1
22	Installation of Precast RCC Cable cover	No's	15583
23	Installation of Route and Joint indicating stone marked with "BYPL 33 KV Cable Helpline No-91-11-399 99 808"	No's	219
24	Laying of PVC warning tape	Meter	4675
25	Fabrication and installation of galvanized Channel, Angle, Beam and other Structural steel including nuts & bolts for all structures including cable support Structure, drain crossing strcture etc	MT	1
26	Laying of optical fiber cable in open excavated trench including laying of 40 mm dia HDPE pipe including blowing and pulling	Meter	9350
27	Laying of optical fiber cable in trenchless ducts using HDD machine including laying of 40 mm dia HDPE pipe including blowing and pulling	Meter	1650
28	Installation of OFC cable splice enclosure	No's	14
29	Testing of optical fiber cable after installation	Lot	1
30	Partial discharge test on complete cable length at site	Lot	1
31	VLF High voltage test on complete cable length as per relevant IEC/IEEE	Lot	1

SCOPE OF WORK FOR SLTC OF 33 KV 3CX400 SQ MM XLPE CABLE INFEEDS

S No	Description	UoM	Quantity
32	Tan Delta test on complete cable length as per relevant IEC/IEEE	Lot	1
33	Installation of Fiber optic distribution box in circuits both ends and termination of fiber optic cable	No's	4
34	Installation of cable armour- earth link box without SVL including cable earthing/armour connection with grid earthing	No's	8
35	Installation, mounting and fixing of 33 kV 3Cx400 sq mm cable with termination on mounting structure/tower and fixing it with suitable HDPE cleats	No's	8
36	Installation of support insulators on cable mounting structure with misc. hardware's.	No's	8
37	Fixing of danger plate on poles including fabrication of clamps etc	No's	8
38	Fixing of circuit Name plate including fabrication of clamps etc	No's	8
39	Fixing of anti climbing device on cables mounting structures including fabrication of clamps etc	No's	2
40	Installation of Cable identification road stud	No's	1
41	Transportation of empty 33 kV cable drums from site to BSES store	No's	110
42	Laying of GI earth connecting strip of 50x6 sq mm size including required welding, painting on joints etc	MT	1
43	Submission of actual laid drawing of cable circuits including GPS coordinates of every 30 meter circuit length, Cable joints, Every turn/curve, Every road crossing (both ends)	Lot	1
44	Cable Phasing work, Cable Phase Sequence (R,Y,B) Marking, Cable 1&2 Marking, and final connection as per Phase Sequence.	Lot	1
45	Masonry Brick work	Cubic meter	1
46	Providing and laying in position cement concrete 1:1.5:3 (1 cement : 1.5 coarse sand : 3 graded stone aggregate) excluding the cost of centering, shuttering, finishing and enforcement	Cubic meter	1
47	Providing and laying in position cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate) excluding the cost of centering, shuttering, finishing and enforcement	Cubic meter	1

SCOPE OF WORK FOR SLTC OF 33 KV 3CX400 SQ MM XLPE CABLE INFEEDS

S No	Description	UoM	Quantity
48	Providing and laying in position cement concrete 1:4:8 (1 cement :4 coarse sand : 8 graded stone aggregate) excluding the cost of centering, shuttering, finishing and enforcement	Cubic meter	1
49	Centering, shuttering including shuttering propping etc and removal of shuttering	Lot	1
50	Fabrication of reinforcement for RCC work including straightening, cutting, bending, placing in position and binding all complete thermo mechanically treated bars.	Lot	1
51	Installation of Brick as Cable Separator	No's	1
52	Installation of Optical Fiber cable loop chamber	No's	37
53	Application of Scotch Vinyl Electrical Tape 35 (Red, Yellow and Blue) on cable end termination kit	Lot	1
54	Application of 3M Scotch 2228 Rubber mastic Tape on cable straight through joint end sealing and for cable sheath repair	Lot	1
55	Application of Self-Fusing Silicone Rubber Electrical Tape 70 on cable end termination boot and lug	Lot	1
56	Design, Engineering, construction of bridge over Shahdara Drain for crossing of 10 No's 11 kV 3Cx300 sq mm and 10 No's 33 kV 3Cx400 sq mm cable as per tender specification	Lot	1

3.2 Scope of Work – Bay Addition Work

S. No	Description	Remarks	UoM	Quantity
1	Erection, testing and Commissioning of Items Specified in "Grid S/S Scope of Supply"		Lot	1
2	Dismantling of Existing Line CRP		No	1
3	Tree Branch Cutting		Lot	1
4	Retrofitting Work	Retrofitting of Line Differential Relay of DTL's Preet Vihar Grid S/S	Lot	1
5	Civil Works	Kindly refer civil specification for below listed line items	Lot	1

SCOPE OF WORK FOR SLTC OF 33 KV 3CX400 SQ MM XLPE CABLE INFEEDS

S. No	Description	Remarks	UoM	Quantity
6	Soil Investigation Report	For designing Purpose	Lot	1
7	Structural Works	For all equipment included in "Grid S/S Scope of supply"	Lot	1
8	Foundation Works	For all equipment included in "Grid S/S Scope of supply"	Lot	1
9	Levelling for compete bay area		Lot	1
10	Power Cable Trench	With 50% spare capacity for future use	Lot	1
11	Control Cable Trench	With 50% spare capacity for future use	Lot	1
12	Support Structure and appropriate clamping arrangement	For proper termination of all power and control cables	Lot	1
13	Chequered Plate for trenches		Lot	1
14	Motorized De-Watering system for trenches		Lot	1
15	Yard Development for Line Bay		Lot	1
16	Almirah	a) One for spare and one for Tools b) Material-MS	No	2

4. SCOPE DEMARCATION

S. No	Head	BYPL	Bidder's Scope	Remarks
1	Road Cutting Permission and Road Restoration	x	✓	Statutory fees will be borne by BYPL
2	Permissions from Various External and Internal Agencies Regarding Cable Laying and Commissioning(Traffic	x	✓	Statutory fees will be borne by BYPL

SCOPE OF WORK FOR SLTC OF 33 KV 3CX400 SQ MM XLPE CABLE INFEEDS

S. No	Head	BYPL	Bidder's Scope	Remarks
	Police, GAIL, IGL, DJB, MTNL/BSNL etc)			
3	PTCC Permission from Various External Agencies (Telecom, DTL. Railways, Defense, etc)	x	✓	As per specifications & Standards
4	Continuous Steel Barricading with Mobile no of Vendor's Engineer Incharge	x	✓	Steel barricade should have small scheme description along with vendor and BYPL name on it
5	Permit to work request to BYPL authority	x	✓	Permit Should be applied to Engineer Incharge prior to work through proper procedure
6	Permit to work issuance from BYPL authority	x	✓	
7	Testing Equipments	x	✓	
8	Lighting Arrangement	x	✓	
9	Construction Power and Construction Water	x	✓	
10	Safety and Security of Manpower(Labor, Engineers, Supervisors etc)	x	✓	
11	Various Tools and Tackles related to Job	x	✓	
12	Loading, Unloading and Transportation of Material	x	✓	It includes transportation of dismantled equipment to BYPL store in stacked manner.
13	Cleanliness around work premises	x	✓	
14	Document/Drawing Submission	x	✓	
15	Document/Drawing Approval	✓	x	
16	Security and Safety of material until handover	x	✓	

SCOPE OF WORK FOR SLTC OF 33 KV 3CX400 SQ MM XLPE CABLE INFEEDS

S. No	Head	BYPL	Bidder's Scope	Remarks
17	Various Machines e.g. Crane, Hydra, JCB etc to complete the Job	✗	✓	
18	Maintenance of Equipments Until Handover to Engineer Incharge and EHV O&M	✗	✓	
19	Electrical Inspector Clearance	✗	✓	Only statutory fees will be borne by BYPL
20	Permit issuing agency for Works inside BYPL Premises	✓	✗	
21	Permit requesting Agency	✗	✓	Permit Should be applied to Engineer In charge prior to start of work. Isolation & permit of only one Feeder at a time, shall be given at a time, during final hook up. All necessary preparation works to be made, in order to minimize the Shutdown Time.
22	Temporary office near work premises	✗	✓	After handing over the equipments, contractor has to evacuate the premises within one week otherwise deemed fit action will be taken
23	Temporary store near work premises	✗	✓	
24	Yard aesthetics at work place should be maintained at the time and after the completion of Work	✗	✓	Disposal of Scrap/Debris etc from site and complete cleaning of working area till handover
25	Any damages done to the existing system, shall be repaired/ rectified/ replaced	✗	✓	

S. No	Head	BYPL	Bidder's Scope	Remarks
26	Clearance certificate	x	✓	Clearance Certificate shall be taken from BYPL Departments (Quality, Safety, Protection, O&M, SCADA, EHV, Civil, etc) before Final Charging of the Systems. Any Site Observations/ Punch points, observed during execution, shall be attended.
27	Various compliances pertaining to Job	x	✓	IE rules, CEA Regulation 2010

5. DOCUMENTATION

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

S. No.	Description	Technical Bid	Drawing Approval	Pre-Dispatch	Pre-Closure
1	Tender No.	Required			
2	Communication Details				
3	Name of the Bidder	Required			
4	Name of Authorized contact person	Required			
5	Contact No. of Authorized contact person	Required			

SCOPE OF WORK FOR SLTC OF 33 KV 3CX400 SQ MM XLPE CABLE INFEEDS

S. No.	Description	Technical Bid	Drawing Approval	Pre-Dispatch	Pre-Closure
6	E-mail id of Authorized contact person	Required			
7	Document Submission Format				
8	Documents shall be submitted in Box file/spiral binding. Any other format is not acceptable	Required			
9	Index of documents with page numbers for each document	Required			
10	Separator with document description shall be provided before each document	Required			
11	Qualifying Requirement Compliance				
12	Summary of compliance of qualifying criteria in tabular form along with summary of documentary proof provided	Required			
13	Detailed Documents supporting compliance of qualifying criteria	Required			
14	Drawings/ Documents as per Technical Specification.				
15	Signed copy of technical specification	Required			
16	Type Test reports of offered model/ type/ rating	Required	Required		
17	Sheath integrity test results for every cable section duly stamped and signed by BSES representative				Required
18	VLF, Tan delta and Partial discharge test results for every circuit duly stamped and signed by BSES representative				Required
19	OFC cable Test results for every circuit duly stamped and signed by BSES representative				Required
20	Actual as laid drawing of complete circuit with GPS coordinates at every a) 30 meter circuit length b) Cable joints c) Every turn/curve				Required

SCOPE OF WORK FOR SLTC OF 33 KV 3CX400 SQ MM XLPE CABLE INFEEDS

S. No.	Description	Technical Bid	Drawing Approval	Pre-Dispatch	Pre-Closure
	d) Every road crossing (both ends) Drawing shall be submitted in hard copy (minimum A3 Size) and AutoCAD dwg				
21	Deviation Sheet	Required	Required		
22	Detailed Drawings	Required	Required		
23	Other drawing/ documents mentioned in technical specification	Required	Required		
24	Soft copy of complete technical bid in pen drive	Required			
25	Samples as per technical specification.	Required			
26	Design Calculation		Required		
27	Manufacturer's quality assurance plan		Required		
28	GTP		Required		
29	Inspection Reports			Required	
30	As manufacturing Drawings			Required	
31	Operation and Maintenance Manual			Required	
32	As built Drawings				Required
33	Soft Copy				
34	In Pen drive	Required			
35	Through Mail		Required	Required	Required

PACKAGE B - DTL PREET VIHAR to BYPL CBD - II GRID

1. SCOPE

Scope covers supply, laying, testing and commissioning of 1 no's circuits of 33 KV 3Cx400 sq mm XLPE underground cable circuits from DTL Preet Vihar Grid to BYPL CBD II Grid – Circuit Length 2500 meter
Circuit will have 2 no's cable runs.

2. SCOPE OF SUPPLY

S No	Material Description	UoM	Quantity
1	Cable 33 kV 3Cx400 sq mm	Meter	5000
2	Cable End Termination kit suitable for 33 kV 3Cx400 sq mm cable indoor termination (Make- Raychem/3M) - For CBD - II Grid end	No's	2
3	Cable End Termination kit Suitable for 33 kV 3Cx400 sq mm cable Indoor GIS panel termination (Make- Raychem/3M) - For Preet Vihar Grid end	No's	2
4	Cable straight through joint kit Suitable for 33 kV 3Cx400 sq mm cable(Make- Raychem/3M)	No's	24
5	Precast RCC (1:2:4) cable cover 600x300x50 mm (used where two cable runs in one trench)	No's	7083
6	HDPE PIPE 200 MM DIA PN4 PE 80	Meter	1750
7	HDPE Pipe Collar 200 mm	No's	292
8	Weather and acid resistant PVC warning tape of 150mm width 300 micron thick Yellow colour with desired Red/Black lettering	Meter	2125
9	Route indicating stones for every 50 meter circuit length and Joint Indication stonas at every cable joint location	No's	74
10	Galvanized Channel, Angle, Beam and other Structural steel with hardwares for all structures including cable support structure, drain crossing structure etc	MT	1
11	Fine Sand	Cubic Meter	373
12	End Cap for Cable 33 KV AL 3X400 Sqmm XLPE	No's	50
13	Optical Fiber cable 48 F (2 Runs)	Meter	5000
14	Duct for Optical Fibre Cable (40mm)	Meter	5000

SCOPE OF WORK FOR SLTC OF 33 KV 3CX400 SQ MM XLPE CABLE INFEEDS

S No	Material Description	UoM	Quantity
15	Collar for optical fiber cable duct	No's	50
16	Optical Fiber cable splice enclosure for jointing of optical fiber cable	No's	6
17	Fibre optic cable end termination distribution box	No's	4
18	Cable armour- earth link box without SVL	No's	8
19	HDPE cleat with hardware's suitable for 33 kV 3Cx400 sq mm cable	No's	8
20	Support insulators for mounting of cable on support structure	No's	8
21	Danger Plates	No's	8
22	Circuit Name Plate	No's	8
23	Anti Climbing device	No's	2
24	Cable Identification Road Stud	No's	1
25	50X6 Sq mm GI Earthing strip	MT	1
26	Aluminium Cable Identification tag with nylon string	No's	167
27	Safety barricading PVC tape	Meter	1
28	Safety barricading cone	No's	1
29	Coarse sand for PCC & RCC	Cubic meter	1
30	Burnt clay Brick - First class	No's	1
31	Cement Bags 50 kg	No's	1
32	Reinforcement steel bars	MT	1
33	Construction Aggregate	Cubic meter	1
34	Optical Fiber Cable Loop chamber for every 300 meter of cable run	No's	17
35	Phase marking Scotch Vinyl Electrical Tape 35 (Red, Yellow and Blue)	Lot	1
36	Cable sheath repair 3M Scotch 2228 Rubber mastic Tape	Lot	1
37	Self-Fusing Silicone Rubber Electrical Tape 70	Lot	1
38	Line differential cum distance relay	No's	2

3. SCOPE OF WORK

S No	Description	UoM	Quantity
1	Surveying of cable Route, Detailed Site Plan & Profile using Ground penetration Radar System, Excavation of trial pits as per field requirement, preparation of route drawing with location of joint chambers position and finalizing the cable route in consultation with BSES Representative	Meter	2500
2	Digging of cable trench as per specification and drawings. Rate is inclusive of digging and backfilling for Ordinary Bituminous/C.C.Road (including dewatering if any)	Cubic meter	502
3	Digging of cable trench as per specification and drawings. Rate is inclusive of digging and backfilling for Dense Carpeted bituminous Road (including dewatering if any)	Cubic meter	401
4	Digging of cable trench as per specification and drawings. Rate is inclusive of digging and backfilling for Footpath/tile/Rajasthani Stone/Brick work (including dewatering if any)	Cubic meter	401
5	Digging of cable trench as per specification and drawings. Rate is inclusive of digging and backfilling for Hard Rocky Soil (including dewatering if any)	Cubic meter	401
6	Laying of XLPE cables in the excavated trench, as per BYPL Standards (Regarding Depth, Layer formation, etc). Cable rollers to be used during Laying.	Meter	3250
7	Laying of XLPE cable in HDPE pipe in excavated trench	Meter	1000
8	Laying of cable in trenchless ducts with 200 mm dia HDPE pipe using HDD machine including laying of 200 mm dia HDPE pipe PN4 PE 80 Class	Meter	750
9	Continuous steel Barricade for all Excavated areas, till the work is completed.	Lot	2125
10	Fixing of Aluminum Cable identification tags with Nylon string at every 30 Mtrs cable length	No's	167
11	Installation of straight through joints for 33 kv 3Cx400 sq mm cables by jointing kit OEM authorized jointer	No's	24
12	Installation of outdoor End Termination for 33kv 3Cx400 sq mm cables by jointing kit OEM authorized jointer	No's	2
13	Installation of Indoor GIS End Termination for 33kv 3Cx400 sq mm cables by jointing kit OEM authorized jointer	No's	2

SCOPE OF WORK FOR SLTC OF 33 KV 3CX400 SQ MM XLPE CABLE INFEEDS

S No	Description	UoM	Quantity
14	Digging of joint pit suitable for 33 cable joint box and covering the joint box with sand and providing protection for Ordinary bituminous road/C.C. Road	No's	6
15	Digging of joint pit suitable for 33 cable joint box and covering the joint box with sand and providing protection for Dense carpeted bituminous road.	No's	6
16	Digging of joint pit suitable for 33 cable joint box and covering the joint box with sand and providing protection for Footpath/ tile/ Rajasthani Stone / Brick Works	No's	6
17	Digging of joint pit suitable for 33 cable joint box and covering the joint box with sand and providing protection for Hard Rocky Soil.	No's	6
18	Spreading of sand forming cushion and cover around the cable	Cubic meter	373
19	Disposal of debris/surplus malba including Loading / Unloading	Cubic meter	410
20	Digging of test pits of required size(not less than 1/2 Meter Wide at site for identification of cable route)	No's	8
21	Watch and ward of complete circuit till project handover	Lot	1
22	Installation of Precast RCC Cable cover	No's	7083
23	Installation of Route and Joint indicating stone marked with "BYPL 33 KV Cable Helpline No-91-11-399 99 808"	No's	74
24	Laying of PVC warning tape	Meter	2125
25	Fabrication and installation of galvanized Channel, Angle, Beam and other Structural steel including nuts & bolts for all structures including cable support Structure, drain crossing strcture etc	MT	1
26	Laying of optical fiber cable in open excavated trench including laying of 40 mm dia HDPE pipe including blowing and pulling	Meter	4250
27	Laying of optical fiber cable in trenchless ducts using HDD machine including laying of 40 mm dia HDPE pipe including blowing and pulling	Meter	750
28	Installation of OFC cable splice enclosure	No's	6
29	Testing of optical fiber cable after installation	Lot	1
30	Partial discharge test on complete cable length at site	Lot	1
31	VLF High voltage test on complete cable length as per relevant IEC/IEEE	Lot	1
32	Tan Delta test on complete cable length as per relevant IEC/IEEE	Lot	1

SCOPE OF WORK FOR SLTC OF 33 KV 3CX400 SQ MM XLPE CABLE INFEEDS

S No	Description	UoM	Quantity
33	Installation of Fiber optic distribution box in circuits both ends and termination of fiber optic cable	No's	4
34	Installation of cable armour- earth link box without SVL including cable earthing/armour connection with grid earthing	No's	8
35	Installation, mounting and fixing of 33 kV 3Cx400 sq mm cable with termination on mounting structure/tower and fixing it with suitable HDPE cleats	No's	8
36	Installation of support insulators on cable mounting structure with misc. hardware's.	No's	8
37	Fixing of danger plate on poles including fabrication of clamps etc	No's	8
38	Fixing of circuit Name plate including fabrication of clamps etc	No's	8
39	Fixing of anti climbing device on cables mounting structures including fabrication of clamps etc	No's	2
40	Installation of Cable identification road stud	No's	1
41	Transportation of empty 33 kV cable drums from site to BSES store	No's	25
42	Laying of GI earth connecting strip of 50x6 sq mm size including required welding, painting on joints etc	MT	1
43	Submission of actual laid drawing of cable circuits including GPS coordinates of every 30 meter circuit length, Cable joints, Every turn/curve, Every road crossing (both ends)	Lot	1
44	Cable Phasing work, Cable Phase Sequence (R,Y,B) Marking, Cable 1&2 Marking, and final connection as per Phase Sequence.	Lot	1
45	Masonry Brick work	Cubic meter	1
46	Providing and laying in position cement concrete 1:1.5:3 (1 cement :1.5 coarse sand : 3 graded stone aggregate) excluding the cost of centering, shuttering, finishing and enforcement	Cubic meter	1
47	Providing and laying in position cement concrete 1:2:4 (1 cement :2 coarse sand : 4 graded stone aggregate) excluding the cost of centering, shuttering, finishing and enforcement	Cubic meter	1
48	Providing and laying in position cement concrete 1:4:8 (1 cement :4 coarse sand : 8 graded stone aggregate) excluding the cost of centering, shuttering, finishing and	Cubic meter	1

SCOPE OF WORK FOR SLTC OF 33 KV 3CX400 SQ MM XLPE CABLE INFEEDS

S No	Description	UoM	Quantity
	enforcement		
49	Centering, shuttering including shuttering propping etc and removal of shuttering	Lot	1
50	Fabrication of reinforcement for RCC work including straightening, cutting, bending, placing in position and binding all complete thermo mechanically treated bars.	Lot	1
51	Installation of Brick as Cable Separator	No's	1
52	Installation of Optical Fiber cable loop chamber	No's	17
53	Application of Scotch Vinyl Electrical Tape 35 (Red, Yellow and Blue) on cable end termination kit	Lot	1
54	Application of 3M Scotch 2228 Rubber mastic Tape on cable straight through joint end sealing and for cable sheath repair	Lot	1
55	Application of Self-Fusing Silicone Rubber Electrical Tape 70 on cable end termination boot and lug	Lot	1
56	ETC of Line differential cum distance relay	No's	2

4. SCOPE DEMARCATION

S. No	Head	BYPL	Bidder's Scope	Remarks
1	Road Cutting Permission and Road Restoration	x	✓	Statutory fees will be borne by BYPL
2	Permissions from Various External and Internal Agencies Regarding Cable Laying and Commissioning(Traffic Police, GAIL, IGL, DJB,MTNL/BSNL etc)	x	✓	Statutory fees will be borne by BYPL
3	PTCC Permission from Various External Agencies	x	✓	As per specifications & Standards

SCOPE OF WORK FOR SLTC OF 33 KV 3CX400 SQ MM XLPE CABLE INFEEDS

S. No	Head	BYPL	Bidder's Scope	Remarks
	(Telecom, DTL. Railways, Defense, etc)			
4	Continuous Steel Barricading with Mobile no of Vendor's Engineer Incharge	x	✓	Steel barricade should have small scheme description along with vendor and BYPL name on it
5	Permit to work request to BYPL authority	x	✓	Permit Should be applied to Engineer Incharge prior to work through proper procedure
6	Permit to work issuance from BYPL authority	x	✓	
7	Testing Equipments	x	✓	
8	Lighting Arrangement	x	✓	
9	Construction Power and Construction Water	x	✓	
10	Safety and Security of Manpower(Labor, Engineers, Supervisors etc)	x	✓	
11	Various Tools and Tackles related to Job	x	✓	
12	Loading, Unloading and Transportation of Material	x	✓	It includes transportation of dismantled equipment to BYPL store in stacked manner.
13	Cleanliness around work premises	x	✓	
14	Document/Drawing Submission	x	✓	
15	Document/Drawing Approval	✓	x	
16	Security and Safety of material until handover	x	✓	
17	Various Machines e.g. Crane, Hydra, JCB etc to complete the Job	x	✓	
18	Maintenance of Equipments	x	✓	

SCOPE OF WORK FOR SLTC OF 33 KV 3CX400 SQ MM XLPE CABLE INFEEDS

S. No	Head	BYPL	Bidder's Scope	Remarks
	Until Handover to Engineer Incharge and EHV O&M			
19	Electrical Inspector Clearance	x	✓	Only statutory fees will be borne by BYPL
20	Permit issuing agency for Works inside BYPL Premises	✓	x	
21	Permit requesting Agency	x	✓	Permit Should be applied to Engineer In charge prior to start of work. Isolation & permit of only one Feeder at a time, shall be given at a time, during final hook up. All necessary preparation works to be made, in order to minimize the Shutdown Time.
22	Temporary office near work premises	x	✓	After handing over the equipments, contractor has to evacuate the premises within one week otherwise deemed fit action will be taken
23	Temporary store near work premises	x	✓	
24	Yard aesthetics at work place should be maintained at the time and after the completion of Work	x	✓	Disposal of Scrap/Debris etc from site and complete cleaning of working area till handover
25	Any damages done to the existing system, shall be repaired/ rectified/ replaced	x	✓	
26	Clearance certificate	x	✓	Clearance Certificate shall be taken from BYPL Departments (Quality, Safety,

S. No	Head	BYPL	Bidder's Scope	Remarks
				Protection, O&M, SCADA, EHV, Civil, etc) before Final Charging of the Systems. Any Site Observations/ Punch points, observed during execution, shall be attended.
27	Various compliances pertaining to Job	x	✓	IE rules, CEA Regulation 2010

5. DOCUMENTATION

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

S. No.	Description	Technical Bid	Drawing Approval	Pre-Dispatch	Pre-Closure
1	Tender No.	Required			
2	Communication Details				
3	Name of the Bidder	Required			
4	Name of Authorized contact person	Required			
5	Contact No. of Authorized contact person	Required			
6	E-mail id of Authorized contact person	Required			
7	Document Submission Format				

SCOPE OF WORK FOR SLTC OF 33 KV 3CX400 SQ MM XLPE CABLE INFEEDS

S. No.	Description	Technical Bid	Drawing Approval	Pre-Dispatch	Pre-Closure
8	Documents shall be submitted in Box file/spiral binding. Any other format is not acceptable	Required			
9	Index of documents with page numbers for each document	Required			
10	Separator with document description shall be provided before each document	Required			
11	Qualifying Requirement Compliance				
12	Summary of compliance of qualifying criteria in tabular form along with summary of documentary proof provided	Required			
13	Detailed Documents supporting compliance of qualifying criteria	Required			
14	Drawings/ Documents as per Technical Specification.				
15	Signed copy of technical specification	Required			
16	Type Test reports of offered model/ type/ rating	Required	Required		
17	Sheath integrity test results for every cable section duly stamped and signed by BSES representative				Required
18	VLF, Tan delta and Partial discharge test results for every circuit duly stamped and signed by BSES representative				Required
19	OFC cable Test results for every circuit duly stamped and signed by BSES representative				Required
20	Actual as laid drawing of complete circuit with GPS coordinates at every a) 30 meter circuit length b) Cable joints c) Every turn/curve d) Every road crossing (both ends) Drawing shall be submitted in hard copy (minimum A3 Size)				Required

SCOPE OF WORK FOR SLTC OF 33 KV 3CX400 SQ MM XLPE CABLE INFEEDS

S. No.	Description	Technical Bid	Drawing Approval	Pre-Dispatch	Pre-Closure
	and AutoCAD dwg				
21	Deviation Sheet	Required	Required		
22	Detailed Drawings	Required	Required		
23	Other drawing/ documents mentioned in technical specification	Required	Required		
24	Soft copy of complete technical bid in pen drive	Required			
25	Samples as per technical specification.	Required			
26	Design Calculation		Required		
27	Manufacturer's quality assurance plan		Required		
28	GTP		Required		
29	Inspection Reports			Required	
30	As manufacturing Drawings			Required	
31	Operation and Maintenance Manual			Required	
32	As built Drawings				Required
33	Soft Copy				
34	In Pen drive	Required			
35	Through Mail		Required	Required	Required

PACKAGE C - DTL PREET VIHAR to BYPL KANTI NAGAR AND KARKARDOOMA GRID

1. SCOPE

Scope covers supply, laying, testing and commissioning of

- i. One circuit of 33 KV 3Cx400 sq mm XLPE underground cable circuits from DTL Preet Vihar Grid to BYPL Kanti Nagar Grid & One circuit from DTL Preet Vihar Grid to BYPL Karkardooma Grid By LILO in existing Karkardooma – Kanti Nagar circuit
Each Circuit Length upto LILO Point - 1750 meter
Each circuit will have 2 no's cable runs.
- ii. Optical fiber cable runs shall be laid from DTL Preet Vihar grid to BYPL Kanti Nagar and Karkardooma grid ensuring grid to grid OFC connectivity.

2. SCOPE OF SUPPLY

S No	Material Description	UoM	Quantity
1	Cable 33 kV 3Cx400 sq mm	Meter	7000
2	Cable End Termination kit Suitable for 33 kV 3Cx400 sq mm cable Indoor GIS panel termination (Make- Raychem/3M) - For Preet Vihar Grid end	No's	4
4	Cable straight through joint kit Suitable for 33 kV 3Cx400 sq mm cable (Make- Raychem/3M)	No's	34
5	Precast RCC (1:2:4) cable cover 600x550x50 mm (used where four cable runs in one trench)	No's	4958
6	HDPE PIPE 200 MM DIA PN4 PE 80	Meter	2450
7	HDPE Pipe Collar 200 mm	No's	408
8	Weather and acid resistant PVC warning tape of 150mm width 300 micron thick Yellow colour with desired Red/Black lettering	Meter	1488
9	Route indicating stones for every 50 meter circuit length and Joint Indication stones at every cable joint location	No's	69
10	Galvanized Channel, Angle, Beam and other Structural steel with hardware for all structures including cable support structure, drain crossing structure etc	MT	1

SCOPE OF WORK FOR SLTC OF 33 KV 3CX400 SQ MM XLPE CABLE INFEEDS

S No	Material Description	UoM	Quantity
11	Fine Sand	Cubic Meter	261
12	End Cap for Cable 33 KV AL 3X400 Sqmm XLPE	No's	70
13	Optical Fiber cable 48 F (2 Runs with each circuit, Grid to Grid connectivity)	Meter	13200
14	Duct for Optical Fibre Cable (40mm)	Meter	13200
15	Collar for optical fiber cable duct	No's	132
16	Optical Fiber cable splice enclosure for jointing of optical fiber cable	No's	17
17	Fibre optic cable end termination distribution box	No's	15
18	Cable armour- earth link box without SVL	No's	4
19	HDPE cleat with hardware's suitable for 33 kV 3Cx400 sq mm cable	No's	8
20	Support insulators for mounting of cable on support structure	No's	4
21	Danger Plates	No's	4
22	Circuit Name Plate	No's	4
23	Anti Climbing device	No's	2
24	Cable Identification Road Stud	No's	1
25	50X6 Sq mm GI Earthing strip	MT	1
26	Aluminium Cable Identification tag with nylon string	No's	233
27	Safety barricading PVC tape	Meter	1
28	Safety barricading cone	No's	1
29	Coarse sand for PCC & RCC	Cubic meter	1
30	Burnt clay Brick - First class	No's	1
31	Cement Bags 50 kg	No's	1
32	Reinforcement steel bars	MT	1
33	Construction Aggregate	Cubic meter	1
34	Optical Fiber Cable Loop chamber for every 300 meter of cable run	No's	44
35	Phase marking Scotch Vinyl Electrical Tape 35 (Red, Yellow and Blue)	Lot	1
36	Cable sheath repair 3M Scotch 2228 Rubber mastic Tape	Lot	1
37	Self-Fusing Silicone Rubber Electrical Tape 70	Lot	1
38	Line differential cum distance relay	No's	4

3. SCOPE OF WORK

S No	Description	UoM	Quantity
1	Surveying of cable Route, Detailed Site Plan & Profile using Ground penetration Radar System, Excavation of trial pits as per field requirement, preparation of route drawing with location of joint chambers position and finalizing the cable route in consultation with BSES Representative	Meter	1750
2	Digging of cable trench as per specification and drawings. Rate is inclusive of digging and backfilling for Ordinary Bituminous/C.C.Road (including dewatering if any)	Cubic meter	648
3	Digging of cable trench as per specification and drawings. Rate is inclusive of digging and backfilling for Dense Carpeted bituminous Road (including dewatering if any)	Cubic meter	519
4	Digging of cable trench as per specification and drawings. Rate is inclusive of digging and backfilling for Footpath/tile/Rajasthani Stone/Brick work (including dewatering if any)	Cubic meter	519
5	Digging of cable trench as per specification and drawings. Rate is inclusive of digging and backfilling for Hard Rocky Soil (including dewatering if any)	Cubic meter	519
6	Laying of XLPE cables in the excavated trench, as per BYPL Standards (Regarding Depth, Layer formation, etc). Cable rollers to be used during Laying.	Meter	4550
7	Laying of XLPE cable in HDPE pipe in excavated trench	Meter	1400
8	Laying of cable in trenchless ducts with 200 mm dia HDPE pipe using HDD machine including laying of 200 mm dia HDPE pipe PN4 PE 80 Class	Meter	1050
9	Continuous steel Barricade for all Excavated areas, till the work is completed.	Lot	1488
10	Fixing of Aluminum Cable identification tags with Nylon string at every 30 Mtrs cable length	No's	233
11	Installation of straight through joints for 33 kv 3Cx400 sq mm cables by jointing kit OEM authorized jointer	No's	34
12	Installation of Indoor GIS End Termination for 33kv 3Cx400 sq mm cables by jointing kit OEM authorized jointer	No's	4
13	Digging of joint pit suitable for 33 cable joint box and covering the joint box with sand and providing protection for Ordinary bituminous road/C.C. Road	No's	9

SCOPE OF WORK FOR SLTC OF 33 KV 3CX400 SQ MM XLPE CABLE INFEEDS

S No	Description	UoM	Quantity
14	Digging of joint pit suitable for 33 cable joint box and covering the joint box with sand and providing protection for Dense carpeted bituminous road.	No's	9
15	Digging of joint pit suitable for 33 cable joint box and covering the joint box with sand and providing protection for Footpath/ tile/ Rajasthani Stone / Brick Works	No's	9
16	Digging of joint pit suitable for 33 cable joint box and covering the joint box with sand and providing protection for Hard Rocky Soil.	No's	9
17	Spreading of sand forming cushion and cover around the cable	Cubic meter	261
18	Disposal of debris/surplus malba including Loading / Unloading	Cubic meter	287
19	Digging of test pits of required size(not less than 1/2 Meter Wide at site for identification of cable route)	No's	8
20	Watch and ward of complete circuit till project handover	Lot	1
21	Installation of Precast RCC Cable cover	No's	4958
22	Installation of Route and Joint indicating stone marked with "BYPL 33 KV Cable Helpline No-91-11-399 99 808"	No's	69
23	Laying of PVC warning tape	Meter	1488
24	Fabrication and installation of galvanized Channel, Angle, Beam and other Structural steel including nuts & bolts for all structures including cable support Structure, drain crossing strcture etc	MT	1
25	Laying of optical fiber cable in 40 mm duct including blowing and pulling	Meter	13200
26	Laying of optical fiber cable in open excavated trench including laying of 40 mm dia HDPE pipe including blowing and pulling	Meter	9900
27	Laying of optical fiber cable in trenchless ducts using HDD machine including laying of 40 mm dia HDPE pipe including blowing and pulling	Meter	3300
28	Installation of OFC cable splice enclosure	No's	17
29	Testing of optical fiber cable after installation	Lot	1
30	Partial discharge test on complete cable length at site	Lot	1
31	VLF High voltage test on complete cable length as per relevant IEC/IEEE	Lot	1
32	Tan Delta test on complete cable length as per relevant IEC/IEEE	Lot	1
33	Installation of Fiber optic distribution box in circuits both ends and termination of fiber optic cable	No's	15

SCOPE OF WORK FOR SLTC OF 33 KV 3CX400 SQ MM XLPE CABLE INFEEDS

S No	Description	UoM	Quantity
34	Installation of cable armour- earth link box without SVL including cable earthing/armour connection with grid earthing	No's	4
35	Installation, mounting and fixing of 33 kV 3Cx400 sq mm cable with termination on mounting structure/tower and fixing it with suitable HDPE cleats	No's	8
36	Installation of support insulators on cable mounting structure with misc. hardware's.	No's	4
37	Fixing of danger plate on poles including fabrication of clamps etc	No's	4
38	Fixing of circuit Name plate including fabrication of clamps etc	No's	4
39	Fixing of anti climbing device on cables mounting structures including fabrication of clamps etc	No's	2
40	Installation of Cable identification road stud	No's	1
41	Transportation of empty 33 kV cable drums from site to BSES store	No's	35
42	Laying of GI earth connecting strip of 50x6 sq mm size including required welding, painting on joints etc	MT	1
43	Submission of actual laid drawing of cable circuits including GPS coordinates of every 30 meter circuit length, Cable joints, Every turn/curve, Every road crossing (both ends)	Lot	1
44	Cable Phasing work, Cable Phase Sequence (R,Y,B) Marking, Cable 1&2 Marking, and final connection as per Phase Sequence.	Lot	1
45	Masonry Brick work	Cubic meter	1
46	Providing and laying in position cement concrete 1:1.5:3 (1 cement :1.5 coarse sand : 3 graded stone aggregate) excluding the cost of centering, shuttering, finishing and enforcement	Cubic meter	1
47	Providing and laying in position cement concrete 1:2:4 (1 cement :2 coarse sand : 4 graded stone aggregate) excluding the cost of centering, shuttering, finishing and enforcement	Cubic meter	1
48	Providing and laying in position cement concrete 1:4:8 (1 cement :4 coarse sand : 8 graded stone aggregate) excluding the cost of centering, shuttering, finishing and enforcement	Cubic meter	1
49	Centering, shuttering including shuttering propping etc and removal of shuttering	Lot	1

SCOPE OF WORK FOR SLTC OF 33 KV 3CX400 SQ MM XLPE CABLE INFEEDS

S No	Description	UoM	Quantity
50	Fabrication of reinforcement for RCC work including straightening, cutting, bending, placing in position and binding all complete thermo mechanically treated bars.	Lot	1
51	Installation of Brick as Cable Separator	No's	1
52	Installation of Optical Fiber cable loop chamber	No's	44
53	Application of Scotch Vinyl Electrical Tape 35 (Red, Yellow and Blue) on cable end termination kit	Lot	1
54	Application of 3M Scotch 2228 Rubber mastic Tape on cable straight through joint end sealing and for cable sheath repair	Lot	1
55	Application of Self-Fusing Silicone Rubber Electrical Tape 70 on cable end termination boot and lug	Lot	1
56	ETC of Line differential cum distance relay	No's	4

4. SCOPE DEMARCATION

S. No	Head	BYPL	Bidder's Scope	Remarks
1	Road Cutting Permission and Road Restoration	x	✓	Statutory fees will be borne by BYPL
2	Permissions from Various External and Internal Agencies Regarding Cable Laying and Commissioning(Traffic Police, GAIL, IGL, DJB,MTNL/BSNL etc)	x	✓	Statutory fees will be borne by BYPL
3	PTCC Permission from Various External Agencies (Telecom, DTL. Railways, Defense, etc)	x	✓	As per specifications & Standards
4	Continuous Steel Barricading with Mobile no of Vendor's Engineer Incharge	x	✓	Steel barricade should have small scheme description along with vendor and BYPL name on it
5	Permit to work request to	x	✓	Permit Should be

SCOPE OF WORK FOR SLTC OF 33 KV 3CX400 SQ MM XLPE CABLE INFEEDS

S. No	Head	BYPL	Bidder's Scope	Remarks
	BYPL authority			applied to Engineer Incharge prior to work through proper procedure
6	Permit to work issuance from BYPL authority	x	✓	
7	Testing Equipments	x	✓	
8	Lighting Arrangement	x	✓	
9	Construction Power and Construction Water	x	✓	
10	Safety and Security of Manpower(Labor, Engineers, Supervisors etc)	x	✓	
11	Various Tools and Tackles related to Job	x	✓	
12	Loading, Unloading and Transportation of Material	x	✓	It includes transportation of dismantled equipment to BYPL store in stacked manner.
13	Cleanliness around work premises	x	✓	
14	Document/Drawing Submission	x	✓	
15	Document/Drawing Approval	✓	x	
16	Security and Safety of material until handover	x	✓	
17	Various Machines e.g. Crane, Hydra, JCB etc to complete the Job	x	✓	
18	Maintenance of Equipments Until Handover to Engineer Incharge and EHV O&M	x	✓	
19	Electrical Inspector Clearance	x	✓	Only statutory fees will be borne by BYPL
20	Permit issuing agency for Works inside BYPL Premises	✓	x	

SCOPE OF WORK FOR SLTC OF 33 KV 3CX400 SQ MM XLPE CABLE INFEEDS

S. No	Head	BYPL	Bidder's Scope	Remarks
21	Permit requesting Agency	x	✓	Permit Should be applied to Engineer In charge prior to start of work. Isolation & permit of only one Feeder at a time, shall be given at a time, during final hook up. All necessary preparation works to be made, in order to minimize the Shutdown Time.
22	Temporary office near work premises	x	✓	After handing over the equipments, contractor has to evacuate the premises within one week otherwise deemed fit action will be taken
23	Temporary store near work premises	x	✓	
24	Yard aesthetics at work place should be maintained at the time and after the completion of Work	x	✓	Disposal of Scrap/Debris etc from site and complete cleaning of working area till handover
25	Any damages done to the existing system, shall be repaired/ rectified/ replaced	x	✓	
26	Clearance certificate	x	✓	Clearance Certificate shall be taken from BYPL Departments (Quality, Safety, Protection, O&M, SCADA, EHV, Civil, etc) before Final Charging of the Systems. Any Site Observations/ Punch points, observed during execution, shall be attended.

S. No	Head	BYPL	Bidder's Scope	Remarks
27	Various compliances pertaining to Job	x	✓	IE rules, CEA Regulation 2010

5. DOCUMENTATION

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

S. No.	Description	Technical Bid	Drawing Approval	Pre-Dispatch	Pre-Closure
1	Tender No.	Required			
2	Communication Details				
3	Name of the Bidder	Required			
4	Name of Authorized contact person	Required			
5	Contact No. of Authorized contact person	Required			
6	E-mail id of Authorized contact person	Required			
7	Document Submission Format				
8	Documents shall be submitted in Box file/spiral binding. Any other format is not acceptable	Required			
9	Index of documents with page numbers for each document	Required			
10	Separator with document description shall be provided before each document	Required			
11	Qualifying Requirement Compliance				

SCOPE OF WORK FOR SLTC OF 33 KV 3CX400 SQ MM XLPE CABLE INFEEDS

S. No.	Description	Technical Bid	Drawing Approval	Pre-Dispatch	Pre-Closure
12	Summary of compliance of qualifying criteria in tabular form along with summary of documentary proof provided	Required			
13	Detailed Documents supporting compliance of qualifying criteria	Required			
14	Drawings/ Documents as per Technical Specification.				
15	Signed copy of technical specification	Required			
16	Type Test reports of offered model/ type/ rating	Required	Required		
17	Sheath integrity test results for every cable section duly stamped and signed by BSES representative				Required
18	VLF, Tan delta and Partial discharge test results for every circuit duly stamped and signed by BSES representative				Required
19	OFC cable Test results for every circuit duly stamped and signed by BSES representative				Required
20	Actual as laid drawing of complete circuit with GPS coordinates at every a) 30 meter circuit length b) Cable joints c) Every turn/curve d) Every road crossing (both ends) Drawing shall be submitted in hard copy (minimum A3 Size) and AutoCAD dwg				Required
21	Deviation Sheet	Required	Required		
22	Detailed Drawings	Required	Required		
23	Other drawing/ documents mentioned in technical specification	Required	Required		
24	Soft copy of complete technical bid in pen drive	Required			
25	Samples as per technical	Required			

SCOPE OF WORK FOR SLTC OF 33 KV 3CX400 SQ MM XLPE CABLE INFEDS

S. No.	Description	Technical Bid	Drawing Approval	Pre-Dispatch	Pre-Closure
	specification.				
26	Design Calculation		Required		
27	Manufacturer's quality assurance plan		Required		
28	GTP		Required		
29	Inspection Reports			Required	
30	As manufacturing Drawings			Required	
31	Operation and Maintenance Manual			Required	
32	As built Drawings				Required
33	Soft Copy				
34	In Pen drive	Required			
35	Through Mail		Required	Required	Required

PACKAGE D - DTL PREET VIHAR to BYPL DSIDC JHILMIL AND GT ROAD GRID

1. SCOPE

Scope covers supply, laying, testing and commissioning of

- i. One circuit of 33 KV 3Cx400 sq mm XLPE underground cable circuits from DTL Preet Vihar Grid to BYPL DSIDC Jhilmil Grid & One circuit from DTL Preet Vihar Grid to BYPL GT Road Grid By LILO in existing DSIDC – GT Road circuit
Each Circuit Length up to LILO Point - 5500 meter
Each circuit will have 2 no's cable runs.
- ii. Optical fiber cable runs shall be laid from DTL Preet Vihar grid to BYPL DSIDC and GT Road grid ensuring grid to grid OFC connectivity.

2. SCOPE OF SUPPLY

S No	Material Description	UoM	Quantity
1	Cable 33 kV 3Cx400 sq mm	Meter	22000
2	Cable End Termination kit Suitable for 33 kV 3Cx400 sq mm cable Indoor GIS panel termination (Make- Raychem/3M) - For Preet Vihar Grid end	No's	4
4	Cable straight through joint kit Suitable for 33 kV 3Cx400 sq mm cable(Make- Raychem/3M)	No's	109
5	Precast RCC (1:2:4) cable cover 600x550x50 mm (used where four cable runs in one trench)	No's	15583
6	HDPE PIPE 200 MM DIA PN4 PE 80	Meter	7700
7	HDPE Pipe Collar 200 mm	No's	1283
8	Weather and acid resistant PVC warning tape of 150mm width 300 micron thick Yellow colour with desired Red/Black lettering	Meter	4675
9	Route indicating stones for every 50 meter circuit length and Joint Indication stonas at every cable joint location	No's	219

SCOPE OF WORK FOR SLTC OF 33 KV 3CX400 SQ MM XLPE CABLE INFEEDS

S No	Material Description	UoM	Quantity
10	Galvanized Channel, Angle, Beam and other Structural steel with hardwares for all structures including cable support structure, drain crossing structure etc	MT	1
11	Fine Sand	Cubic Meter	1515
12	End Cap for Cable 33 KV AL 3X400 Sqmm XLPE	No's	220
13	Optical Fiber cable 48 F (2 Runs with each circuit, Grid to Grid connectivity)	Meter	23100
14	Duct for Optical Fibre Cable (40mm)	Meter	23100
15	Collar for optical fiber cable duct	No's	231
16	Optical Fiber cable splice enclosure for jointing of optical fiber cable	No's	29
17	Fibre optic cable end termination distribution box	No's	8
18	Cable armour- earth link box without SVL	No's	4
19	HDPE cleat with hardware's suitable for 33 kV 3Cx400 sq mm cable	No's	8
20	Support insulators for mounting of cable on support structure	No's	4
21	Danger Plates	No's	4
22	Circuit Name Plate	No's	4
23	Anti Climbing device	No's	2
24	Cable Identification Road Stud	No's	1
25	50X6 Sq mm GI Earthing strip	MT	1
26	Aluminium Cable Identification tag with nylon string	No's	733
27	Safety barricading PVC tape	Meter	1
28	Safety barricading cone	No's	1
29	Coarse sand for PCC & RCC	Cubic meter	1
30	Burnt clay Brick - First class	No's	1
31	Cement Bags 50 kg	No's	1
32	Reinforcement steel bars	MT	1
33	Construction Aggregate	Cubic meter	1
34	Optical Fiber Cable Loop chamber for every 300 meter of cable run	No's	77
35	Phase marking Scotch Vinyl Electrical Tape 35 (Red, Yellow and Blue)	Lot	1
36	Cable sheath repair 3M Scotch 2228 Rubber mastic Tape	Lot	1
37	Self-Fusing Silicone Rubber Electrical Tape 70	Lot	1

S No	Material Description	UoM	Quantity
38	Line differential cum distance relay	No's	4

3. SCOPE OF WORK

S No	Description	Unit	Quantity
1	Surveying of cable Route, Detailed Site Plan & Profile using Ground penetration Radar System, Excavation of trial pits as per field requirement, preparation of route drawing with location of joint chambers position and finalizing the cable route in consultation with BSES Representative	Meter	5500
2	Digging of cable trench as per specification and drawings. Rate is inclusive of digging and backfilling for Ordinary Bituminous/C.C.Road (including dewatering if any)	Cubic meter	2038
3	Digging of cable trench as per specification and drawings. Rate is inclusive of digging and backfilling for Dense Carpeted bituminous Road (including dewatering if any)	Cubic meter	1630
4	Digging of cable trench as per specification and drawings. Rate is inclusive of digging and backfilling for Footpath/tile/Rajasthani Stone/Brick work (including dewatering if any)	Cubic meter	1630
5	Digging of cable trench as per specification and drawings. Rate is inclusive of digging and backfilling for Hard Rocky Soil (including dewatering if any)	Cubic meter	1630
6	Laying of XLPE cables in the excavated trench, as per BYPL Standards (Regarding Depth, Layer formation, etc). Cable rollers to be used during Laying.	Meter	14300
7	Laying of XLPE cable in HDPE pipe in excavated trench	Meter	4400
8	Laying of cable in trenchless ducts with 200 mm dia HDPE pipe using HDD machine including laying of 200 mm dia HDPE pipe PN4 PE 80 Class	Meter	3300
9	Continuous steel Barricade for all Excavated areas, till the work is completed.	Lot	4675
10	Fixing of Aluminum Cable identification tags with Nylon string at every 30 Mtrs cable length	No's	733

SCOPE OF WORK FOR SLTC OF 33 KV 3CX400 SQ MM XLPE CABLE INFEEDS

S No	Description	Unit	Quantity
11	Installation of straight through joints for 33 kv 3Cx400 sq mm cables by jointing kit OEM authorized jointer	No's	109
12	Installation of Indoor GIS End Termination for 33kv 3Cx400 sq mm cables by jointing kit OEM authorized jointer	No's	4
13	Digging of joint pit suitable for 33 cable joint box and covering the joint box with sand and providing protection for Ordinary bituminous road/C.C. Road	No's	27
14	Digging of joint pit suitable for 33 cable joint box and covering the joint box with sand and providing protection for Dense carpeted bituminous road.	No's	27
15	Digging of joint pit suitable for 33 cable joint box and covering the joint box with sand and providing protection for Footpath/ tile/ Rajasthani Stone / Brick Works	No's	27
16	Digging of joint pit suitable for 33 cable joint box and covering the joint box with sand and providing protection for Hard Rocky Soil.	No's	27
17	Spreading of sand forming cushion and cover around the cable	Cubic meter	1515
18	Disposal of debris/surplus malba including Loading / Unloading	Cubic meter	1666
19	Digging of test pits of required size(not less than 1/2 Meter Wide at site for identification of cable route)	No's	8
20	Watch and ward of complete circuit till project handover	Lot	1
21	Installation of Precast RCC Cable cover	No's	15583
22	Installation of Route and Joint indicating stone marked with "BYPL 33 KV Cable Helpline No-91-11-399 99 808"	No's	219
23	Laying of PVC warning tape	Meter	4675
24	Fabrication and installation of galvanized Channel, Angle, Beam and other Structural steel including nuts & bolts for all structures including cable support Structure, drain crossing strcture etc	MT	1
25	Laying of optical fiber cable in 40 mm duct including blowing and pulling	Meter	23100
26	Laying of optical fiber cable in open excavated trench including laying of 40 mm dia HDPE pipe including blowing and pulling	Meter	17325
27	Laying of optical fiber cable in trenchless ducts using HDD machine including laying of 40 mm dia HDPE pipe including blowing and pulling	Meter	5775

SCOPE OF WORK FOR SLTC OF 33 KV 3CX400 SQ MM XLPE CABLE INFEEDS

S No	Description	Unit	Quantity
28	Installation of OFC cable splice enclosure	No's	29
29	Testing of optical fiber cable after installation	Lot	1
30	Partial discharge test on complete cable length at site	Lot	1
31	VLF High voltage test on complete cable length as per relevant IEC/IEEE	Lot	1
32	Tan Delta test on complete cable length as per relevant IEC/IEEE	Lot	1
33	Installation of Fiber optic distribution box in circuits both ends and termination of fiber optic cable	No's	8
34	Installation of cable armour- earth link box without SVL including cable earthing/armour connection with grid earthing	No's	4
35	Installation, mounting and fixing of 33 kV 3Cx400 sq mm cable with termination on mounting structure/tower and fixing it with suitable HDPE cleats	No's	8
36	Installation of support insulators on cable mounting structure with misc. hardware's.	No's	4
37	Fixing of danger plate on poles including fabrication of clamps etc	No's	4
38	Fixing of circuit Name plate including fabrication of clamps etc	No's	4
39	Fixing of anti climbing device on cables mounting structures including fabrication of clamps etc	No's	2
40	Installation of Cable identification road stud	No's	1
41	Transportation of empty 33 kV cable drums from site to BSES store	No's	110
42	Laying of GI earth connecting strip of 50x6 sq mm size including required welding, painting on joints etc	MT	1
43	Submission of actual laid drawing of cable circuits including GPS coordinates of every 30 meter circuit length, Cable joints, Every turn/curve, Every road crossing (both ends)	Lot	1
44	Cable Phasing work, Cable Phase Sequence (R,Y,B) Marking, Cable 1&2 Marking, and final connection as per Phase Sequence.	Lot	1
45	Masonry Brick work	Cubic meter	1

SCOPE OF WORK FOR SLTC OF 33 KV 3CX400 SQ MM XLPE CABLE INFEEDS

S No	Description	Unit	Quantity
46	Providing and laying in position cement concrete 1:1.5:3 (1 cement :1.5 coarse sand : 3 graded stone aggregate) excluding the cost of centering, shuttering, finishing and enforcement	Cubic meter	1
47	Providing and laying in position cement concrete 1:2:4 (1 cement :2 coarse sand : 4 graded stone aggregate) excluding the cost of centering, shuttering, finishing and enforcement	Cubic meter	1
48	Providing and laying in position cement concrete 1:4:8 (1 cement :4 coarse sand : 8 graded stone aggregate) excluding the cost of centering, shuttering, finishing and enforcement	Cubic meter	1
49	Centering, shuttering including shuttering propping etc and removal of shuttering	Lot	1
50	Fabrication of reinforcement for RCC work including straightening, cutting, bending, placing in position and binding all complete thermo mechanically treated bars.	Lot	1
51	Installation of Brick as Cable Separator	No's	1
52	Installation of Optical Fiber cable loop chamber	No's	77
53	Application of Scotch Vinyl Electrical Tape 35 (Red, Yellow and Blue) on cable end termination kit	Lot	1
54	Application of 3M Scotch 2228 Rubber mastic Tape on cable straight through joint end sealing and for cable sheath repair	Lot	1
55	Application of Self-Fusing Silicone Rubber Electrical Tape 70 on cable end termination boot and lug	Lot	1
56	ETC of Line differential cum distance relay	No's	4

4. SCOPE DEMARCATION

S. No	Head	BYPL	Bidder's Scope	Remarks
1	Road Cutting Permission and Road Restoration	x	✓	Statutory fees will be borne by BYPL
2	Permissions from Various	x	✓	Statutory fees will be

SCOPE OF WORK FOR SLTC OF 33 KV 3CX400 SQ MM XLPE CABLE INFEEDS

S. No	Head	BYPL	Bidder's Scope	Remarks
	External and Internal Agencies Regarding Cable Laying and Commissioning(Traffic Police, GAIL, IGL, DJB,MTNL/BSNL etc)			borne by BYPL
3	PTCC Permission from Various External Agencies (Telecom, DTL. Railways, Defense, etc)	x	✓	As per specifications & Standards
4	Continuous Steel Barricading with Mobile no of Vendor's Engineer Incharge	x	✓	Steel barricade should have small scheme description along with vendor and BYPL name on it
5	Permit to work request to BYPL authority	x	✓	Permit Should be applied to Engineer Incharge prior to work through proper procedure
6	Permit to work issuance from BYPL authority	x	✓	
7	Testing Equipments	x	✓	
8	Lighting Arrangement	x	✓	
9	Construction Power and Construction Water	x	✓	
10	Safety and Security of Manpower(Labor, Engineers, Supervisors etc)	x	✓	
11	Various Tools and Tackles related to Job	x	✓	
12	Loading, Unloading and Transportation of Material	x	✓	It includes transportation of dismantled equipment to BYPL store in stacked manner.
13	Cleanliness around work premises	x	✓	
14	Document/Drawing Submission	x	✓	

SCOPE OF WORK FOR SLTC OF 33 KV 3CX400 SQ MM XLPE CABLE INFEEDS

S. No	Head	BYPL	Bidder's Scope	Remarks
15	Document/Drawing Approval	✓	✗	
16	Security and Safety of material until handover	✗	✓	
17	Various Machines e.g. Crane, Hydra, JCB etc to complete the Job	✗	✓	
18	Maintenance of Equipments Until Handover to Engineer Incharge and EHV O&M	✗	✓	
19	Electrical Inspector Clearance	✗	✓	Only statutory fees will be borne by BYPL
20	Permit issuing agency for Works inside BYPL Premises	✓	✗	
21	Permit requesting Agency	✗	✓	Permit Should be applied to Engineer In charge prior to start of work. Isolation & permit of only one Feeder at a time, shall be given at a time, during final hook up. All necessary preparation works to be made, in order to minimize the Shutdown Time.
22	Temporary office near work premises	✗	✓	After handing over the equipments, contractor has to evacuate the premises within one week otherwise deemed fit action will be taken
23	Temporary store near work premises	✗	✓	
24	Yard aesthetics at work place should be maintained at the time and after the completion of Work	✗	✓	Disposal of Scrap/Debris etc from site and complete cleaning of working area till handover

S. No	Head	BYPL	Bidder's Scope	Remarks
25	Any damages done to the existing system, shall be repaired/ rectified/ replaced	x	✓	
26	Clearance certificate	x	✓	Clearance Certificate shall be taken from BYPL Departments (Quality, Safety, Protection, O&M, SCADA, EHV, Civil, etc) before Final Charging of the Systems. Any Site Observations/ Punch points, observed during execution, shall be attended.
27	Various compliances pertaining to Job	x	✓	IE rules, CEA Regulation 2010

5. DOCUMENTATION

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

S. No.	Description	Technical Bid	Drawing Approval	Pre-Dispatch	Pre-Closure
1	Tender No.	Required			
2	Communication Details				
3	Name of the Bidder	Required			
4	Name of Authorized contact person	Required			

SCOPE OF WORK FOR SLTC OF 33 KV 3CX400 SQ MM XLPE CABLE INFEEDS

S. No.	Description	Technical Bid	Drawing Approval	Pre-Dispatch	Pre-Closure
5	Contact No. of Authorized contact person	Required			
6	E-mail id of Authorized contact person	Required			
7	Document Submission Format				
8	Documents shall be submitted in Box file/spiral binding. Any other format is not acceptable	Required			
9	Index of documents with page numbers for each document	Required			
10	Separator with document description shall be provided before each document	Required			
11	Qualifying Requirement Compliance				
12	Summary of compliance of qualifying criteria in tabular form along with summary of documentary proof provided	Required			
13	Detailed Documents supporting compliance of qualifying criteria	Required			
14	Drawings/ Documents as per Technical Specification.				
15	Signed copy of technical specification	Required			
16	Type Test reports of offered model/ type/ rating	Required	Required		
17	Sheath integrity test results for every cable section duly stamped and signed by BSES representative				Required
18	VLF, Tan delta and Partial discharge test results for every circuit duly stamped and signed by BSES representative				Required
19	OFC cable Test results for every circuit duly stamped and signed by BSES representative				Required
20	Actual as laid drawing of complete circuit with GPS coordinates at every a) 30 meter circuit length				Required

SCOPE OF WORK FOR SLTC OF 33 KV 3CX400 SQ MM XLPE CABLE INFEDS

S. No.	Description	Technical Bid	Drawing Approval	Pre-Dispatch	Pre-Closure
	b) Cable joints c) Every turn/curve d) Every road crossing (both ends) Drawing shall be submitted in hard copy (minimum A3 Size) and AutoCAD dwg				
21	Deviation Sheet	Required	Required		
22	Detailed Drawings	Required	Required		
23	Other drawing/ documents mentioned in technical specification	Required	Required		
24	Soft copy of complete technical bid in pen drive	Required			
25	Samples as per technical specification.	Required			
26	Design Calculation		Required		
27	Manufacturer's quality assurance plan		Required		
28	GTP		Required		
29	Inspection Reports			Required	
30	As manufacturing Drawings			Required	
31	Operation and Maintenance Manual			Required	
32	As built Drawings				Required
33	Soft Copy				
34	In Pen drive	Required			
35	Through Mail		Required	Required	Required

VOLUME – III

TECHNICAL SPECIFICATIONS

FOR

**SUPPLY, LAYING, TESTING & COMMISSIONING OF
33KV 3CX400 MM² CABLE WITH REQUIRED
ACCESSORIES AS PER THE SCOPE OF WORK AT
VARIOUS LOCATIONS FOR BYPL, DELHI (INDIA)**

NIT NO CMC/BY/19-20/RB/SV/019





Due Date for Submission: 10.06.2019, 14:30 HRS

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



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

Specification No:
SP- EWHP- 01- R4

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

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Revision Record

Note:

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

[R4]

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

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

General Specification

1.0.0 Codes & Standards

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

National Standards

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

International Standards

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

2.0.0 Cable Construction Features

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

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

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

Cable Code: **[R4]**

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

(N.A. - Not applicable for Specification)

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

A Aluminium conductor

2X XLPE insulation

W Steel round Wire armour (N.A.)

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

Wa Non-magnetic round Wire armour

F Steel formed wire (strip) armour

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

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

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

Y PVC outer sheath

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

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

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

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

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

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

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

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

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

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

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

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

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

Annexure – A

Scope, Documentation and Delivery schedule

1. Scope

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

a) Document Submission

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

Legend:

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

[R4]

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

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

3. Delivery Schedule [R4]

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

Annexure - B

GUARANTEED TECHNICAL PARTICULARS (GTP) [R4]

Note: [R4]

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

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

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

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

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

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

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

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

Annexure - C

List of Sub-Vendors for critical items

[R4]

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

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

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

Annexure - D

Service Conditions [R4]

(Atmospheric / Soil conditions at Site)

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

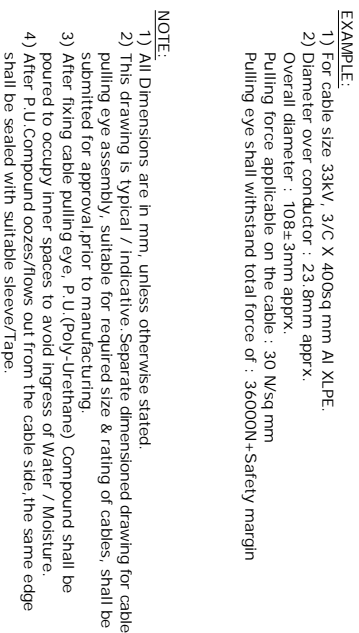
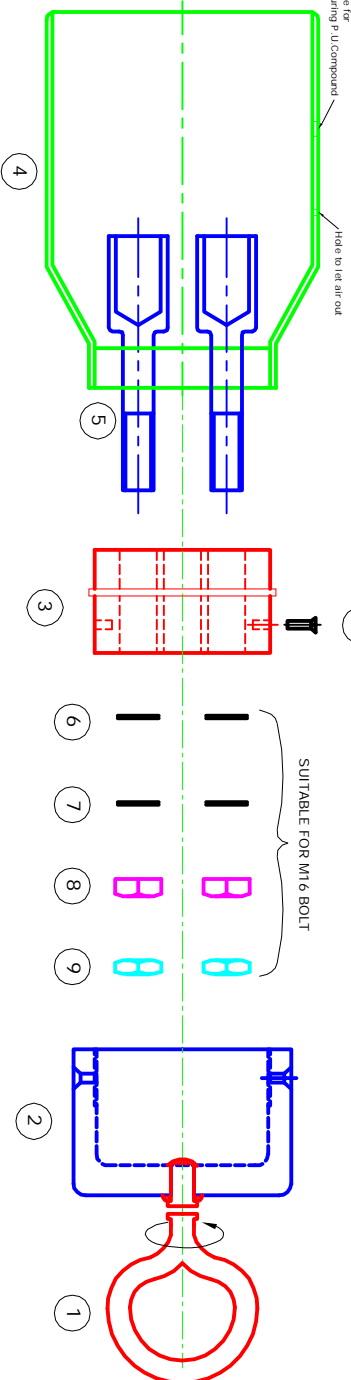
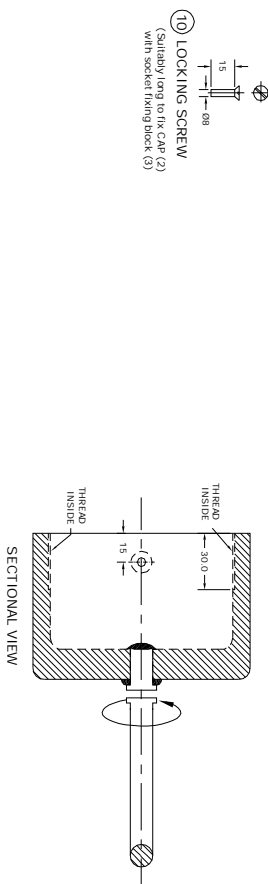
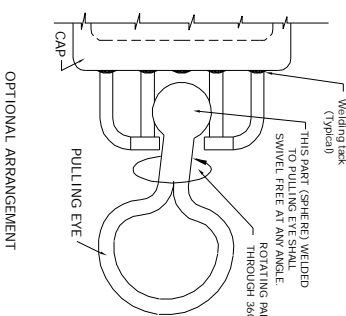
B. Delhi		
a)	Average grade atmospheric condition	Heavily polluted, dry
b)	Average grade soil condition	
c)	Maximum altitude above sea level	1000 M
d)	Air temperature Ambient	i) Highest : 50 deg C ii) Average : 40 deg C iii) Minimum : 0 deg C
e)	Relative Humidity	100 % max
f)	Thermal Resistivity of Soil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

Annexure E

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

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

Both the above drawings are given on next pages.

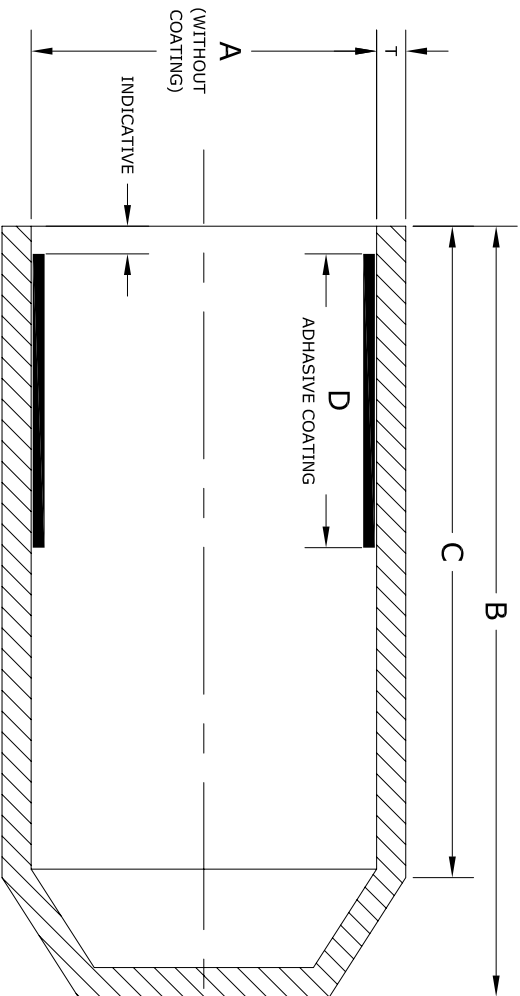


Addl V.P.

DIMENSIONS

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

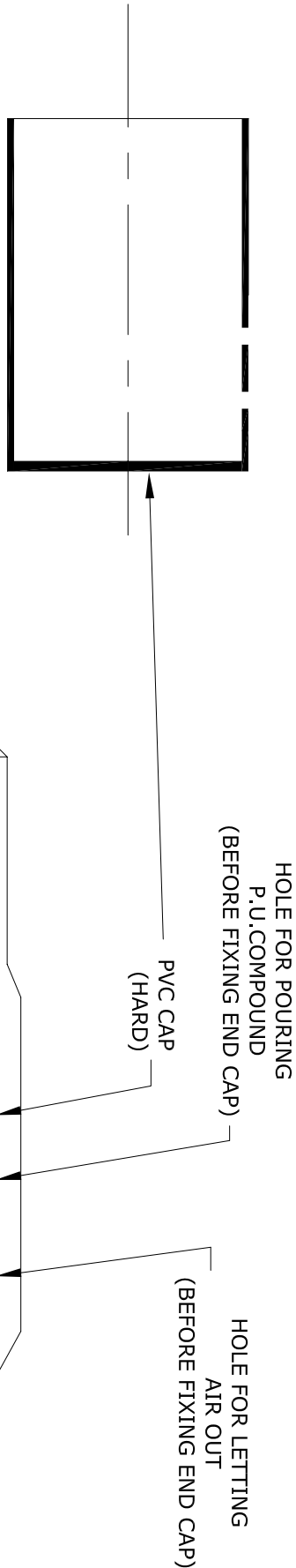
EXP - Expanded (as supplied), REC - Recovered freely, LC - Longitudinal Change, T - Wall Thickness, EC - End Cap



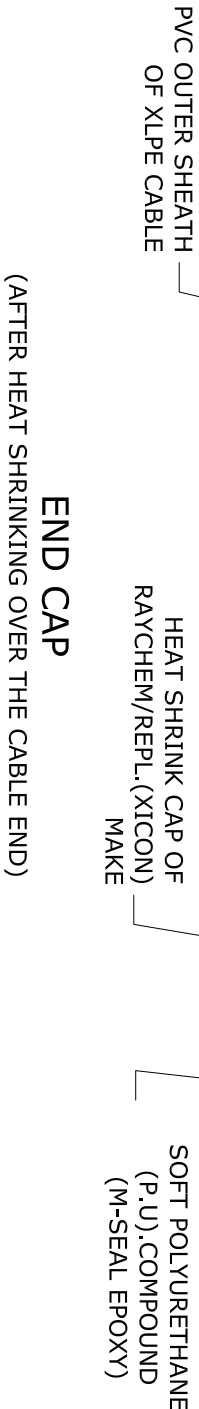
END CAP
(AS SUPPLIED)
SECTIONAL VIEW

MATERIAL SPECIFICATIONS

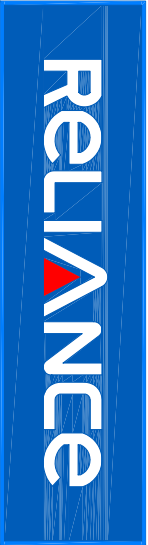
Characteristics	Test Class	Value	Test Method
A Physical Properties			
1 Specific Gravity	Type	1.05 ± 0.2	ASTM D -1505
2 Water Absorption	Type	1 % (max)	ASTM D-570 / ISO 62
3 Tensile Strength	Routine	10 N /sqmm (min)	ASTM D-412 / ISO 37
4 Ultimate Elongation	Routine	300% (min)	ASTM D-412 / ISO 37
5 Hardness	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 SEALING CAP
(FOR XLPE CABLE)
SECTIONAL VIEW



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



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

SCALE :NOT TO SCALE

DATE: 09-05-2011

END SEALING CAP
(FOR XLPE CABLE)

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

REVISIONS

Annexure- F

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

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

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



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

09.03.2012

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

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



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



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



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



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



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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17		
		f)	Electrical Tests					One sample										
		i)	Partial discharge test	pC					IS 7098(Part 2)/85	IS 7098(Part 2)/85			-	P	V/W			
		ii)	Bending test						IS 7098(Part 2)/85	IS 7098(Part 2)/85			-	P	V/W			
		iii)	Partial discharge test	pC					IS 7098(Part 2)/85	IS 7098(Part 2)/85			-	P	V/W			
		iv)	Dielectric power factor test (as a function of voltage)						IS 7098(Part 2)/85	IS 7098(Part 2)/85			-	P	V/W			
		v)	Dielectric power factor test (as a function of temperature)						IS 7098(Part 2)/85	IS 7098(Part 2)/85			-	P	V/W			
		vi)	Heating cycle test	deg C, hrs., nos.					IS 7098(Part 2)/85	IS 7098(Part 2)/85			-	P	V/W			
		vii)	Dielectric power factor as a function of voltage						IS 7098(Part 2)/85	IS 7098(Part 2)/85			-	P	V/W			
		viii)	Partial discharge test	pC					IS 7098(Part 2)/85	IS 7098(Part 2)/85			-	P	V/W			
		ix)	Impulse withstand test						IS 7098(Part 2)/85	IS 7098(Part 2)/85			-	P	V/W			
		x)	High voltage test	kV, min.					IS 7098(Part 2)/85	IS 7098(Part 2)/85			-	P	V/W			
		g)	Insulation Resistance test (Volume Resistivity test)	ohm-cm					One sample	IS 7098(Part 2)/85	IS 7098(Part 2)/85			-	P	V/W		
		h)	Flammability Test						One sample	IS 7098(Part 2)/85	IS 7098(Part 2)/85			-	P	V/W		
		i)	Water Penetration Test (WPT) on core (Longitudinal Water-Blocking test)						One sample	IEC 60502-2	IEC 60502-2			-	P	V/W		
		j)	Freely strippable insulation screen (Strippability Test)											-	P	V/W		
		k)	Ovality check on core											-	P	V/W		
		l)	Ovality check on completed Cable											-	P	V/W		
		m)	Check on fixing of M.S. Spindle Plates											-	P	V/W		
		o)	Additional tests on FRLS-type cables only															
		1)	Tests on FRLS outer sheath						One sample									
			i) Oxygen Index test												-	P	V	
			ii) Temperature Index test												-	P	V	
			iii) Acid gas generation test												-	P	V	
			iv) Smoke density test												-	P	V	
	2)	Flammability test on a piece of completely ready FRLS cable						One sample	IS 7098 (Part 2)/85 / IEC 332 (Part 3- Category B)	IS 7098 (Part 2)/85			-	P	V/W			



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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
2.	Routin Tests	a)		High Voltage	kV, min.				100 %	IS 7098(Part 2)/85	IS 7098(Part 2)/85		-	P	V	
		b)		Conductor Resistance	ohm/km				100 %	IS 8130/84	IS 8130/84		-	P	V	
		c)		Partial Discharge	pC				100 %	IS 7098(Part 2)/85	IS 7098(Part 2)/85		-	P	V	
		d)		Freely strippable insulation screen (Strippability Test)									-	P	V	
3.	Acceptance Tests	a)		Annealing test for copper					Appendix A to IS 7098(Part 2)/85	IS 8130/84	IS 8130/84		-	P	V	
		b)		Tensile test for aluminium						IS 8130/84	IS 8130/84		-	P	V	
		c)		Wrapping test for aluminium						IS 8130/84	IS 8130/84		-	P	V	
		d)		Conductor resistance test	ohm/km					IS 8130/84	IS 8130/84		-	P	W	
		e)		Test for thickness of insulation & sheath						IS 7098(Part 2)/85	IS 7098(Part 2)/85		-	P	W	
		f)		Eccentricity test on insulation												
		g)		Hot set test for insulation	%					IS 7098(Part 2)/85	IS 7098(Part 2)/85		-	P	W	
		h)		Tensile strength & Elongation at break of insulation & outer sheath	N/mm2, %				Appendix A to IS 7098(Part 2)/85	IS 7098 (Part 2) / 85 & IS 5831/84 (Type ST2)			-	P	W	
		i)		Partial discharge test	pC					IS 7098(Part 2)/85	IS 7098(Part 2)/85		-	P	W	
		j)		High voltage test	kV, min.					IS 7098(Part 2)/85	IS 7098(Part 2)/85		-	P	W	
		k)		Insulation resistance (Volume resistivity) test	ohm-cm					IS 7098(Part 2)/85	IS 7098(Part 2)/85		-	P	W	
		l)		Tests for dimension and number of armour wires/strips	mm					IS 3975, IS 10810 Pt. 36			-	P	W	
		m) i)		Test for anti-termite property of outer sheath									-	P	W	
		ii)		Test for anti-rodent property of outer sheath									-	P	W	
		n)		Winding of cable on drum To check : i) cable appearance ii) drum appearance iii) cable winding iv) packing v) embossing / printing vi) length verification vii) mass of cable viii) ovality check on completed cable x) Fixing of M. S. Plates					One drum from offered lot				-	P	W	



Sr. No.	COMPONENT			CHARACTERISTICS & OPERATIONS	UNIT	CLASS	Measuring Equipment / Technique	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT / TEST	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			Remarks		
SV	MFR	R-Infra																
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17		
		a)		Water Boil test to check the integrity of semiconducting layer					Appendix A to IS 7098(Part 2)/85				-	P	W			
		p)		Void and Contamination test for insulation										-	P	W		
		q)		Swell Height of water-swellable tape										-	P	W		
		r)		Lay Ratio of armour										-	P	W		
		s)		Mass of Zinc coating for armour							IS 3975, IS 10810 Pt. 36 &			-	P	W		
		t)		Uniformity of Zinc coating							IS 3975, IS 10810 Pt. 36			-	P	W		
		u)		Printing over semicon										-	P	W		
		v)		Water Penetration Test (WPT) on core (I.e. Longitudinal Water-Blocking Test)						IEC 60502-2	IEC 60502-2			-	P	W		
		w)		Freely strippable insulation screen (Strippability Test)										-	P	W		
		x)		Ovality check on core										-	P	W		
		y)		Additional tests for FRLS cables														
		1)		Tests on FRLS sheath														
		i)		Oxygen Index test										-	P	W		
		ii)		Temperature Index test										-	P	W		
		iii)		Acid gas generation test										-	P	W		
		iv)		Smoke density test										-	P	W		
		2)		Flammability test on finished cable										-	P	W		
		D.	PACKING & MARKINGS															
		1	Packing & Marking	a)		Cable end sealing					100 %	IS 7098(Part 2)/85	IS 7098(Part 2)/85		-	P	V/W	
		b)		Pulling eye at leading end							100 %				-	P	V/W	
c)		Stencilling / Marking on drum							100 %	IS 7098(Part 2)/85	IS 7098(Part 2)/85		-	P	V			

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. R-Infra may witness Raw materials and In process Inspections, in addition to Type/Routine/Acceptance tests, at any time/stage of manufacturing.
5. R-Infra's Inspector shall randomly select a cable drum for type testing at vendor's premises / CPRI / ERDA among the lot offered for inspection.
6. For each of the offered lot for inspection, R-Infra may randomly select one cable drum for testing of end cap "Destructive testing" to verify adhesion of sealing cap to cable outer sheath. Similarly, pulling eye shall be tested with 30N/mm² pressure.

Annexure- G

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

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

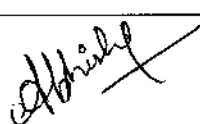
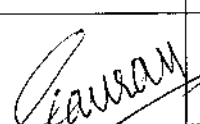
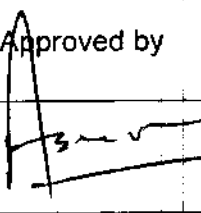
Property	Units	Requirements Values
Min. Avg. Electrical Breakdown Strength(qual. test)	Kv/mm	≥ 25
Impulse Strength	Kv/mm	≥ 83
Water Tree Length	mm	0.25
Max. Bowtie Tree Density	(Number per 16.4 cu. cm)	Maximum 15 (0.12-0.25 mm range)

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

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

TECHNICAL SPECIFICATION FOR CABLE LAYING

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

Prepared by	Reviewed by	Approved by	Rev	02
			Date	18 th March 2019
AV	GS	AA	Page	1 of 42

TECHNICAL SPECIFICATION FOR CABLE LAYING

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TECHNICAL SPECIFICATION FOR CABLE LAYING

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1. REFERENCE STANDARDS

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

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

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

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

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

2.2. CLEARANCES

The desired minimum clearances are as follows –

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

TECHNICAL SPECIFICATION FOR CABLE LAYING

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

2.3. DEPTH OF CABLE LAYING

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

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

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

2.4. WIDTH OF CABLE TRENCHES

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

2.5. BENDING RADIUS OF CABLES

TECHNICAL SPECIFICATION FOR CABLE LAYING

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

i) Single Core Cables (PVC & XLPE)

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

ii) Multi Core Cables (PVC & XLPE)

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

Where 'D' is overall diameter of the cable

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

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

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

ii) For Cables pulled by Cable eyes

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

TECHNICAL SPECIFICATION FOR CABLE LAYING

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

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

2.7. METHODS OF LAYING

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

TECHNICAL SPECIFICATION FOR CABLE LAYING

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

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

The type of the covers shall be as under

TECHNICAL SPECIFICATION FOR CABLE LAYING

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

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

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

TECHNICAL SPECIFICATION FOR CABLE LAYING

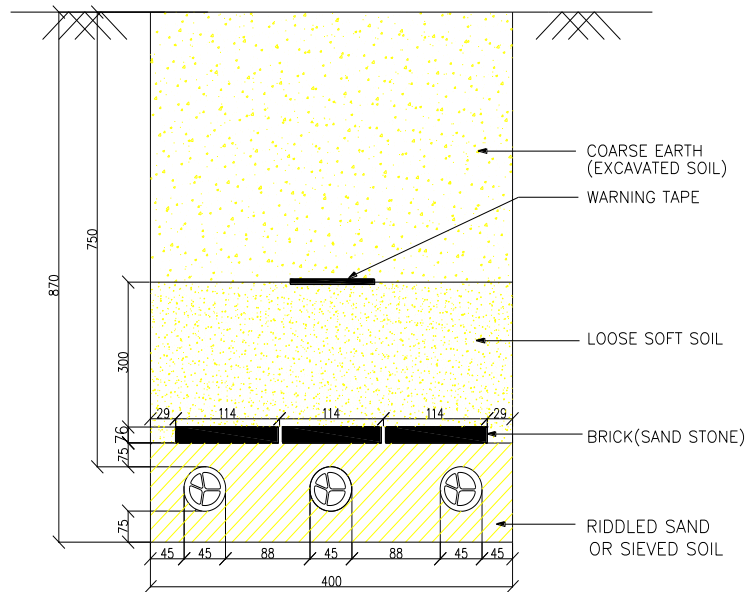


Figure 1.1 – 1.1kV, 150sqmm Buried Cable

TECHNICAL SPECIFICATION FOR CABLE LAYING

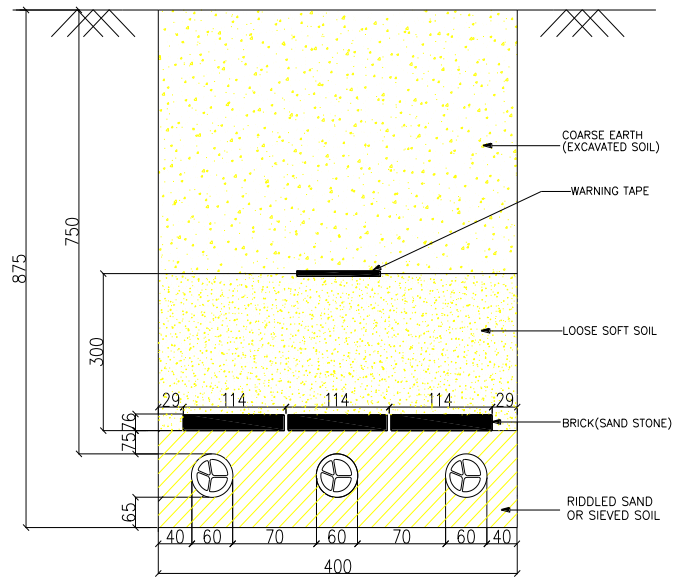


Figure 1.2 – 1.1kV, 300sqmm Buried Cable

TECHNICAL SPECIFICATION FOR CABLE LAYING

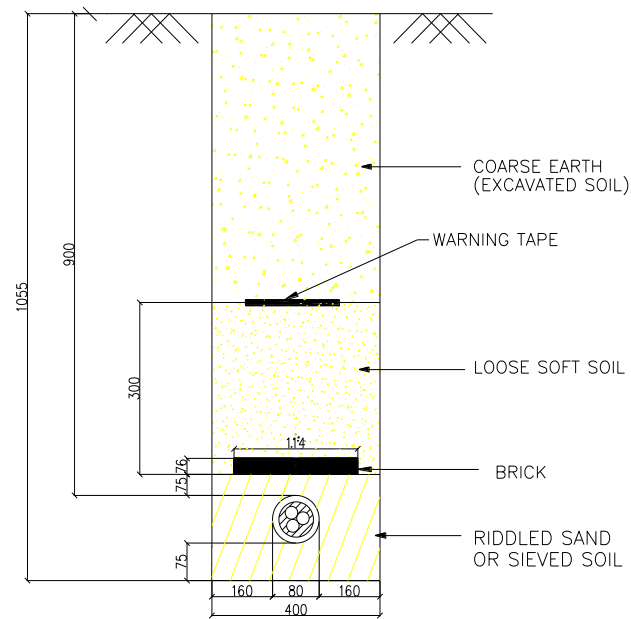


Figure 1.3 – 11kV Buried Cable for Single Circuit

TECHNICAL SPECIFICATION FOR CABLE LAYING

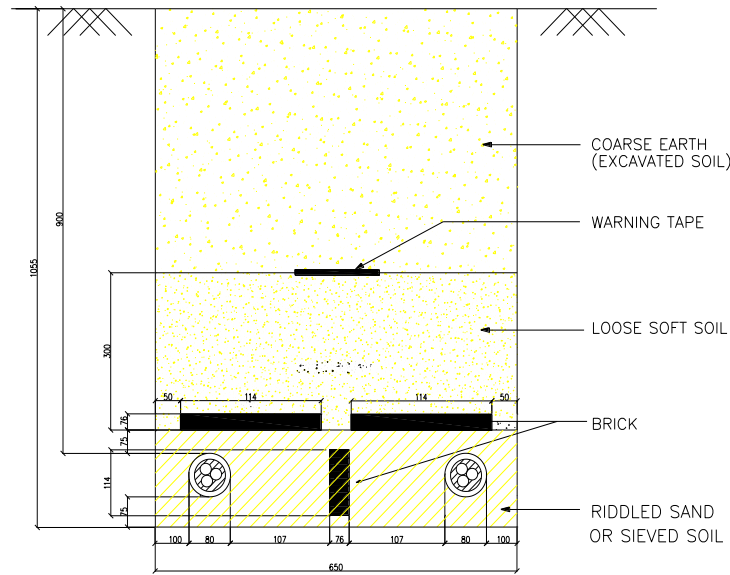


Figure 1.4 – 11kV Buried Cable for Double Circuit

TECHNICAL SPECIFICATION FOR CABLE LAYING

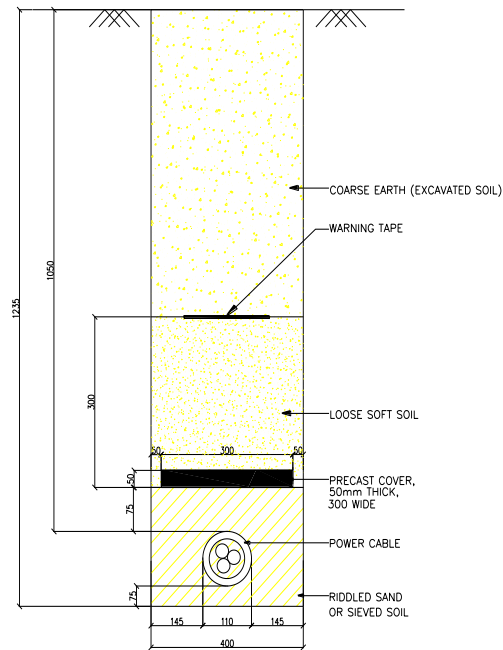


Figure 1.5 – 33kV Buried Cable for Single Circuit

TECHNICAL SPECIFICATION FOR CABLE LAYING

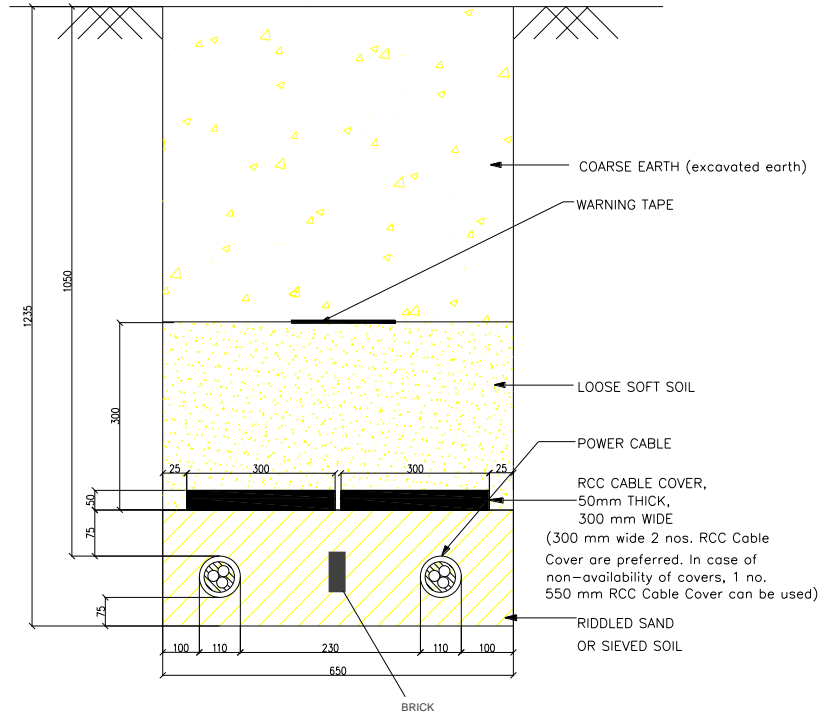


Figure 1.6 – 33kV Buried Cable for Double Circuit

TECHNICAL SPECIFICATION FOR CABLE LAYING

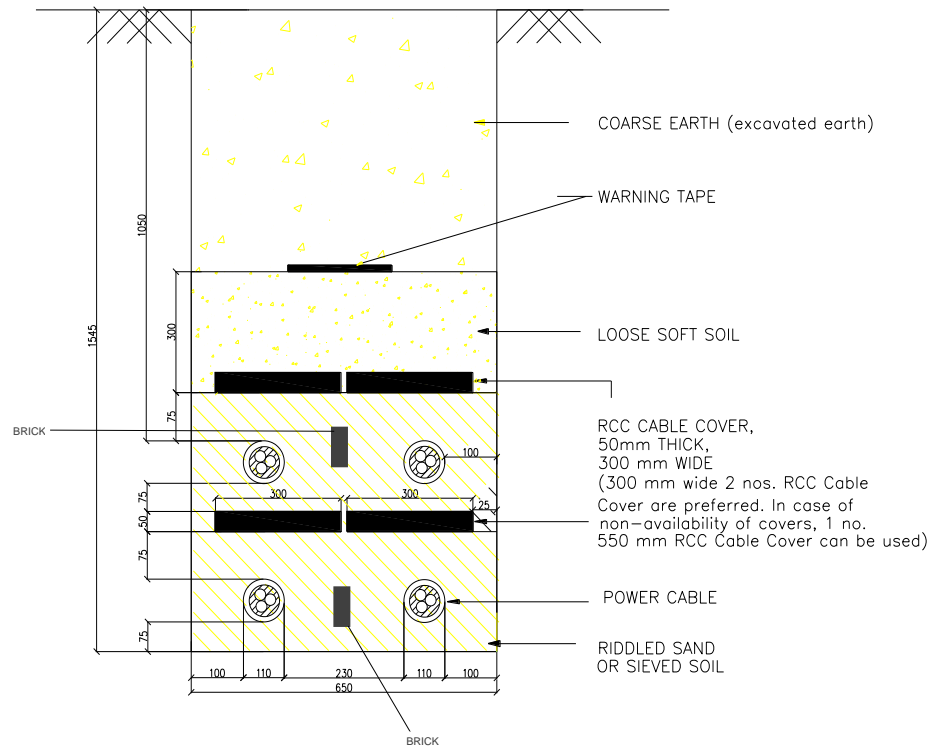


Figure 1.7 – 33kV Buried Cable Option-1 for Four Circuits

TECHNICAL SPECIFICATION FOR CABLE LAYING

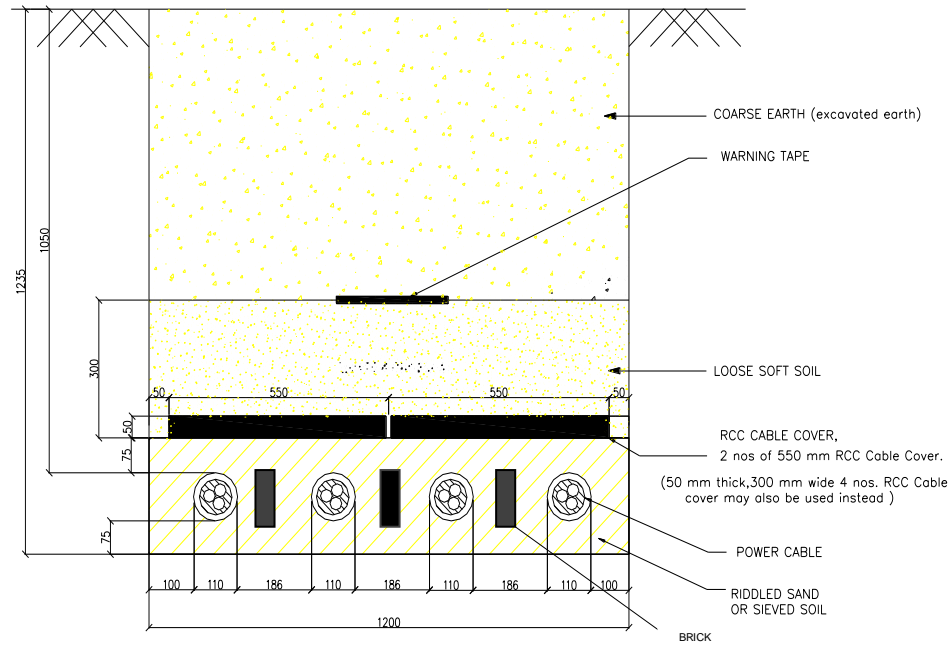


Figure 1.8 – 33kV Buried Cable Option-2 for Four Circuits

TECHNICAL SPECIFICATION FOR CABLE LAYING

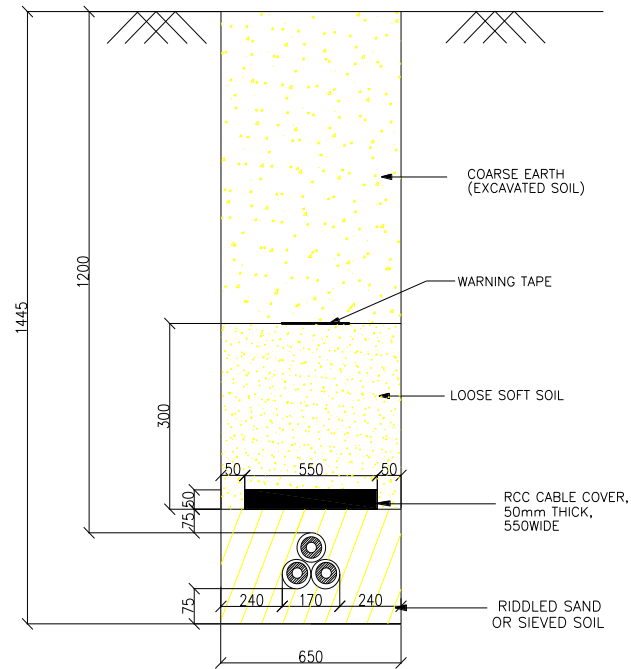


Figure 1.9 – 66kV Buried Cable for Single Circuit

TECHNICAL SPECIFICATION FOR CABLE LAYING

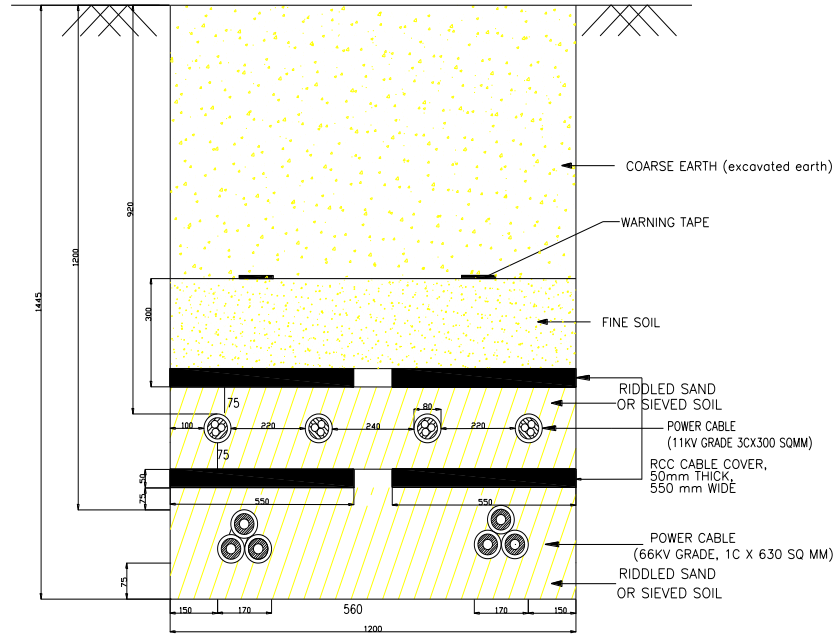


Figure 1.10 – 66kV Double Circuit and 11kV Circuits

TECHNICAL SPECIFICATION FOR CABLE LAYING

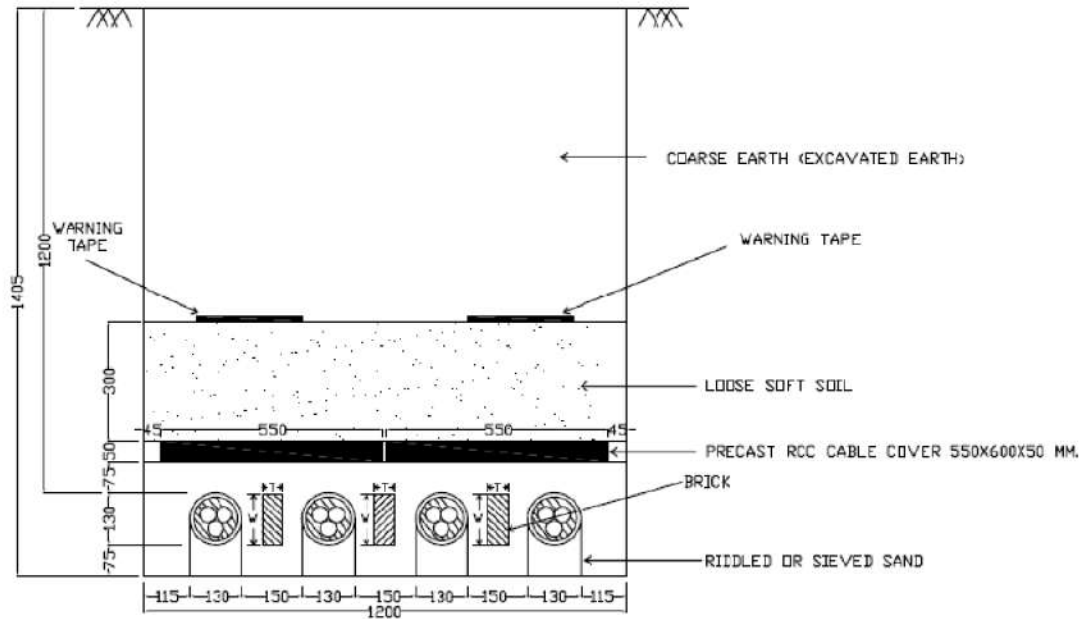


Figure 1.11 – 66kV 3Cx300 sq mm Four No's Cable Runs

TECHNICAL SPECIFICATION FOR CABLE LAYING

2.8 CABLE OVER BRIDGES

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

2.9 LAYING OF SINGLE CORE CABLES

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

TECHNICAL SPECIFICATION FOR CABLE LAYING**2.10 EARTHING OF SINGLE CORE CABLES**

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

2.11 GENERAL GUIDELINES FOR LAYING CABLES

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

TECHNICAL SPECIFICATION FOR CABLE LAYING

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

2.12 HANDLING AND STORAGE OF CABLE DRUMS

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

TECHNICAL SPECIFICATION FOR CABLE LAYING

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

2.13 PROCEDURE OF LAYING

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

TECHNICAL SPECIFICATION FOR CABLE LAYING

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

2.14 EXCAVATION OF THE TRENCHES

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

TECHNICAL SPECIFICATION FOR CABLE LAYING

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

TECHNICAL SPECIFICATION FOR CABLE LAYING

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

2.15 EXCAVATED MATERIAL

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

2.16 PIPES AND DUCTS

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

TECHNICAL SPECIFICATION FOR CABLE LAYING

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

TECHNICAL SPECIFICATION FOR CABLE LAYING

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

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

3. JOINTING OF CABLES

3.1 TYPES OF ACCESSORIES

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

3.2 REQUIREMENTS OF CABLE JOINTS

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

TECHNICAL SPECIFICATION FOR CABLE LAYING

- ii) Connector & lug should have a mechanical strength should be comparable to that of the conductor.
- iii) Thickness of built up insulation should be equal to or more than thickness of insulation of cable.
- iv) The Joint should provide proper mechanical protection to the insulated cores against damage by impact.
- v) The joints should ensure the continuity of metallic sheath or armour.
- vi) Proper stress control shall be provided to eliminate occurrences of high electrical stresses at screen cut points and over crimped connector.
- vii) The Joints shall be provided with an outermost layer resistant to corrosion by chemical effect

For joints of screened cables, following additional features must be considered

- i) Electric stress relief at termination of screen
- ii) Ionization and corona discharge

Besides the above requirement, cable joints should be simple and compact. It should require minimum time for jointing. It should be mechanically strong to

TECHNICAL SPECIFICATION FOR CABLE LAYING

withstand dynamic stresses due to short circuit current and impacts. The joints should further be resistant to corrosion and other chemical effects.

3.3 PREPARATION BEFORE JOINTING

A proper joint position should be selected for jointing. The joint pit should be of sufficient dimensions as to allow jointers to work. Sides of the pit should be well covered with tarpaulin sheets to prevent loose earth from falling. When jointing cables in water logged ground or under monsoon conditions, sump hole should be excavated at one end of the joint pit in such a position so that the accumulating water can be pumped out or baled out without causing interference to the jointing operation. The jointing as far as possible is to be carried out inside a tent. Before proceeding for jointing, on the existing cable, it is very essential to identify the cable to be jointed. For jointing of high tension cables, the cable should be made dead and earthed before commencement of the jointing. This should be confirmed by spiking method.

Cleanliness is the most important factor in all jointing work. All tools should be clean and dry at the time of the jointing process. Cleanliness while handling the insulation is very important. Any contamination of the insulation by dust or moisture is detrimental to the joint. In case of paper cables, the cable seals should be examined for any damage or puncture. The paper insulation should then be tested for the presence of moisture. This is done by dipping the insulation paper in hot G-38 compound (110 Deg - 120 deg.C). Care should be taken not to touch the paper with hand. Paper should be held with a plier which

TECHNICAL SPECIFICATION FOR CABLE LAYING

should be slightly warm. If moisture is present in the sample, it will be detected easily by a bubbling or crackling sound. In case of faulty cable, if on test moisture is detected, then further test would have to be carried out to arrest moisture. The cables to be jointed should then be meggered to check the condition of the insulation and a further check of further continuity of cables and tracing out cables to be jointed is necessary. Number on cores represents the phases. But these should never be taken for granted. Crossing of the core should be avoided in a joint.

3.4 PROCESS OF JOINTING

The process of jointing mainly consist of

- i) Connecting conductors together
- ii) Replacing the machine applied insulation
- iii) Providing earth continuity
- iv) Providing mechanical protection

Conductor joints should satisfy the following basic requirements.

- i) Ensure conductivity of the conductor by proper crimping.

TECHNICAL SPECIFICATION FOR CABLE LAYING

- ii) Leave a reasonably smooth finish and profile on the conductor joint so as to avoid under stress concentration.

4. BACK FILLING TRENCHES AND TEMPORARY REINSTATEMENT

- i) Filling in of trenches shall not be commenced until BSES has inspected and approved the cables and accessories at site. The inspection should be done on daily basis so that the trenches do not remain open unnecessarily, to avoid inconvenience to public.
- ii) Where cables routes are in public highways, footpaths, gardens etc., the method of reinstatement will be subject to approval by MCD. All costs incurred will be at the contractor's expenses.
- iii) The contractor shall be responsible for proper permanent reinstatement of the upper levels, which shall be carried out to the satisfaction of BSES and the MCD authorities concerned.
- iv) Before finally leaving site, permanent reinstatement shall be executed by the contractor to the approval of MCD and the property owners and all costs incurred shall be to the contractor's account.

TECHNICAL SPECIFICATION FOR CABLE LAYING**5. PERMANENT REINSTATEMENT OF PUBLIC ROAD, FOOT PATH ETC**

- i) In public roads and footways the surfaces and foundations shall be temporarily reinstated by the contractor. After settlement, temporary reinstatement material shall be removed as necessary and the permanent reinstatement shall be carried out to the approval of the appropriate highway authority / MCD. Stone and pre-cast concrete paving kerbs and channels shall also be finally reinstated by the contractor.
- ii) Temporary reinstatement shall be maintained by the contractor until commencement of final reinstatement to ensure that the surface is always safe for the passage of pedestrians and vehicular traffic.

6. IDENTIFICATION

All cables shall be identified below the gland at each end, at joint position and at approved positions by means of bands engraved or punched with cable no. feeder name, size of cable, number of cores, phase colour etc. The bands shall be secured fastened in a permanent manner, and shall be made of material able to resist corrosion, dampness and mechanical damage.

TECHNICAL SPECIFICATION FOR CABLE LAYING**7. CABLE ROUTE MARKERS**

All cables routes shall have markers at suitable location with a gap not exceeding 30 meters. The route markers shall be approved design. Additional markers shall be provided at joint locations with approved markings.

8. CABLE SUPPORTS / CLAMPS

- i) The contractor shall supply and install all the supports, racks, trays, cleats, saddles, clips and other parts required to carry and secure the cables, without risk so that there is no undue mechanical load or stress due to weight of the cable at each end. Cleats, saddles and clips shall be of the design as approved by BSES. No cable shall be laid on the trench floor. They shall be run in a neat and orderly manner and the crossing of cables within the trench shall be avoided as far as possible. Where cable runs unavoidably cross, a suitable supporting arrangement shall be provided to maintain an adequate gap between the cables.
- ii) Every cable shall be supported at a point not more than 500 mm from its termination.

TECHNICAL SPECIFICATION FOR CABLE LAYING**9. INSTALLATION OF CABLES IN TUNNELS / BASEMENT / BELOW THE PANELS**

- i) The design of cable support for cables installed in air in cable tunnels, basements etc. shall consist of vertical steel members spaced at approved interval and secured to the walls, floors and ceilings as necessary by means of bolts either cemented in position or expanded into cored holes. Each vertical support shall have bolted to it a number of steel brackets spaced at the intervals and designed to support and retain trays constructed of galvanized sheet steel of adequate section to carry the weight of the cables, plus space for an additional quantity of future cables at least 25% by weight and dimensions in excess of the cables installed under the contract and an additional load of 100 kg at the extremity without distortion. The trays shall be designed with raised edges to retain the cables and shall incorporate an interlocking feature so as to prevent movement between supports.
- ii) The design and construction of all cable cleating and supporting arrangements shall suit the cable system design. The spacing of cable supports shall be approved by BSES.
- iii) Cable run on trays shall be neatly dressed and where not provided with cleats shall be secured by heavy gauge, type approved metal reinforced, clips or saddles. Not more than six cables shall be embraced by one clip.

TECHNICAL SPECIFICATION FOR CABLE LAYING

- iv) Mild steel of appropriate sections, duly painted in an approved manner, shall be used for fabrication of cable supports. The steel shall be free from blisters, scales, laminations or other defects. Before final painting, the steel sections shall be provided with double coat of red primer.

10. CABLE PROTECTION AT OVERHEAD TOWERS OR POLES

Where the cables terminate on overhead line poles or towers located outside substation compounds the contractor shall provide suitable cable supporting galvanized steel work attached to the pole or tower and comprising backboard, runners, sheet, steel cover of not less than 3.0mm thickness, stays, cable cleats, anti climbing guard and all incidental items to provide secure protection for the cables. Isolators and Lightning arrestor. The erection and steel structure required shall also be in scope of the contractor.

11. SUN SHADES

All cables shall be protected from direct solar radiation by ventilated sun shields as approved by BSES.

12. ROUTE PLAN

- i) Contractor should get updated the GIS map of BSES of route along with joints and other obstructions.
- ii) During the progress of the contract works the contractor shall record on a set of route plans and cross section drawings of an approved

TECHNICAL SPECIFICATION FOR CABLE LAYING

form, these details so that the same can be transferred on the GPS maps. Such particulars will allow an accurate reference to be made in the case of any fault or projected modification. These records shall show, amongst other data, both indoors and outdoors the exact position of every joint, cable end termination and also the particulars of the depth of the trench, the arrangement of the cables, with cable numbers and the position of all obstructions revealed during the course of excavations. These completed records shall be submitted to BSES within 15 days of completion of any particular route/feeder.

13. SITE FACILITIES TO BE MAINTAINED BY THE CONTRACTOR

- i) The contractor shall arrange for all the tools and tackles required for cable laying, jointing testing and commissioning as per this specification.
- ii) The contractor shall arrange illumination and Power supply so that the work can be carried out round the clock.
- iii) The contractor shall maintain functional dewatering pumping facility with suitable power supply so as to protect the cables and the joints from ingress of water due to rain or otherwise
- iv) The contractor shall make arrangement to provide suitable scaffolding arrangement to carry out the termination work
- v) The contractor shall carry out proper barricading of the dug cable route and the joint bays and shall take all necessary precautions to avoid any public hazard.

TECHNICAL SPECIFICATION FOR CABLE LAYING**14. TESTING**

Following tests are to be carried out during and after completion of Cable Laying:

- i) Testing of cable before jointing –Cable shall be tested for Insulation Resistance prior to laying by opening the end and resealing end properly.
- ii) Testing on complete Cable Installation –
 - a. Insulation resistance of each core shall be measured against all the other cores and the metal screen connected to earth.
 - b. The resistance of the conductor shall be measured.
 - c. High voltage – Very Low frequency (VLF) kit shall be used for high voltage testing of complete cables length. Testing voltage and duration shall be as per IEEE 400.2 standards.
 - d. Partial discharge test shall be carried on complete cable length.
 - e. Charging of Cable at No-Load at Nominal working voltage for 24 Hours.
 - f. After laying and before termination of cable a sheath test shall be conducted for 66KV Single core Cable as under:-

At both ends the cable shall be raised from ground. From the end graphite coat over the outer PVC jacket shall be removed with a piece of glass for a length of 300mm. A spiked steel rod with an eye for attaching a wire shall be driven into the ground and connected to a nearby water or hydrant pipe. Insulation resistance of PVC

TECHNICAL SPECIFICATION FOR CABLE LAYING

jacket shall be measured between the aluminum wire armour and the spike with a 500/1000V insulation tester. Measured resistance shall not be less than 2.5 mega ohm / KM. Thereafter 10KV DC shall be applied for one minute in the same way. After the test the armour shall be kept earthed to the steel spike for 15 minutes for discharging residual charge.

- g. Any other testing required to complete the job shall be performed as per IEC standards.

15. BARRICADING AND SAFETY REQUIREMENT

- a. Dimensions of barricading- Height- 2 mtr, Length- 1.5 mtr.
- b. There shall not be any gap in between two barricades.
- c. LED Bacon light shall be placed at 1st and every 4th barricade
- d. Name, painting, color, cleanliness etc. shall be done on regular basis.
- e. Vendor to ensure that traffic management shall not be excuse of work execution. The contactor shall not undertake loading and unloading at carriageways obstructing the free flow of vehicular traffic.
- f. Full height fence, barriers, barricades etc. shall be erected around the site in order to prevent the working area from the risk of accidents due to speedy vehicular movement. In same way barricades shall protect the road users from the danger due to construction equipment and temporary structures.
- g. The structure dimensions of the barricades , material and composition, its color scheme, BSES logo and details shall be in

TECHNICAL SPECIFICATION FOR CABLE LAYING

accordance with specification and drawing laid down in the tender documents.

- h. All the barricades shall be erected as per the design requirements of employer, numbered painted and shall be maintained in good condition. Barricading In-charge shall maintain barricade register at site.
- i. All barricades shall be easily seen in the dark/night time by the road users so that no vehicle hits the barricades. Night vision shall be ensured by affixing retro reflective strips of required size and shape at appropriate angle at bottom and middle portion of the barricades at a minimum gap of 1000 mm. In addition minimum one red light /red blinker and red beacon light shall be placed at the top of each barricade.
- j. No dust deposit is permitted at the front side of barricades.
- k. Cable drum shall be returnable and vendor shall take it back (by buy back process or as per PO agreement) from site at their own risk and cost.
- l. Once cable lying of a drum is completed, within two days, empty drum shall be removed from site.
- m. Trained traffic marshal with all PPE and traffic control light (Red and Green) shall be placed at site for 24x7 hours.
- n. During execution of job, any damage to other agency's properties shall be counted in vendor account and necessary action shall be taken by vendor to immediate recover, repair etc.

TECHNICAL SPECIFICATION FOR CABLE LAYING

- o. Excess earth shall be removed from site after back filling. Site to be cleared to avoid flowing of dust. Barricades to be removed from site within 24 hrs after completion of job.
- p. During non working hrs vendor to ensure presence of supervisor for controlling any event from locals.
- q. PPEs
 - a. Helmets
 - b. Mask
 - c. Jacket
 - d. Safety Shoes
 - e. First Aid Box etc.

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

- r. EPR/Scanning shall be done by vendor of whole the route and same shall be submitted to BYPL. This work shall be done by vendor before execution of job.
- s. Lifting of cable drums with hydraulic machine, pulling of cable from top end of drum with pulling machine (hydraulic winch) is mandatory.
- t. Violation on barricading guideline and safety norms, a fine of Rs.5000 /day shall be imposed. BYPL inspector/engineer in-charge shall be empowered to impose the above penalty.
- u. Artwork & Text to be printed on barricading sheet shall be approved by BYPL prior to start of work

Technical Specification of Fiber optical cable & Joint with 48 strands for Line Differential Relay and
suitable Permanently Lubricated HDPE Pipe

**Technical Specification of Fiber optical cable &
Joint with 48 strands for Line Differential Relay
and
suitable Permanently Lubricated HDPE Pipe
Specification No. – SP-FO48-96-R1**

Prepared by	Reviewed by	Approved by	Rev	00
			Date	7 th May 2019
AV	GS	AA	Page	1 of 9

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**Technical Specification of Fiber optical cable & Joint with 48 strands for Line
Differential Relay and suitable PLB HDPE Pipe****1.0. SCOPE**

This specification covers manufacturing and supply of Fiber optical cable with 48 strands, its joint and suitable PLB HDPE Pipe.

2.0. SERVICE CONDITIONS

Optical Fiber cable to be supplied against this specification shall be suitable for satisfactory operation under the following conditions-

2.1	Average grade atmosphere	Heavily polluted, Dry
2.2	Maximum altitude above sea level	1000M
2.3	Relative Humidity	100%
2.4	Ambient air temperature	Highest 50 Deg C Average 40 Deg C Minimum 0 Deg C
2.5	Operating temperature	0 Deg C - 50 Deg C
2.6	Rainfall	750mm concentrated in four months

3.0. CONSTRUCTIONAL FEATURES OF OPTICAL FIBER CABLE

S No	Parameter	Units	Guaranteed Value
3.1	No. of fibers in the cable		48
3.2	Type of fibers		Single mode,G652D
3.3	Cable diameter - Nominal - Tolerance	mm mm	
3.4	Cable weight	Kg/ km	
3.5	Max Tensile Strength	KN	3500
3.6	Max pulling tension - During installation - During Service	KN KN	6000 3500
3.7	Minimum bending radius - During installation - During service	mm mm	
3.8	Continuous length	Km	2000+/-10%

**Technical Specification of Fiber optical cable & Joint with 48 strands for Line Differential Relay
and suitable PLB HDPE Pipe**

3.9	Temperature range for Operation, Installation, Shipping, Storage	°C	-20deg to +70deg
3.10	Crush strength	KN/M2	
3.11	Impact resistance	Nm	
3.12	Torsion resistance		180 deg
3.13	Outer jacket thickness - Nominal - Tolerance	mm mm	1.6mm +/-0.2
3.14	Outer jacket material		HDPE
3.15	Description of outer jacket coatings/ additives		Anti Termite & Anti Rodent
3.16	Inner jacket material		HDPE Black
3.17	Inner jacket thickness		1.2mm
3.18	Description of Inner jacket coatings/ additives		Anti Termite
3.19	Cable core binding arrangement - Lay length - Lay Direction	mm S/Z	
3.20	Central strength members - Material - Diameter - Shape	mm	FRP 2.0mm Round
3.21	Peripheral strength member		Glass Yarns
3.22	Central Fiber optic unit:	Y/N	N
3.23	Loose tube dia & material		1.9mm +/- 0.1 with PBTP
3.24	Loose tube lay direction		
3.25	No of fibers per tube		4

Technical Specification of Fiber optical cable & Joint with 48 strands for Line Differential Relay and suitable PLB HDPE Pipe

3.26	Total no. of tubes and number of empty tubes		
3.27	Identification / numbering of individual tubes		
3.28	Filling compound within tube		Thixotropic Tube Filling Jelly
3.29	Filling compound in cable core interstices		Thixotropic Flooding Jelly
3.30	Rip cord (s) provided ?	Y/N	Y
3.31	Cable design life	Years	Min 25Years
3.32	Describe cable termite proofing measures		Anti Termite additives
3.33	Describe cable anti-rodent measures		Equally distributed Glass Yarns over Inner Sheath

4.0. CONSTRUCTIONAL FEATURES OF JOINT FOR OPTICAL FIBER CABLE

Construction of the optical fiber cable joint Box shall be as following:

4.1 Main Box:

The main box shall be sturdy & durable having a base and dome shaped body. The domed shaped body shall cover the entire junction while the base shall enable the entries of the optical fiber cable. The base and dome shall be made of Thermoplastic /High density polypropylene material. The Joint Box should be suitable for opening and reentry frequently without impairing its properties. The body may have ribs as strength member if required.

4.2 Cable organizer (Strength member and cable termination)

Cable organizer shall be suitable to secure extra length of fiber tubes with safe bending radius. It should not cause any strain or tension on the fiber. It shall be possible to fix the strength member(s) and the optical fiber cable firmly so that the cable arrangement will not shift or move laterally inside the Joint box. The Internal structure shall be metallic (made of stainless steel) to support and hold the cables and strength members etc. The metallic parts for making connections shall be made of Brass or Nickle Chromium plated steel and the total assembly shall be corrosion proof.

4.3 Fiber organizer/ Fiber Splice trays

Fiber organiser shall be non-metallic made of ABS material having following characteristic.

i.	Specific Gravity	1.01-1.21 gm/cc	ASTM-D-792
ii.	Tensile Strength	0.002 kg/sqmm – 0.005 kg/sqmm	ASTM-D-638
iii.	Elongation	<50%	ASTM-D-638
iv.	Water absorption	0.3-0.4	ASTM-D-57-59
v.	Rock well hardness	R81-R111	ASTM-D785A

Test certificates in conformity to the above parameters of the ABS Material shall be furnished. Fiber organizer cassettes shall be provided on which the fiber splice and service loops of fibers may be placed by making fiber coils. Slots on the splice tray for fixing splice protection sleeve shall be in such a way that they will not cause any stress or strain on sleeve or fiber and shall not shift, loose or move inside the tray or come into conflict with the fiber coils once fixed. It shall be possible to fix a minimum of 4 secondary tubes at the entry port of each tray. No PVC or any other type of adhesive tape is permitted to hold fibers and loose tube inside the tray. All fibers of a tube shall be spliced in a single tray for better tube identity and fiber looping. The fiber organiser shall be fixed inside the Joint box in such a way that this shall not loosen once fixed or to shift or move in any way.

4.4 Holding Arrangements

The box shall provide the following:

- i. Holding arrangement and framework for properly securing cable organizers with splice trays.
- ii. Securing arrangement for holding fibers.
- iii. Holding device to hold strength member of fiber optic cable securely.
- iv. Any other extra component required for providing strength and reliability to the Joint Box.

4.4 Compatibility

All the component and parts used shall be compatible with the optical fiber cable, fiber splices and cable components. Their use for long should not result in increase in transmission loss or deterioration in other properties.

4.5 Marking on body of the Joint box

Following information by marking indelibly on Joint box shall be provided:

- i. Manufacturer's name & date
- ii. Type of Joint box
- iii. Number of Splice organizer cassettes
- iv. Number of splices per cassette
- v. Batch number and serial number.
- vi. Name of Purchaser i.e. BSES Yamuna Power Ltd
- vii. Purchase order number & Date

Technical Specification of Fiber optical cable & Joint with 48 strands for Line Differential Relay and suitable PLB HDPE Pipe

5.0. CONSTRUCTIONAL FEATURES OF HDPE PIPE FOR OPTICAL FIBER CABLE



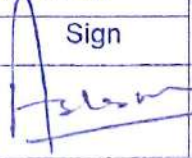
S No	Parameter	Units	Guaranteed Value
PLB HDPE Pipe Parameters			
5.1	Manufacturer's Name		
5.2	Pipe diameter - Nominal - Tolerance	mm %	40 +1% & -0%
5.3	Wall Thickness - Nominal - Tolerance	mm %	3.5 +1% & -0%
5.4	Standard Length - Nominal - Tolerance	meter &	500 +/- 5%
5.5	Weight	Kg/meter	
5.6	Pipe construction type		Two concentric layers
5.7	Thickness of permanent lubricant	mm	3.85 mm
5.8	Construction material of outer layer		HDPE
5.8	Construction material of inner layer		HDPE with silicon
5.9	Base HDPE Resin - Density at 27 deg C - Melt flow rate at 190 deg C & 5 kg load	Kg/m ³ g/10 minutes	940 to 958 0.2 to 1.1
5.10	Service life span	years	>25
5.11	Maximum outside diameter of fiber optic cable that can be installed by blowing technique		16 mm
5.12	Suitable for underground cable installation by- - Blowing - Pulling		Yes Yes

Technical Specification of Fiber optical cable & Joint with 48 strands for Line Differential Relay and suitable PLB HDPE Pipe

5.13	Tensile Strength	N/mm ²	Min. 20
5.14	Elongation at break	%	Min 350
5.15	Internal coefficient of friction		>0.06
5.16	Description of coatings/ additives		Anti Termite & Anti Rodent
PLB HDPE Pipe Accessories			
5.17	Coupler Type		Push Fit
2.18	Coupler Material		PP
5.19	Coupler strength		15 Kgf/cm ²
5.20	End cap material		PP

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

Specification no – SP-HCSTJ-03-R1

Prepared by		Reviewed by		Approved by		Rev	Date
Name	Sign	Name	Sign	Name	Sign		
PG		GS		AA		R0	02/06/2017

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

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SP-HCSTJ-03-R1

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

Record of Revision

Item/Clause No.	Change in Specification	Approved By	Rev

Technical Specification For Heat Shrinkable And Cold Shrinkable Straight Through Jointing Kit (11 KV, 33 KV, 66 KV XLPE Insulated Cables)**1.0.0 Scope of work**

- A. Heat Shrinkable / Cold shrinkable Straight through Joint Kits (hereinafter briefly referred to as “STJ Kits”), suitable for 11 kV, 33 & 66kV XLPE cables, shall be designed, manufactured, tested, packed and delivered by the Vendor, as per Purchaser’s requirements.
- B. During post-installation period, if a joint fails at site, the vendor shall depute a technical team to site for a root-cause analysis of the failure of the joint, in the presence of BSES officials. An Analysis Report shall then be submitted for BSES’s review and approval. If this report concludes the cause of failure as due to a design/manufacturing defect in a component, then vendor shall replace all such components in the entire stock available with BSES.

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

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

2.1.1 International Standards:

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

Technical Specification For Heat Shrinkable And Cold Shrinkable Straight Through Jointing Kit (11 KV, 33 KV, 66 KV XLPE Insulated Cables)**3.0.0 Cable Construction**

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

- 11kV, 3-core x 150 sq mm AL
- 11kV, 3-core x 300 sq mm AL
- 11kV, 1-core x 1000 sq mm AL
- 33kV, 3-core x 300 / 400 sq mm AL
- 66kV, 1-core x 630 sq mm AL
- 66KV, 1 core x 1000 sq mm AL

3.1.0	Conductor	a) Electrolytic Grade Stranded Aluminium Conductor b) Grade: H2 / H4 as per IS: 8130 / 1984 (For Al) c) Stranded, compacted and circular in shape d) Class 2 e) Longitudinal "Water-Blocking Arrangement" (or water-tight construction or water barrier protection)
3.1.1	Conductor Screen	Extruded Semi Conducting material
3.1.2	Insulation	Extruded XLPE Insulation.
3.1.3	Insulation Screen	Freely strippable Semi Conducting (without application of heat) for 66KV firmly bonded.
3.1.4	Water Swell able Tape	Semi-conducting Water Swell able Tape under the copper tape on each core.
3.1.5	Copper Tape	Copper Tape applied helically over the layer formed by application of insulation screen, water swell able tape and identification strip
3.1.6	Filler	All interstices, including center interstices filled by PP filler.
3.1.7	Over all three cores	Binder tape
3.1.8	Inner Sheath	Extruded Inner Sheath of Black PVC type ST-2.
3.1.9	Armour	a) For 3-core Cables : Galvanized Steel flat strip armour b) For 1-core Cables : Non-Magnetic, Hard drawn Aluminium wire (flat/round) c) Corrugated aluminium or lead sheathed for 66KV Cable
3.1.10	Binder Tape	Rubberized cotton tape
3.1.11	Outer Sheath	Extruded outer sheath of PVC (ST-2) for 11 KV and 33 KV and HDPE ST 7 for 66KV with termite- repellent and anti-rodent properties.

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

4.0.0 Straight-Through Joints (STJ)

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

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

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

4.1.0 Heat Shrinkable / Cold Shrinkable STJ joints		
4.1.1	Cable preparation	Cable preparation shall be as per installation instruction sheet. Manufacturer shall provide Installation instruction sheet in every kit
Connector		
4.1.2	Conductor Screen	<p>For 11kV</p> <p>a) Conductors to be jointed by crimping connectors</p> <p>b) Annular CSA (cross-sectional area) of the ferrule shall not be less than CSA of the conductor of the cable. Length of the ferrule shall be sufficient to allow adequate number of crimps, to limit temperature rise at the joint. (Vendor to furnish dimensional drawing for ferrule, indicating crimp marks.)</p> <p>c) For aluminium cable, the crimped ferrule shall be of aluminium</p> <p>d) Refer annexure F for GA drawing of crimping ferrule</p> <p>For 33kV and 66KV</p> <p>a) Shear bolt type mechanical connector</p> <p>b) Approved make:</p> <ul style="list-style-type: none"> • Tyco Electronics (BSM-185/400-U) • Pfisterer (332617010) • Or equivalent make (Manufacturer shall take prior approval from CES) <p>d) Maintain smooth surface over connector after cut the shear head bolt</p> <p>e) Vendor to furnish drawing for the mechanical connector</p>
4.1.3	Void filling and stress relief over crimped connector and cut point of the insulation screen.	By means of High permittivity mastic tapes / Lubricant.
4.1.4	Metal screen continuity	By means of Tinned copper wire mesh, wrap individual core from cu screen with 50 % overlap and continue on other side cu screen. Bind the copper wire mesh on copper screen with copper binding wire
Armour / Earthing Continuity		

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

4.1.5	Armour bond	a) By means of a combination of steel (G.I.) support ring (for 3 - core Cable) or Aluminium support ring (for 1 - core Cable) and two nos. of stainless steel hose clips. b) GI Support Ring shall be 'zinc-sprayed Split Type
4.1.6	Armour continuity	By means of two nos. Of tinned copper braided conductor of 25 sq. mm. for 11 kV 35 sq. mm. for 33kV and 50 sq mm for 66KV.
Accessories		
4.1.7	Suppression of electrical discharges over XLPE insulation	Cleaning solvent /equivalent, for manual application.
4.1.8	Installation Instruction	Shall be provided in English and Hindi and shall be inside every kit.
4.1.9	Sheet paper Tap	Paper tape, required for measurements during jointing, shall be provided inside every kit.
4.1.10	Identification Tag (for traceability)	a) An aluminum pouch with paper tag & sealing arrangement at one end shall be provided. b) This tag is required to be tied over the cable at one side of the joint. c) The paper tag shall give following information 1) Vendor kit designation 2) Division 3) Breakdown ID/Shutdown ID/Scheme No. 4) Cable section 5) Type of joint 6) Size of Joint 7) Make of joint 8) Voltage class 9) Serial no. of kit 10) Vendor lot & batch no 11) Month & year of manufacturing 12) Date of installation 13) Name of joiner 14) Name of vendor supervisor 15) Name of BSES supervisor 16) Remarks
4.1.11	Printing on each Heat/cold shrinkable or Moulded component	Month and year of manufacturing, batch no. /lot no., size, make, type etc.

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

4.2.0 Only for Heat Shrinkable STJ joints

4.2.1	Stress Control System	<p>a) The earthed insulation screen of an XLPE cable is terminated at a suitable distance (minimum 75 mm) from the connector (Ferrule).</p> <p>b) The stress control tube is in electrical contact with insulation screen.</p> <p>c) Impedance of the tube shall be constant up to an operating temperature and shall be within the range 1×10^8 ohm-cm to 8×10^8 ohm-cm.</p> <p>d) The physical and electrical properties shall conform to EA TS 09-13.</p>
4.2.1	Insulation build-up	<p>a) Maximum three layers of insulation tubes shall be used. Total thickness of the insulation being provided in the joint shall not be less than 1.2 times the insulation of the cable being jointed.</p> <p>b) Outer-most tube shall be screened insulating tube (dual wall tube). This tube shall be manufactured by extrusion process.</p> <p>c) Physical and Electrical properties shall conform to EA TS 09-13.</p>
4.2.2	Sealing end of tube	By means of Core end sealing sleeve with red mastic coating. \ Bidder must ensure to provide a solution to prevent water/moisture ingress in the joint.
4.2.3	Mechanical Protection	<p>a) For 3-core cable: By means of a rollable steel mat (with required protective coating against corrosion) (Refer Annex F)</p> <p>b) For 1-core cable:</p> <ul style="list-style-type: none"> i) Copper wire mesh ii) Adhesive coated medium wall tube iii) One more layer of copper wire mesh iv) Medium wall tube
4.2.4	Corrosion Protection	By means of semi-rigid tubes, internally coated with water blocking sealant. Thick wall Insulating tube

4.3.0 Only for Cold Shrinkable ST joints

Scope:

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

4.3.1	Stress Control System	By means of one piece body (splice assembly) providing stress control, insulation and screen continuity.
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Technical Specification For Heat Shrinkable And Cold Shrinkable Straight Through Jointing Kit (11 KV, 33 KV, 66 KV XLPE Insulated Cables)

4.3.2	Mechanical Protection	By application of mastic coated vinyl tape and armor cast structural material. The taped armor cast layer may also be sprayed with water to hasten the curing.
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4.4.0	Technical Particulars	Vendor shall submit Guaranteed Technical Particulars (GTP) as per Annexure A.
4.5.0 Testing & Inspection		
4.5.1	Type Tests	a) Straight-Through Joint shall be of type-tested quality. b) In addition to this, vendor will be required to conduct type-testing on heat/cold -shrinkable and moulded components, stress grading mastic, etc., in line with EA TS 09-13 standard, at third party test laboratory once in 6 months on randomly selected sample of each voltage rating without any commercial implication.
4.5.2	Routine & acceptance Tests	I) All the routine and acceptance tests shall be carried out as per EA TS 09-13 guidelines, refer Annexure C. II) H.V. Test shall be carried out on a randomly selected and installed Straight-Through Joint, in the presence of Purchaser's representative, at manufacturer's works. III) The joint shall withstand a test of 4Uo voltage for 4 hours.
4.5.6	Inspection	I) Purchaser reserves the right to inspect /witness all tests on the STJ Kits at Seller's works at any time, prior to dispatch, to verify compliance with the specification. II) In-process and / or final inspection call intimation shall be given in advance to purchaser.
4.5.7	Test Certificates	i) Three sets of complete Test Certificates (Routine & Acceptance tests) shall be submitted along with the delivery of STJ Kits. ii) Bought-out Items: Vendor shall submit Test Certificates, lot/batch number-wise, from their sub- suppliers / principal. TC's should clearly indicate the measured technical parameters, in accordance with sub-supplier's specification. (Also refer Annexure - C)
4.6.0	Documents	"Documents" refer to Documents, Data, Manuals, etc. (Scanned copy of signed documents also shall be part of entire soft file (e-file).

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

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

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


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

5.0.0 Quality Assurance Plan (QAP)

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

6.0.0 Deviations

6.1.0	Deviations	a) Deviations from this specification can be acceptable, only where the Seller has listed in his quotation the requirements he cannot, or does not, wish to comply with and which deviations the Buyer has agreed to in writing, before any order is placed. b) In the absence of any list of deviations from the Seller, it will be assumed by the Buyer that the Seller complies with the Specification fully.
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Technical Specification For Heat Shrinkable And Cold Shrinkable Straight Through Jointing Kit (11 KV, 33 KV, 66 KV XLPE Insulated Cables)	

7.0.0 Delivery

7.1.0	Delivery	Dispatch of Material: Vendor shall dispatch the material, only after the Routine Tests /Final Acceptance Tests (FAT) of the material witnessed/waived by the Purchaser, and after receiving written Material Dispatch Clearance Certificate (MDCC) from the Purchaser.
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Technical Specification For Heat Shrinkable And Cold Shrinkable Straight Through Jointing Kit (11 KV, 33 KV, 66 KV XLPE Insulated Cables)**Annexure - A: Guaranteed Technical Particulars (GTP)**

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

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

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

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

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

Annexure - B: Kit Content Table (KCT)

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

A. Heading

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

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

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

C. Notes on the KCT

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

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

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

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

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

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

B. Measurements of Dimensions

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

1. Supplied dimensions
2. Recovered dimensions

C. Destructive Testing

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

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

Routine Test Reports (RTR) (Typical)

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

Technical Specification For Heat Shrinkable And Cold Shrinkable Straight Through Jointing Kit (11 KV, 33 KV, 66 KV XLPE Insulated Cables)**Annexure - D: Deviation Sheet**

Sr No.	Clause No.	Deviation

Annexure - E: Service Conditions

(Atmospheric conditions in Delhi)

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

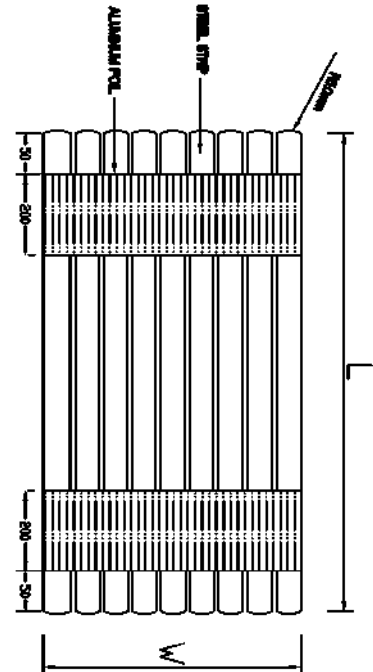
Technical Specification For Heat Shrinkable And Cold Shrinkable Straight Through Jointing Kit (11 KV, 33 KV, 66 KV XLPE Insulated Cables)

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

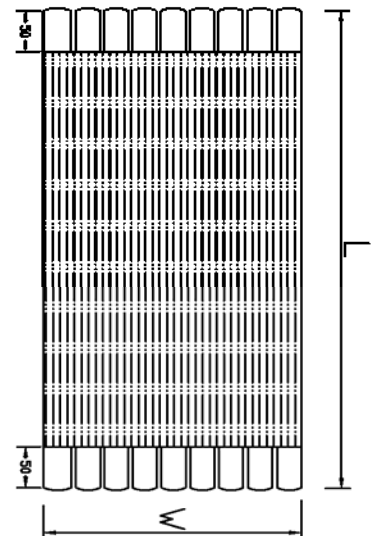


Technical Specification For Heat Shrinkable And Cold Shrinkable Straight Through Jointing Kit (11 KV, 33 KV, 66 KV XLPE Insulated Cables)

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



SIDE-B



SDE-B

STRENGTHENED WITH TWO SMALL ALUMINUM FOL. STOPS. IT SHOULD BE INSTALLED UPWARD SIDE-UP WITH ALMOST COMPLETE ALUMINUM FOL. IT SHALL BE RESTING OVER THE JOINT.

NOTE-ALL DIMENSIONS ARE IN MM

Tel: 09687 111 11

**YOUTH LINE ALSO
OFFER-SPRING AND-SUMMER**

DR. EUGENE HILL, JR., M.D., F.A.C.S., F.R.C.S., F.R.C.P.

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DIMENSIONS FOR 8TP TYPE G CANISTER

GENO.	VOLUME	JOINT SIZE	NO. OF STIFFERS	LENGTH (L)	WIDTH (W)
1	1IKV	1E9P1LC-1E9P1LC	40	1450	400
2	1IKV	2E4P1LC-2E4P1LC	46	1550	460
3	1IKV	1E9P1LC-1500L PE	40	1450	400
4	1IKV	2E4P1LC-3000L PE	46	1550	460
5	1IKV	1E9P1LC-3000L PE	46	1550	460
6	1IKV	7E0P1LC-3000L PE	46	1550	460
7	1IKV	1500L PE-1500L PE	34	1260	240
8	1IKV	3000L PE-3000L PE	36	1360	360
9	1IKV	1500L PE-3000L PE	36	1360	360
10	33IKV	30E9P1LC-30E9P1LC	50	1850	500
11	33IKV	30E9P1LC-40E9P1LC	50	1850	500

FORM	PA-358	TITLE--	 BSES BSES Yamuna Power Limited
SUBJECT	WATER		
APPN.	44	STRT TYPE-G CANNISTER V.H.	
DATE	11.11.13	(C.A.N) FOR DONT PROTECTION	
PG#	05	(GENERAL ARRANGEMENT)	
DWG.NO:-			CES/DP/ICT/1948
REV	0		

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

Specification no – SP-HSGTK-04-R1

Prepared by		Reviewed by		Approved by		Rev	Date
Name	Sign	Name	Sign	Name	Sign		
AV		GS		AA		B0	02/06/2017

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

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SP-HSGTK-04-R1

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

Record of Revision

Item/Clause No.	Change in Specification	Approved By	Rev

Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 KV, 33 KV, 66 KV Cables)**1.0.0 Scope of work**

Heat Shrinkable & GIS Termination Kits, suitable for 11 kV & 33 kV, 66KV XLPE / PILC cables, shall be designed, manufactured, tested, packed and delivered by the Vendor, as per Purchaser's requirements.

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

SL	Standard Number	Title
2.1.1	IS - 13573: 2011	Joints & Terminations of Polymeric Cables for working voltages from 6.6 kV up to and including 33 kV Performance Requirements and Type Tests
2.1.2	IS – 7098 Part 2 : 1985	Cross-linked Polyethylene (XLPE) Insulated PVC sheathed cables : Part 2 : For working voltages from 3.3 kV upto and including 33 kV
2.1.3	IS - 692: 1994	Paper insulated lead-sheathed cables (PILC) for rated voltages up to and including 33 kV specification
2.1.3	IS - 10810: 1984	Methods of test for cables

2.1.1 International Standards:

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

3.0.0 Cable Construction

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

XLPE type Cables: 3-core x 150, 300 & 400 sq. mm. Al
1-core x 630 or 1000 sq. mm. Al

PILC type Cables: 3-core 240 or 300 sq. mm. Al

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

3.1.0	Conductor	For XLPE : a) Electrolytic Grade stranded Aluminium b) Grade: H2/ H4 as per IS: 8130/84 (For Al) c) Shape: Compacted Circular d) Class 2 For PILC : a) 11 kV : sector-shaped b) 33kV: oval-shaped
3.2.0	Conductor Screen	For XLPE : Extruded Semi Conducting material For PILC : 11 kV : no conductor screen 33 kV : carbon paper
3.3.0	Insulation	For XLPE: Extruded XLPE Insulation For PILC: Layers of impregnated papers
3.4.0	Insulation Screen	For XLPE : a) Freely strippable Semi Conducting (without application of heat) for 66KV firmly bonded b) Copper Tape For PILC : a) 11 kV : absent (Belted) b) 33kV: metallised paper tape
3.5.0	Water Swellable Tape	For XLPE: Semi-conducting Water Swellable Tape shall be provided under the copper tape on each core. For PILC : not applicable
3.6.0	Filler	For XLPE: All interstices, including centre interstices filled by PP filler. For PILC : a) 11 kV : Crushed paper filler b) 33kV: Jute twine
3.7.0	Over all three cores	XLPE : Binder tape PILCA : 11 kV : belt paper 33kV: Copper Woven Fabric tape
3.8.0	Inner Sheath	For XLPE: Extruded Inner Sheath of Black PVC type ST-2. For PILC : Lead alloy sheath
3.9.0	Bedding Tape	For XLPE: not applicable For PILC: two layers of paper, followed by compounded (bituminized) cotton tape.
3.10.0	Copper Woven Fabric Tape (CWF tape)	For XLPE : not applicable For PILC : a) 11 kV : absent (Belted cable) b) 33 kV : applicable for screened cable

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

3.11.0	Armour	For XLPE : a) Galvanised steel flat strip armour (For 3 core cables) b) Hard drawn Aluminium Wire (For 1 core cables) c) Aluminium or lead sheathed for 66KV cable For PILC : a) 11 kV double steel tape armour
3.12.0	Binder Tape	For XLPE: Rubberised cotton tape
3.13.0	Outer Sheath	For XLPE: Extruded outer sheath of PVC (ST-2) for 11 KV/ 33 KV and HDPE for 66KV Cable with termite- repellent. For PILC : compounded (bituminised) Jute/PVC

4.0.0 Cable Termination Kits

General Technical Requirements for Cable Termination Kits are as follows:

4.1.0	Scope	Design, manufacture, testing and supply of Cable Termination Kits for H. T. Power Cables.				
4.2.0	Functional Requirements					
4.2.1.	Conductor Connection	Voltage Grade	Cable Size	Application	Material of Lug	Connection Method
		11 KV	3Cx 150 & 3Cx 300 sq mm	Indoor	Bi-Metal	Mechanical connector
				Outdoor	Aluminium	Mechanical connector
			1Cx1000 sq mm	Indoor	Aluminium	Crimping
				Outdoor	Aluminium	Crimping
		33 KV	3Cx400 sq mm	Indoor	Bi-Metal	Mechanical connector
				Outdoor	Aluminium	Mechanical connector
		66 KV	1Cx630 & 1Cx1000 sq mm	Indoor	Aluminium	Crimping
				Outdoor	Aluminium	Crimping
		a) For 240 sq. mm. PILC cable and 300 sq. mm. XLPE cable, the lug suitable for 300 sq. mm. XLPE cable shall be used. b) For GIS cable termination kits: Conductor connection assembly shall be done by standard method of split, silver-plated copper cone and pressure-fit contact assembly or as per manufacturer's standard.				

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

4.2.2	Stress Control System	<p>a) The earthed insulation screen of an XLPE cable is terminated at a suitable distance from the conductor.</p> <p>b) The tube is in electrical contact with insulation screen.</p> <p>c) Impedance of the tube shall be constant upto an operating temperature and shall be within the range 1×10^{08} ohm-cm to 8×10^{08} ohm-cm.</p> <p>d) Minimum length of stress control tube for 11 kV and 33 kV shall be 130 mm and 260 mm respectively.</p> <p>e) The physical and electrical properties shall conform to ESI 09: 13.</p> <p>f) For GIS cable termination kits Stress control shall be done by means of a polymeric stress cone. External profile of the cone shall match inner profile of GIS epoxy bushing. Vendor shall specify the material (EPDM / Silicone) of the cone.</p>
4.2.3	Insulation Protection	<p>a) XLPE insulation shall be protected by means of an outer tube, resistant to tracking and weathering.</p> <p>b) One end of the tube shall be coated internally with red sealant mastic for a length of 50 mm.</p> <p>c) Physical and Electrical properties shall conform to ESI 09: 13.</p>
4.2.3.1	Outer Anti-tracking Tube	Outer length of the tube shall be controlled by providing creepage Extension Shed having the same material composition as the tube. These lengths are given in the table below:

Cable System		Minimum Length of tube (mm)		Creepage Extension Shed (No.) (min)	
Voltage	Cores	Indoor	Outdoor	Indoor	Outdoor
11 kV	3 - core	650	650	Nil	2
	1 - core	340	340	Nil	2
33 kV	3 - core	800	1200	2	5
	1 - core	600	600	2	5

4.2.3.3	Oil Barrier Tube (applicable for PILC cable termination)	<p>a) Transparent tube is used for restoring the insulation provided by belt paper, which is terminated at the crotch.</p> <p>b) 33 kV PILC Termination: The oil barrier tube provides an oil-resistant layer to contain impregnating compound within, thus preventing anti-tracking tube coming in contact with the impregnating compound.</p>
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Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 KV, 33 KV, 66 KV Cables)

4.2.4	Environmental Sealing System	<p>a) Red Sealant Mastic Tape: This tape, used for sealing at ends, shall be synthetic rubber-based and resistant to tracking and weathering. Sufficient quantity of this tape shall be provided.</p> <p>b) Lug-sealing Sleeve: It shall have the same material composition as outer anti-tracking tube. The sleeve shall be fully coated internally with red sealant mastic tape. Length of the sleeve shall be so as to cover half length of the lug barrel and an equal length of track-resistant tube.</p> <p>c) Conductive Break-out: It shall be provided over the crotch for 3-core cables. The break-out base shall overlap PVC outer sheath by a 50 mm. minimum.</p> <p>d) For GIS termination kits : Environmental sealing of cores below the switchgear shall be by means of a trifurcation kit, consisting of heat shrinkable conductive break-out and heat-shrinkable conductive tube of total length of 6 metres supplied in one roll.</p>
4.2.5	Earth Bond System	<p>a) Earth Bond Assembly shall comprise of copper braided conductors as earthing conductors, GI armour support ring (split type) and two stainless steel hose clips.</p> <p>b) For GIS termination kit The earthing arrangement for 3-core cables shall be the same as stated under 'a' above.</p> <p>c) Two nos. copper braided conductors shall be of size: 25 sq. mm. for 11 kV cables, 35 sq. mm. for 33 kV cables and 50 sq mm for 66KV.</p> <p>d) Length of the copper braided conductor shall be 750 mm.</p> <p>e) Each copper braided conductor shall be supplied with copper lug, crimped at one end. Size of lug : 70 sq. mm. for 11 kV and 120 sq. mm. for 33 kV.</p>
4.2.6	Suppression of electrical discharges	<p>Following materials are required for use during cable termination :</p> <p>a) Silicone-based compound Required for filling-in minute services/ surface cracks over XLPE insulation.</p> <p>b) Polymeric mastic Required for application over semiconducting screen, for, eliminating any air-entrapment at any cut point on the surface. It should have sufficient elongation and electrical properties compatible with stress control tube.</p>
4.2.7	Installation. Instruction Sheet	It shall be in English and Hindi language and shall be provided inside every kit.
4.2.8	Identification Tag (for traceability)	<p>a) An aluminum pouch with paper tag & sealing arrangement at one end shall be provided.</p> <p>b) This tag is required to be tied over the cable at one side of the joint.</p> <p>c) The paper tag shall give following information</p> <ol style="list-style-type: none">1) Vendor kit designation2) Division3) Breakdown ID/Shutdown ID/Scheme No.4) Cable section5) Type of joint6) Size of Joint7) Make of joint

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

		8) Voltage class 9) Serial no. of kit 10) Vendor lot & batch no 11) Month & year of manufacturing 12) Date of installation 13) Name of jointer 14) Name of vendor supervisor 15) Name of BSES supervisor 16) Remarks
4.2.9	Paper Measuring Tap	Required for use during cable preparation / terminations.
4.3.0	Technical Particulars	Vendor shall submit Guaranteed Technical Particulars (GTP) as per Annexure A.
4.4.0	Type Tests	Termination Kit shall be of type-tested quality.
4.5.0	Testing & Inspection	
	a) Tests	All the routine and acceptance tests shall be carried out as per ESI guidelines. (Also refer Annexure -C)
	b) Inspection	1) Buyer reserves the right to witness all tests specified on individual H. S. components, Moulded components or completed Cable Termination Kit. 2) Buyer reserves the right to inspect Cable Termination Kit at the Seller's works at any time, prior to dispatch, to verify compliance with the specification. 3) In-process and final inspection call intimation shall be given in advance to purchaser.
	c) Test Certificates	Three sets of complete Test Certificates (Routine & Acceptance tests) shall be submitted along with the delivery of Cable Termination Kits.
	d) Type Test	a) End termination kit shall be of type-tested quality. b) In addition to this, vendor will be required to conduct type-testing on heat shrinkable and moulded components, stress grading mastic, etc., in line with EA TS 09-13 standard, at third party test laboratory once in every six months on randomly selected sample of each voltage rating without any commercial implication.
4.6.0	Documents	"Documents" refer to Documents, Data, Manuals, etc. (Scanned copy of signed documents also shall be part of entire soft file (e-file) or CD.)
4.6.1	Along with the Bid	Vendor shall submit signed 3 sets (plus 1 set of soft copy) of following documents: a) GTP (duly filled-in) (as per Annexure - A). b) Cross-sectional drawings for components Assembly c) Type Test Certificates d) Complete Catalogue and Instructions. e) Any other document.
4.6.2	After Award of Contract	Vendor shall submit signed 2 sets (plus 1 set of soft copy) of above mentioned documents within 15 days, for Purchaser's approval.

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

4.6.3	"As-Built" documents	Final signed "As-built" documents for the equipment in 3 sets (hard copy), 1 no. soft copy. These documents shall include signed Routine & Acceptance Test Certificates also.
4.7.0	Packing, Marking, Shipping, Handling and Storage	Every component/kit/box shall be properly sealed/ packed for protection against damage.
a)	Identification Label	Markings / Labels shall be on both sides of every packed box. 1) Identification number/type designation (as per manufacturer's standard) 2) Voltage grade, size, description of the Kit (including the voltage grade, size, type of the cables, for which it is to be used) 3) Batch no., lot no., etc. 4) Quantity 5) a) Purchase Order no. & date b) Purchaser's name BSES Yamuna Power Ltd c) BSES's SAP code number 6) Weights (kg) of each Cable Termination Kit and of each box containing kits. 7) Manufacturer's name 8) Month & Year of Manufacturing 9) Date of packing, shelf life (if applicable)
b)	Transit damage	The seller shall be responsible for any transit damage due to improper packing.

5.0.0 Quality Assurance (QA)

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

6.0.0 Deviations

6.1.0.	Deviations	A) Deviations from this specification can· be acceptable, only where the Seller has listed in his quotation the requirements he cannot, or does not, wish to comply with and which deviations the Buyer has agreed to in writing, before any order is placed. B) In the absence of any list of deviations from the Seller, it will be assumed by the Buyer that the Seller complies with the Specification fully.
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Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 KV, 33 KV, 66 KV Cables)**7.0.0 Delivery**

7.1.0.	Delivery	Despatch of Material: Vendor shall despatch the material, only after the Routine Tests/Final Acceptance Tests (FAT) of the material witnessed/waived by the Purchaser, and after receiving written Material Despatch Clearance (MDC) from the Purchaser.
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Annexure – A: Guaranteed Technical Particulars (GTP)

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

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

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

	steel mat)		
7.6	Method of conductor continuity a) For crimping connector b) For mechanical connector		
8	Description of items in the Kit, which are imported /sourced From Principal /Sub-suppliers		
9	Names of items in the Kit and their respective shelf life (months / years)		
10	Kit Content Table (KCT) enclosed? (Refer Annexure — B)	Yes / No	
11	Drawing for connector (ferrule) enclosed	Yes / No (If yes, mention the document reference)	
12	Is Annexure - D (Technical Deviation Sheet) duly filled-in?		
13	Packing (Qty) i) Packing of every Kit h) Group Packing	1 no -- No. of Kits per Box -- No. of Boxes	
14	Installation Procedure enclosed?	Yes / No (If yes, mention the document reference)	
15	Quality Assurance Plan (QAP for raw materials, in-process inspection, factory testing) is enclosed?	Yes / No	
16	Whether all heat-shrinkable and moulded components of the kit meet the requirements of and have been tested in accordance with EA TS -09-1 3.(for heat-shrinkable joints)	Yes / No (If yes, details of test report no. /Date /name of test laboratory to be mentioned.)	

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

17	Type Test Reports (TTR) (Relevant test report no. & date, With type, size, other details of each type of Kit.)		
	a) Prepared Joint: CPRI TTR as per BIS / IEC enclosed?	Yes/No	
	b) Loose Components: CPRI TTR as per EA TS 09-13 enclosed?	Yes/No	
18	Printing details on each of the Heat- shrinkable and Moulded components	(Mention the text, presently printed on each of the component)	

Annexure – B: Kit Content Table (KCT)

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

A. Heading

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

B. Details / Parameters

(For each component/item of the KCT)

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

C. Notes on the KCT

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

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

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

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

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

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

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

B. Measurements of Dimensions

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

- 1. Supplied dimensions
- 2. Recovered dimensions

C. Destructive Testing

On various heat-shrinkable / moulded components of ready Kits

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

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

D. Routine Test Reports (RTR)

(Typical)

BSES	SP-HSGTK-04-R1
Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 KV, 33 KV, 66 KV Cables)	

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

Annexure – D: Technical Deviation Sheet

Sr No.	Clause No.	Deviation

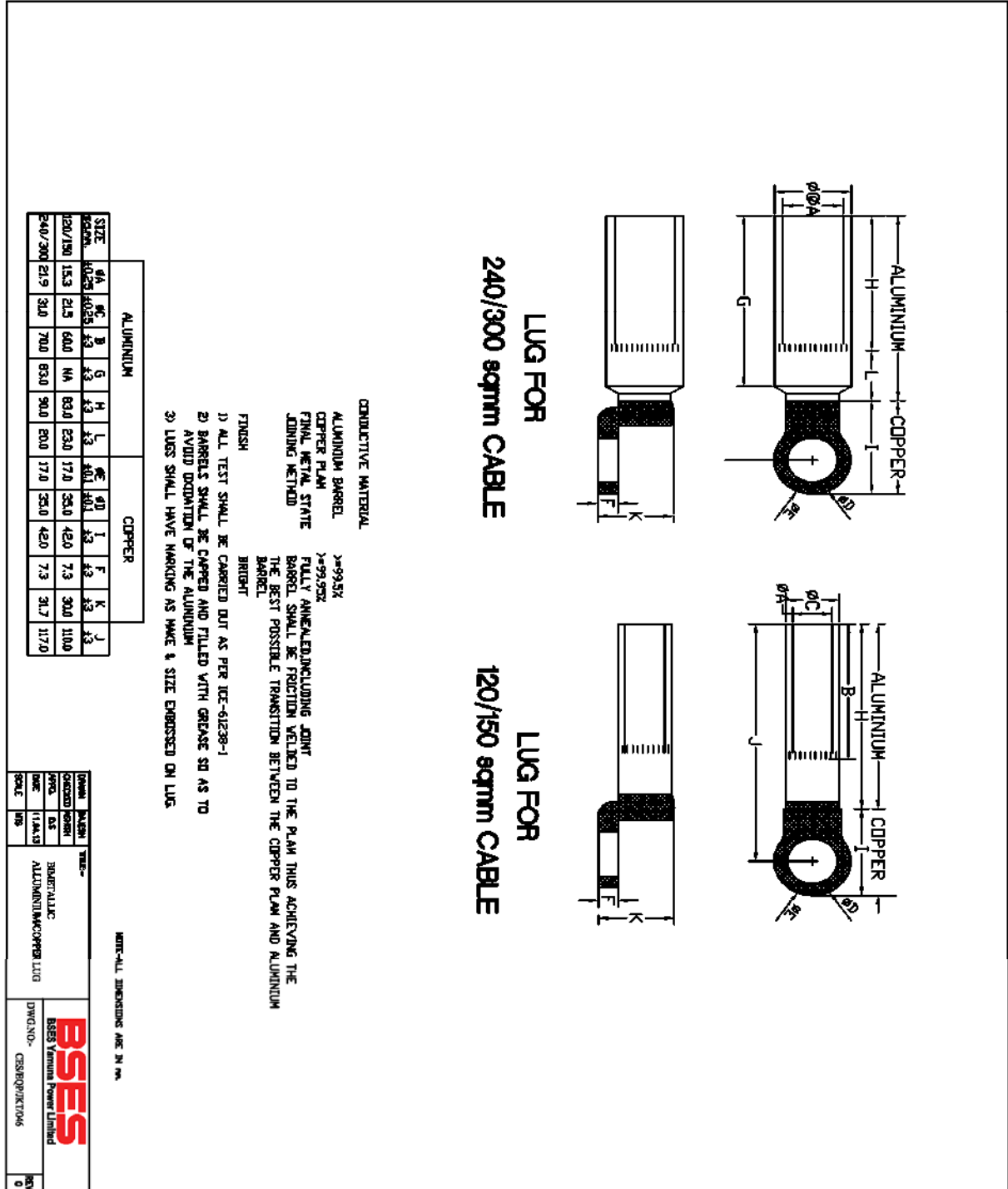
Annexure – E: Service Conditions

(Atmospheric conditions at Site)

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

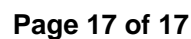
Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 KV, 33 KV, 66 KV Cables)

Annexure – F: Bimetallic Aluminium / Copper Lug



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

Annexure – G: Aluminum Lug For XLPE Cable



**TECHNICAL SPECIFICATION
FOR
CIVIL WORK
OF
CABLE BRIDGE**

Prepared by	Reviewed by	Approved by	Rev	1
Akhilesh Kumar	Gaurav Sharma	Ashwani Aggarwal	Date	07-May-19
Akhilesh Kumar	Gaurav Sharma	Ashwani Aggarwal	Page	1 of 12

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1 INTENT

The specification covers the following:

- a. Design, engineering, and construction of civil works for cable bridge of BSES Yamuna Power Ltd. All civil works shall also satisfy the general technical requirements specified in other Sections of this Specification and as detailed below.
- b. They shall be designed to the required service condition / loads as specified elsewhere in this Specification or implied as per National and International Standards.
- c. All civil works shall be carried out as per applicable Indian Laws, Standards and Codes. All materials shall be of best quality conforming to this specification, relevant Indian Standards and Codes.
- d. The Contractor shall furnish all design, drawings, labor, tools, equipment, materials, temporary works, constructional plant and machinery, fuel supply, transportation and all other incidental items not shown or specified but as may be required for complete performance of the Works in accordance with approved drawings, specifications and direction of Owner.
- e. The work shall be carried out according to the design/drawings to be developed by the bidder and approved by the Owner. Certain minimum requirements are indicated in this specification for guidance purposes only.
- f. The Owner shall provide the legal permission from the concerned dept. or Govt. agencies. The bidder shall visit the site to ascertain the quantum of work, present condition of the land before submitting the offer. No request for commercial changes will be entertained post award of work due to any claim related to site condition / plot condition. The layout and levels of all structure etc shall be made by the bidder at his own cost from the general grids of the site and benchmarks set by the bidder and approved by the Owner in presence of engineer in charge.
- g. The bidder shall give all help in instruments, materials and personnel to the Owner for checking the detailed layout and shall be solely responsible for the correctness of the layout and levels. The contractor shall make his own arrangements for water and electricity.

2 CODES & STANDARDS

The following Indian Codes and Standards shall generally be used for design of civil and structural works. In all cases, the latest revisions with amendments, if any, shall be followed.

- a. SP: 6 ISI handbooks for structural engineers.
- b. IS: 2062 Specification for Structural Steel (Standard quality).
- c. IS: 456 Code of practice for plain and reinforced concrete.

- d. IS: 800 Code of practice for general construction in steel.
- e. IS: 806 Code of practice for use of steel tubes in general building construction
- f. IS: 808 Rolled steel beam, channel & angle sections
- g. IS: 813 Scheme of symbols for welding.
- h. IS: 816 Code of practice for use of metal arc welding for general construction in mild steel.
- i. IS: 1080 Code of practice for design and construction of shallow foundations in soils (other than raft, ring and shell).
- j. IS: 875 Code of practice for design loads (other than earthquake) for buildings and structures.
- k. IS: 1893 Criteria for earthquake resistant design of structure
- l. IS: 1904 Code of practice for foundations in soil:-General requirements
- m. IS: 1905 Code of practice for structural safety of buildings
- n. IS: 2074 Ready mixed paint, air drying, red oxide chrome, priming
- o. IS: 2212 Code of practice for brick work
- p. IS: 2911 Code of practice for design & construction of pile foundation
- q. IS: 2950 Code of Practice for design and construction of raft foundations
- r. IS: 2974 Code of Practice for design and construction of machine foundations
- s. IS: 4326 Code of Practice for earthquake resistant design and construction of Buildings
- t. IS: 8009 Code of Practice for calculation of settlement of foundations: (parts 1& 2)
- u. IS: 1829 Code practice for protection of iron and steel (Part I to III) structures for atmosphere corrosion
- v. IS: 13920 Code practice for ductile detailing of reinforced concrete structure subjected to seismic force

3 SCOPE OF WORK

- a. Twenty number of cable (10 no's of 33 kV 3Cx400 sq mm cable and 10 no's of 11 kV 3Cx300 sq mm cables) will pass through the bridge. Live load considered as the cable weight.
- b. Inspection pathway of 1 meter on the bridge is required.
- c. Abutments are of RCC and other support structure and beam must be steel girder.

4 GUIDELINES FOR DESIGN

4.1 Design Loads for Equipment

Design criteria shall comprise the codes and standards used. Applicable climatic data including wind loads, earthquake factors maximum and minimum temperatures applicable to the building locations, assumptions of dead and live loads, including equipment loads, impact factors, Safety factors and other relevant information.

- a. Loads of cable and support structure shall be considered as per manufacturer's certified drawings.
- b. The soil testing must be carried out by the vendor to obtain the allowable bearing pressure required for the design of foundation.
- c. Foundations shall be analyzed for all possible load combinations as per the relevant IS codes.
- d. Minimum reinforcement shall be governed by IS: 2974 and IS: 456.

4.2 Design Criteria

- a. The minimum grade of concrete shall be M-35 & Grade of Steel FY-415
- b. Limit state method of design shall be adopted unless specified otherwise in the specification.
- c. For detailing of reinforcement IS: 2502 and SP: 16 shall be followed. Cold twisted deformed bars conforming to IS: 1786 shall be used as reinforcement. However, in specific areas mild steel (Grade I) conforming to IS:432 can also be used.
- d. The procedure used for the design of the foundations shall be the most critical loading combination of the steel structure and or equipment and/or superstructure and other conditions, which produces the maximum stresses in the foundation or the foundation component and as per the relevant IS Codes of foundation design. Detailed design calculations shall be submitted by the bidder showing complete details of work proposed to be used.

- e. Design shall consider any sub-soil water pressure that may be encountered following relevant standard strictly.
- f. Necessary protection to the foundation work. If required shall be provided to take care of any special requirements for aggressive alkaline soil. Black cotton soil or any other type of soil, which is detrimental / harmful to the concrete foundations in the running drain.
- g. Foundation system adopted by Bidder shall ensure that relative settlement.

5 CONSTRUCTION/EXECUTION WORK

The Contractor shall develop the site area to meet the requirement of the intended purpose. The site preparation shall conform to the requirements of relevant sections of this specification or as per stipulations of standard specifications. The Contractor shall give all help in instruments, materials and personnel to the Owner for checking the detailed layout and shall be solely responsible for the correctness of the layout and levels.

5.1 Cement, Concrete & Steel Grades

5.1.1 Cement

- a. Unless otherwise specified or called for by Engineer, the fresh ordinary Portland cement conforming to IS-8112 of 1976 (latest revision) i.e. 43 grade shall be used for the works.
- b. Make of cement shall be ACC/J.K Laxmi/Ultratech or approved by the owner.
- c. The record of cement shall be maintained in M.A.S register by the contractor and verified by engineer of the BYPL.
- d. Cement shall be stored in a perfectly water-tight and well ventilated site store capable of accommodating cement to ensure continuity of the work and having a raised and perfect dry floor. Each parcel or consignment of cement shall be stacked separately therein to permit easy access for inspection and a record shall be kept so that each parcel or consignment may be identified. Cement which has become stale or otherwise unsuitable and any bags or the like containing hardened lumps or cakes of cement, consequent to storage at Contractor's site stores will be rejected and shall be removed from the site and disposed of as directed by the Engineer. The cost of such rejected quantities shall be borne by the Contractor.

5.1.2 Concrete

- a. Design Mix of M-35 grades of concrete as per provisions of IS: 456 and other applicable codes shall generally be used for civil work. RMC must be of ACC/Ultratec/Shree cement.

5.1.3 Steel

- a. The reinforcing bars shall be Fe-415 generally conform to various requirements of IS: 1786 (for High Strength deformed steel bars and wires for concrete reinforcement).
- b. Only TATA/SAIL/JINDAL make shall be used.

5.1.4 Aggregates

- a. Aggregates shall consist of natural sand, crushed stone and gravel and shall be chemically inert, strong, hard, clean, durable against weathering of limited porosity, free from deleterious materials and shall conform to the applicable standards. If so desired by the Engineer, they shall be washed and screened.
- b. Sampling and testing shall be as per the applicable standards and shall be carried out under the supervision of Engineer. The cost of all test, sampling, etc. shall be borne by the Contractor.
- c. All coarse and fine aggregates shall be stacked separately and shall avoid contamination with foreign materials. Segregates aggregates shall be rejected.
- d. The necessary arrangements for field test shall be done at site. The material testing register and weighing material register shall be maintained for field and lab mandatory test by the contractor's authorized site engineer, having degree in Civil Engineering or minimum three year experience with diploma in civil engg. The copy of all the certificates shall be submitted to BSES officials.

5.1.5 Water

- a. Water used for both mixing and curing shall be as per applicable standards.
- b. Potable waters are generally satisfactory. Where water can be shown to contain an excess acid, alkali, sugar or salt, Engineer may refuse to permit its use.
- c. Water test certificate provide by the vendor.

5.1.6 Bricks

- a. Ensure that the bricks are free from cracks, war page and of uniform colour.
- b. Manufacturer's test report & Material Test reports for all the materials shall be submitted for approval prior to the utilization for work.

- c. Contractor shall make his own arrangements for the storage of adequate quantity of material.

5.2 Levelling, Excavation, Backfill & Compaction

- a. If fill material is required, the fill material shall be suitable as per the requirement & level. The fill shall be such a material and the site so designed as to prevent the erosion by wind and water of material from its final compacted position or the in-situ position of undisturbed soil. Backfill material around foundations or other works shall be suitable for the purpose for which it is used and compacted to the density described under Compaction. If rocky strata available at site then bidder have to do all the necessary arrangements for rock cutting & its disposal.
- b. The thickness of fill material under the foundations shall be such that the maximum pressure from the footing, transferred through the fill material and distributed onto the original undisturbed soil will not exceed the allowable soil bearing pressure of the original undisturbed soil. For expansive soils the fill materials and other protections etc. to be used under the foundation is to be got approved by the Owner. All the area excavated in due course of construction must be filled by vendor. The area of future bay must be filled by vendor up to the proper level of yard.
- c. Whenever water table is met during the excavation, it shall be dewatered and water table shall be maintained below the bottom of the excavation level during excavation, concreting and backfilling.
- d. Material unsuitable for founding of foundations shall be removed and replaced by suitable fill material and to be approved by the Owner. Excavated material not suitable or not required for backfill shall be disposed off in areas as directed by Owner. Excavation and backfill for foundations shall be in accordance with the relevant IS code.
- e. The density to which fill materials shall be compacted shall be as per, relevant IS and as per direction of Owner. All compacted sand filling shall be confined as far as practicable. Backfilled earth shall be compacted to minimum 95% of the Standard Proctor's density at OMC. The sub-grade for the roads and embankment filling shall be compacted to minimum 95% of the Standard Proctor's density at OMC. Cohesion less material sub grade shall be compacted to 70% relative density (minimum).

5.3 General Requirement Site Surfacing/Stone Filling

The material required for site surfacing/stone filling shall be free from all types of organic materials and shall be of standard quality, and as approved by the Owner. The material to be used for stone filling/site surfacing shall be uncrushed/crushed/broken stone of 20 mm nominal size (ungraded single size) conforming to Table 2 of IS:383 - 1970. Hardness, Flakiness shall be as required for wearing courses are given below:

- a. Sieve Analysis limits (Gradation)
(IS: 383 - Table - 2)

Sieve	% passing by weight
Size	100
40mm	85 – 100
20mm	0 – 20
10mm	0 – 5

'One Test' shall be conducted for every 500 Cu.m.

b. Hardness

Abrasion value (IS: 2386 Part-IV) - not more than 40%

Impact value (IS: 2386 Part-IV) - not more than 30% and frequency shall be one test per 500 cum with a minimum of one test per source

c. Flakiness Index

One test shall be conducted per 500 cum of aggregate as per IS:2386 Part-I and maximum value is 25%

5.4 Admixtures & Additives

- a. Only approved admixtures shall be used in the concrete for the Works. When more than one admixture is to be used, each admixture shall be batched in its own batch and added to the mixing water separately before discharging into the mixer. Admixtures shall be delivered in suitably labeled containers to enable identification.
- b. Admixtures in concrete shall conform to IS: 9103. The waterproofing cement additives shall conform to IS: 2645. Owner shall approve concrete Admixtures/ Additives.
- c. The contractor may propose and the Owner may improve the use of a water-reducing set-retarding admixture in some of the concrete. The use of such an admixture will not be approved to overcome problems associated with inadequate concrete plant capacity or improperly planned placing operations and shall only be approved as an aid to overcoming unusual circumstances and placing conditions.
- d. The water-reducing set-retarding admixture shall be an approved brand of Ligno-sulphonate type admixture.
- e. All Reinforcement to Steel Bars shall confirm to IS 1786:1985 of Grade Fe-415.
- f. M-35 Grade of Concrete shall be used.
- g. 100mm Thick Lean Concrete shall be laid under all foundations.
- h. Loose pockets shall be completely removed & filled with PCC(1:4:8)

6 SUBMISSIONS

The following documents shall be submitted by the Contractor for approval of the BYPL prior to commencement of fabrication and erection / construction.

This list is not exhaustive but indicative only. Final list of drawings shall be prepared by successful Bidder during detailed engineering.

Drawing submission shall be as per the matrix given below. All documents/ drawing shall be provided in Soft & Hard on A3/ A4 sheet in box file with separators for each section. Language of the documents shall be English only. Deficient/ improper document/ drawing submission may liable for rejection

S. No	Detail of Document	Bld	Approval	Post construction
1	Soil test report		Required	
2	Foundation design & drawing of cable bridge	Required	Required	Required
3	Structural steel fabrication drawings for cable support structure		Required	Required
4	Retaining support wall		Required	Required
5	Pile foundation detail of abutments		Required	Required

7 INSPECTION & TESTING

Necessary arrangements for field tests shall be done at site. Bidder has to do the following tests from NABL accredited labs:

- Raw material test : For Cement, sand , aggregates, water, brick, Steel
- Cube Test for compressive strength of concrete

8 QUALITY CONTROL

- Construction Quality shall be properly controlled by the bidder. Bidder shall work as per the Field Quality Plan provided by the owner. All the Tests specified in the Field Quality Plan shall be done by bidder.

- c. A Civil Engineer shall be deployed by the bidder for construction quality control. Civil Engineer has to review ongoing construction work, check materials and workmanship.

9 STATUTORY RULES




- a. Contractor shall comply with all the applicable statutory rules pertaining to factories act (as applicable for the State). Fire Safety Rules of Tariff Advisory Committee. Water Act for pollution control and coordinate with forest department for necessary approval prior to tree cutting.
- b. Plastering on structural members (in fire prone areas) etc. shall be made according to the recommendations of Tariff Advisory Committee.
- c. Statutory clearance and norms of State Pollution Control Board shall be followed as per Water Act for effluent quality from plant.

10 DEVIATIONS

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 that the bidder complies fully with this specification. No deviation will be acceptable post order.

**Specification
for
Bay Marshalling Box**

Specification no – SP- PTHU-01-01

Prepared by:		Reviewed by:		Approved by:		Rev	Date
Name	Sign	Name	Sign	Name	Sign	1	20 th January 2012
Ashish		Gaurav		DS			

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1.0.0 Codes & standards

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

Indian Standards

IS 12063	Classification of degrees of protection provided by enclosure of electrical equipment
IS 5039	Distribution pillars for voltage not exceeding 1000V AC and 1200V DC
IS 2147	Degree of Protection provided by enclosures for low voltage switchgear and controlgear.
IS 5133 Part I	Boxes for enclosure of the electrical accessories: Steel and Cast iron boxes
IS 8828	Circuit breaker for overcurrent protection for household & similar installations.
IS 6005	Code of practice for phosphating iron and steel.
IS3202	Code of practice for climate proofing.
IS 2551	Danger Notice Plates
IS 4237	General requirement for switchgear & controlgear for voltage not exceeding 1000V AC & 1200V DC.
IS 8623	Low voltage switchgear & controlgear assemblies
	Indian Electricity Rules
	Indian Electricity Act

2.0.0 Major Design Criteria & Parameters of the Bay Marshalling Kiosk

2.1.0	Type	Bay marshalling Kiosk shall be made out of sheet metal, suitable for Outdoor application, vertical self standing enclosure.
2.1.1	Service condition	Refer annexure B
2.2.0	Major Parts	
2.2.1	Enclosure	Made out of CRC sheet metal of not less than 2mm thick at the side and Top.
2.2.2	Design	Shall be dust and vermin proof, suitable for humid, dusty and tropical atmosphere. Lifting lugs shall be provided to the top. It shall have domed or sloping roof. Hinged type door shall be provided in front of enclosure. Door shall have handle and provision of padlocking arrangement. (see fig 1)

2.3.0	Internals of marshalling Kiosk	
2.3.1	Terminal block	<p>MB shall have three distinct sets of Terminal block in vertical formation required for</p> <ul style="list-style-type: none"> a) AC & DC Distribution up to 415V for AC and 220V for DC. b) For CT & PT connections c) For other potential free contacts. (see fig 1)
2.3.2	Type of Terminal	<ul style="list-style-type: none"> i) AC and DC distribution terminals shall be non disconnecting stud type. Refer figure-1 for terminal sizes. ii) CT & PT terminals shall be disconnecting Stud type suitable for 6mm² copper cable. iii) For other potential free contacts terminals shall be stud type suitable for 6 mm² copper cable.
2.3.3	Design	<p>The terminal blocks shall be made of non-inflammable, molded resin / polyamide with integrally molded barriers, brass inserts & removable transparent covers. Each terminal shall be clearly marked with identification number or letters Each terminals shall have provision for insertion of banana plugs for testing. Marshalling Kiosk shall have followings: -</p> <ul style="list-style-type: none"> -To receive 415V AC 3phase 4wire and distribution as per scheme in figure -1. - To receive DC supply and distribution as per scheme in figure-1.
2.3.4	Distribution MCB	<p>The MCB for AC and DC power supply shall be mounted in horizontal configuration at the bottom. For AC circuit MCB shall be 4Pole and 2Pole. For DC it shall be 2 Pole. Partition barrier shall be provided for identification of AC and DC (see fig 2)</p>
2.3.5	Wiring	<p>Copper flexible 1.1Kv grade PVC insulated, FRLS grade. The wiring shall be neatly bunched, supported and should be readily accessible, PVC troughs shall be provided.</p>
2.4.0	Cable Entry	<p>Removable cable gland plate shall be provided at the bottom made out of not less than 2.5mm thick sheet. Proper PVC conduit shall be provided for dressing of wires up to the terminals.</p>
2.5.0	Panel Illumination	<p>A lamp with Door limit switch shall be provided for illumination of panel. A 5/15 power socket shall also be provided.</p>
2.6.0	Heater	<p>A heater with thermostat and Fuses shall be provided inside the panel.</p>

2.7.0	Earthing	Two (02) no's earthing terminals shall be provided at both side for earthing.
2.8.0	Painting	
2.8.1	Painting surface preparation	The cubicle shall be painted by chemical 7 tank process with minimum 75 micron thickness.
2.8.2	Painting external finish	692 as per IS 5 on external side and Glossy white inside enclosure.

3.0.0 Fittings and Accessories on Bay Marshalling Kiosk

3.1	Rating and Diagram Plate	Required
3.1.1	Material	Anodized aluminum 16SWG
3.1.2	Background	SATIN SILVER
3.1.3	Letters, diagram & border	Black
3.1.4	Process	Etching
3.2	Name plate details	Required

4.0.0 Approved make of components

4.1	Connectors	Connectwell, Elmex, Phoenix
4.2	Flexible wire	Finolex, Lapp Kabel
4.3	MCB	Schneider, L&T, Siemens, Legrand
4.4	Space heater with thermostat	Elcon, Girish

Note – Any other make of component to be approved by purchaser

5.0.0 Quality assurance

5.1	Vendor quality plan	To be submitted for purchaser approval.
5.2	Inspection point	To be mutually identified and agreed in quality plan

6.0.0 Progress Reporting

6.1	Outline Document	To be submitted for purchaser approval for outline of production, inspection, testing, packing, dispatch, documentation programme
6.2	Detailed Progress report	To be submitted to Purchaser once a month containing i) Progress on material procurement ii) Progress on fabrication (As applicable) iii) Progress on assembly (As applicable) iv) Progress on internal stage inspection v) Reason for any delay in total programme vi) Details of test failures if any in

		manufacturing stages. vii) Progress on final box up Constraints / Forward path
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7.0.0 Drawing, Data & manuals

7.1.0	To be submitted along with bid	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 programme and ISO 9000 series or equivalent national certification 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.
7.2.0	After award of contract, seller has to submit mentioned drawings for buyer's Approval (A) / Reference (R)	i) Programme for production and testing (A) ii) Guaranteed Technical Particulars (A) iii) Calculations to substantiate choice of electrical, structural, mechanical component size / ratings (A) iv) Detailed dimensional drawing for all components, general arrangement drawing showing detailed component layout and detailed schematic and wiring drawings for all components. v) Terminal arrangement details etc (as applicable) (A) vi) Drawing of major components (A) vii) Rating and diagram plate (A) viii) Detailed loading drawing to enable the buyer to design and construct foundations (as applicable) (R) ix) Transport / Shipping dimensions with weights. etc (As applicable) (R) x) List of makes of all components (A) xi) Detailed installation and commissioning instructions (R) xii) Quality plan
7.3.0	Submittals required prior to	i) Inspection and test reports, carried out in

	dispatch	manufacturer's works (R) ii) Test certificates of all bought out items iii) Operation and maintenance Instruction as well as trouble shooting charts/ manuals
7.4.0	Drawing and document sizes	Standard size paper A0, A1, A2, A3, A4
7.5.0	No of drgs. /Documents required at different stages	As per Annexure A Scope of Supply

8.0.0 Inspection & testing

8.1.0	Inspection and Testing during manufacture	
8.2.0	Sheet metal Box / Panel	i) Checking of dimensions as per approved drawing. ii) Checking for thickness of sheet metal. iii) Thickness of Paint as applicable
8.3.0	Connectors/MCB/Wire	i) Check for routine electrical test.
8.4.0	Routine tests	Following routine test shall be conducted on each BMK :- - Dimensional Checks - Degree of protection for enclosure (paper insertion test) - Test for paint thickness. - HV/IR tests - Functional tests.
8.5.0	Type Tests	a) On cubicle of each rating and type (In Govt. recognized independent test laboratory) i) IP Protection test. b) In case 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. / authorized body then it shall be acceptable for type testing.
8.6.0	Acceptance test	Following routine test shall be conducted on each BMK :- - Dimensional Checks - Degree of protection for enclosure (paper insertion test) - Test for paint thickness. - HV/IR tests

		- Functional tests.
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9.0.0 Packing , Shipping, Handling and Storage

9.0.0	Packing	
9.1.1	Packing protection	Against corrosion, dampness, heavy rains, breakage and vibration
9.1.2	Packing for accessories and spares	Robust wooden non returnable packing case with all the above protection and identification labels.
9.1.3	Packing identification label	<p>In each packing case, following details are required :</p> <ul style="list-style-type: none"> 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's / its agent viii) Description and quantity ix) Country of origin x) Month and year of manufacturing xi) Case measurements xii) Gross and net weights in kilograms xiii) All necessary slinging and stacking instructions.
9.1.4	Shipping	<p>i) The bidder shall ascertain at an early date and definitely before the commencement of manufacture, any transport limitations such as weights, dimensions, road culverts, Overhead lines, free access etc. from the manufacturing plant to the project site; and furnish to the Purchaser confirmation that the proposed packages can be safely transported, as normal or oversize packages, up to the plant site. Any modifications required in the infrastructure and cost thereof in this connection shall be brought to the notice of the Purchaser.</p> <p>ii) The seller shall be responsible for all transit damage due to improper packing.</p>
9.1.5	Handling and Storage	Manufacturer instruction shall be followed. Detail handling & storage instruction sheet / manual needs to be furnished before commencement of supply.

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, assembly, testing at stages of manufacture as per Cl. 12 of this specification, final testing at manufacturer works on completely assembled bay marshalling Kiosk before dispatch, packing, delivery and submission of all documentation for the bay marshalling Kiosk.

1.2 BOQ as following -

Sr No	Purchaser Equipment Tag No / SAP code	Location / Substation name	Unit	Quantity
1		e.g. Santacruz	No	e.g. 1
2		e.g. Alaknanda	No	e.g. 1
3				

2.0 Submission of documents

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	6 copies + 1 soft copy in CD	
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	
Test Report	2 copies		6 copies + 1 soft copy in CD	Type test and sample routine test reports

3.0 Delivery schedule

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

Annexure – B - Service Conditions

1.0.0	Delhi Atmospheric conditions	
a)	Average grade atmosphere:	Heavily polluted, dry
	Maximum altitude above sea level	1000 M
b)	Ambient Air temperature	Highest 50 deg C, Average 40 deg C
	Minimum ambient air temperature	0 Deg C
c)	Relative Humidity	100 % Max
d)	Thermal Resistivity of Soil	150 Deg.C cm/W
e)	Seismic Zone	4 as per IS 1893
f)	Rainfall	750 mm concentrated in four months
g)	Wind Pressure	195Kg/m ² up to 30M elevation as per IS 875-1975

Annexure – C - Guaranteed Technical Particulars

Sr No	Description	Data by purchaser	Data by Supplier
1.0	Location of equipment	Project specific to be filled up	
2.0	Name of manufacturer		
2.1	Address & contact details		
3.0	Type		
3.1	Manufacturer Model no		
4.0	Degree of protection of enclosure	IP55	
5.0	Thickness of sheet metal enclosure		
5.1	- Top & side sheet	2.0mm min.	
5.2	- Bottom sheet	2.5mm min.	
6.0	Internal lamp with door switch provided		
7.0	Rating of space heater with thermostat		
8.0	Rating of plug and socket	5/15 Ampere	
9.0	Terminal Blocks		
9.1	Make and type		
9.2	Rating		
9.3	Number of terminals provided	As per Fig 2	
9.4	Suitable for conductor size		
9.5	20% spare terminals provided for scheme furnished		
10.0	Miniature circuit breaker		
10.1	Make and type		
10.2	Rated voltage & frequency		
10.3	No. of poles		
10.4	Current rating		
	- Continuous at 50DEG C		
	- Short time for 1 sec.		
10.5	Breaking capacity		
	- Symmetrical		
	-Assymeterical		

10.6	Type of blow out device		
10.7	Type of overload device		
10.8	Terminals suitable for cable size		
10.9	Whether provided with 2NO/2NC aux. Contacts		
11.0	Cables and Wire		
11.1	Voltage grade	1.1KV	
11.2	Conductor		
11.3	-Material	Copper	
11.4	-Size	10 & 6mm ²	
12.0	Overall dimensions (depth, width & height)		
13.0	Details of earthing studs		

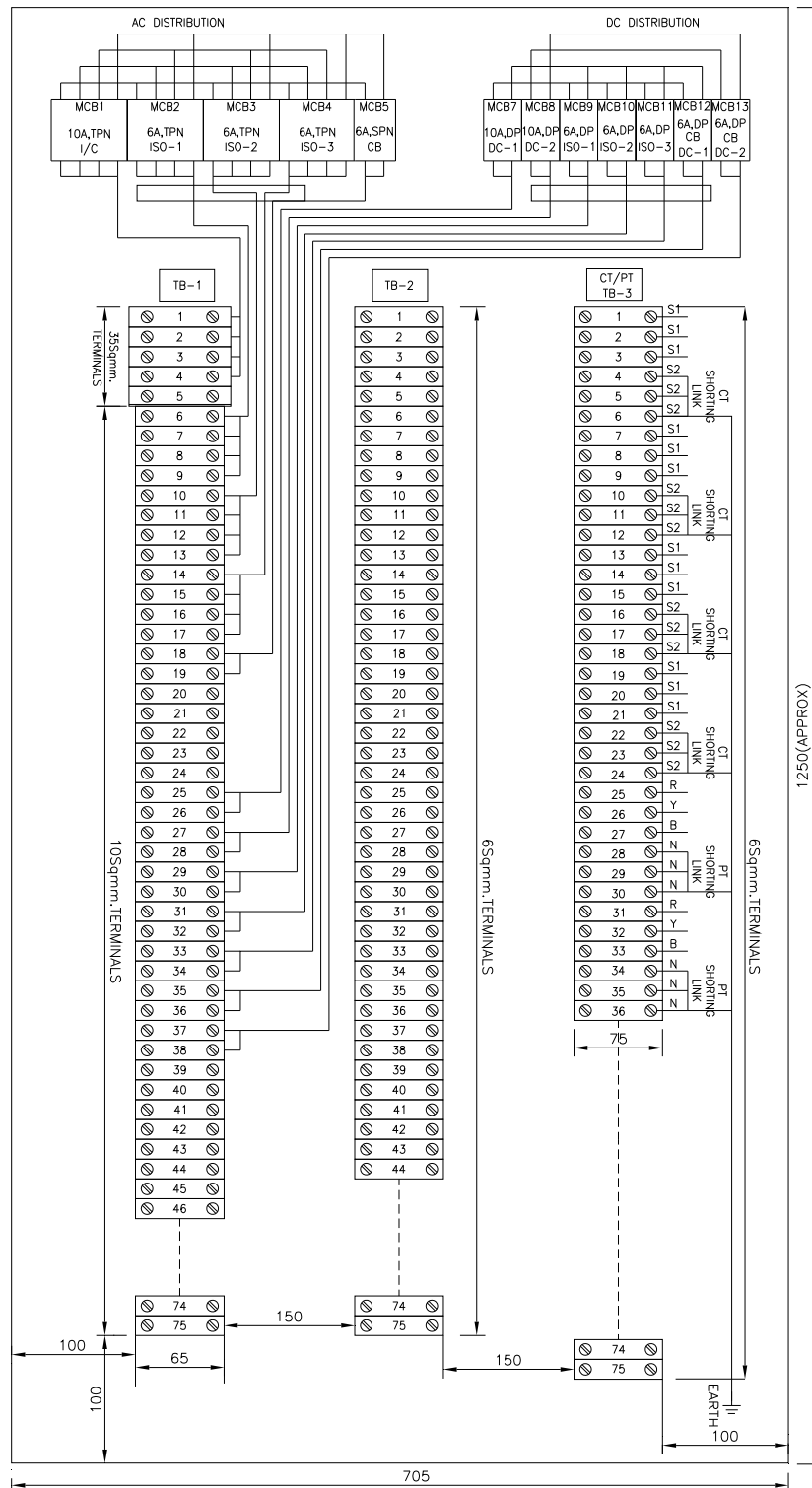


FIGURE-1 –SCHEMATIC DIAGRAM

Note –

1. Terminal block TB-1(75 nos), TB-2(75nos), shall be non disconnecting stud type
2. Terminal block TB-3 (75 nos) shall be disconnecting stud type.
3. Cable Trough shall be provided along the terminal blocks.
4. Busbar type links should be used for CT/PT star point formation. 6 nos. spare links to be provided for shorting of spare core of CT.
5. All dimensions are in mm.

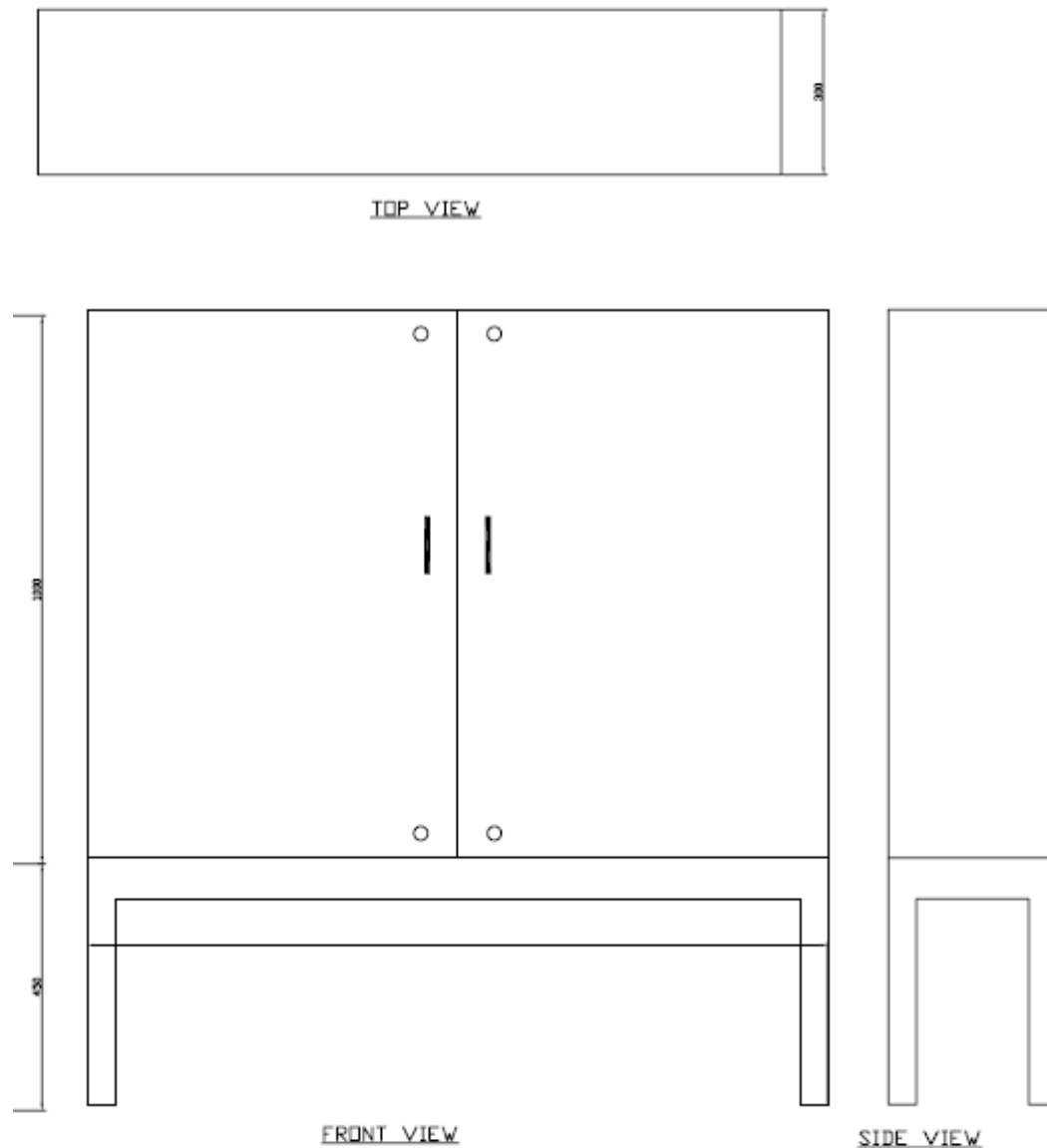


FIGURE -2 – DIMENSION DRAWING

Note –

1. Panel should be suitable for outdoor application. Degree of protection for enclosure should be IP55.
2. Color shade should be 692 as per IS5. Internal paint shall be glossy white.
3. Rain canopy of appropriate size should be provided at the top of panels.
4. All dimensions are in mm.

TECHNICAL SPECIFICATION

FOR

CABLE SEALING SYSTEM

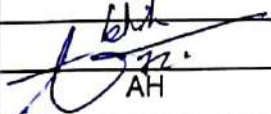

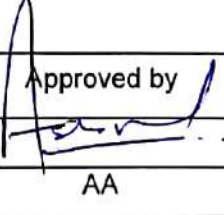
Prepared by  AH	Reviewed by  GS	Approved by  AA	Page 1 of 8
			Rev 0
			Date 26 Apr 2019

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TECHNICAL SPECIFICATION FOR CABLE SEALING SYSTEM**1.0 SCOPE**

- This specification covers the design, manufacture, testing, supply, erection & commissioning of Cable Sealing System and its accessories.
- Scope also includes
 - Supply of Modular Cable Sealing System including its transportation to BYPL Sites.
 - Installation testing commissioning of Modular Cable Sealing Solution with all the accessories including civil work if any.

2.0 CODES & STANDARDS

- Material, equipment and methods used in the manufacturing of Cable Sealing System shall confirm to the latest edition of following standard

Standard Name / No	Standard's Description
Indian Electricity Act	Latest Edition
CBIP manual	Latest Edition
BS476 Part 20	Fire tests on building materials and structures. Method for determination of the fire resistance of elements of construction (general principles)

3.0 SERVICE CONDITIONS

3.1	Max Ambient Temperature	50 deg C
3.2	Max Daily average ambient temp	40 deg C
3.3	Min Ambient Temp	0 deg C
3.4	Maximum Humidity	95%
3.5	Minimum Humidity	10%
3.6	Maximum annual rainfall	750 mm
3.7	Average no of rainy days per annum	60
3.8	Rainy months	June to Oct
3.9	Altitude above MSL	300 M
3.10	Seismic Zone	IV

TECHNICAL SPECIFICATION FOR CABLE SEALING SYSTEM

4.0 GENERAL FEATURES

4.1	Multi-cable transit system	Consisting of transit frames
4.1.1	Material	Stainless Steel of Grade 304
4.2	Multi-layered Insert blocks with Accessories	
4.2.1	Characteristic	Peelable, Tearable and adjustable
4.2.2	Material	Lycron or EPDM based halogen free rubber low-smoke index rubber
4.2.3	Filling of usable insert blocks for the future use	For Uncovered space left
4.2.4	Spare Capacity	30%
4.3	Retainer Plate	Required
4.4	End Packing	Required
4.5	Lubricant	Required
4.6	Stay Plates	For separating Flexible multi-layered Insert blocks
4.6.1	Material	Stainless Steel of Grade 304
4.7	Press Wedge	
4.7.1	Material	EPDM based halogen free low-smoke index rubber
4.8	Special Tool	For opening the cable sealing system
4.9	Fire insulation	3 Hours
4.10	Tests	
4.10.1	Type test as per BS476 Part 20 or UL-1479 or NBC-2016.	Required
4.10.2	Water Tightness (3 Bar) Type Test	Required
4.10.3	Smoke Tighness (2.5 Bar)	Required
4.10.4	Protection against Vermin	Required
4.11	IP Protection	IP67
4.12	Shelf Life	25 Years
4.13	Solubility in Water	Insoluble
4.14	Make	Roxtec, MCT brattberg

- Note- Any other make other than specified in above table shall be subject to BSES Yamuna Power Limited Approval.

TECHNICAL SPECIFICATION FOR CABLE SEALING SYSTEM

5.0 DEVIATIONS

- Deviation from this specification shall be stated in writing with the tender by reference to the specification clause/ GTP/ Drawing and description of alternative offer. In absence of such a statement, it shall be assumed by the buyer that the seller complies fully with this specification.

6.0 QUALITY, INSPECTION & TESTING

6.1	Vendor quality plan	To be submitted for purchaser approval
6.2	Inspection points	To be mutually identified & agreed in quality plan
6.3	Type test	Equipment shall be type tested from CPRI/ERDA/NABL accredited lab as per IEC/IS/UL standard.
6.4	Routine test	As per relevant standard
6.5	Acceptance test	To be performed in presence of Owner at manufacturer works shall be as per approved QAP

7.0 GTP

- Vendor must submit clause wise compliance against specification at the time of drawing approval.

8.0 DRAWING AND DATA SUBMISSION MATRIX

S. No	Head	Bid	Drawing Approval	Pre Dispatch	Pre Closure
8.1	Contact Person Name, Email ID and Mobile Number	Required	Required		
8.2	Deviation Sheet (as per "Deviations" Clause)	Required			
8.3	GTP	Required	Required		
8.4	Relevant Type Test as per IS/IEC/UL	Required	Required		

TECHNICAL SPECIFICATION FOR CABLE SEALING SYSTEM

S. No	Head	Bid	Drawing Approval	Pre Dispatch	Pre Closure
8.5	Manufacturer's quality assurance plan and certification for quality standards		Required		
8.6	Sizing Calculation of Associated Equipment		Required		
8.7	Recommended Spares for five years of operation)		Required		
8.8	Drawings	Required	Required		
8.9	QAP		Required		
8.10	BOQ		Required		
8.11	Make of all Component as per specification		Required		
8.12	Installation, erection and commissioning manual		Required		
8.13	Inspection Reports			Required	
8.14	As manufacturing Drawings			Required	
8.15	Operation and Maintenance Manual			Required	
8.16	Trouble shooting manual			Required	
8.17	As built Drawings				Required

9.0 PACKING

9.1	Packing Protection	Against corrosion, dampness, heavy rains, breakage and vibration. During transportation/ transit and storage, module may be subjected to outdoor conditions. Hence, packing of each panel shall be weatherproof.
9.2	Packing for accessories and spares	Robust wooden non returnable packing case with all the above protection & identification Label

TECHNICAL SPECIFICATION FOR CABLE SEALING SYSTEM

9.3	Packing Identification Label to be provided on each packing case with the following details
9.3.1	Individual serial number
9.3.2	Purchaser's name
9.3.3	PO number (along with SAP item code, if any) & date
9.3.4	Equipment Tag no. (if any)
9.3.5	Destination
9.3.6	Project Details
9.3.7	Manufacturer / Supplier's name
9.3.8	Address of Manufacturer / Supplier / it's agent
9.3.9	Description and Quantity
9.3.10	Country of origin
9.3.11	Month & year of Manufacturing
9.3.12	Case measurements
9.3.13	Gross and net weights in kilograms
9.3.14	All necessary slinging and stacking instructions

10.0 SHIPPING

10.1	Shipping	<p>The bidder shall ascertain at an early date and definitely before the commencement of manufacture, any transport limitations such as weights, dimensions, road culverts, Overhead lines, free access etc. from the Manufacturing plant to the project site. Bidder shall furnish the confirmation that the proposed Packages can be safely transported, as normal or oversize packages, up to the site. Any modifications required in the infrastructure and cost thereof in this connection shall be brought to the notice of the Purchaser.</p> <p>The seller shall be responsible for all transit damage due to improper packing.</p>
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TECHNICAL SPECIFICATION FOR CABLE SEALING SYSTEM**11.0 HANDLING AND STORAGE**

11.1	Handling and Storage	Manufacturer instruction shall be followed. Detail handling & storage instruction sheet / manual needs to be furnished before commencement of supply.
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TECHNICAL SPECIFICATION

FOR

CIVIL WORKS

Prepared by	Reviewed by	Approved by	Rev	1
Akhilesh Kumar	Gaurav Sharma	Ashwani Aggarwal	Date	07.05.2019
Akhilesh Kumar	Gaurav Sharma	Ashwani Aggarwal	Page	1 of 18

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1 SCOPE

Specification covers design, engineering, material supply and civil works for new grid substations. All civil works shall satisfy the general technical requirements specified in other Sections of this Specification and as detailed below. They shall be designed to the required service condition / loads as specified elsewhere in this Specification or implied as per National and International Standards. Items/components of site not explicitly covered in the specification but required for completion of the project shall be deemed to be included in the scope.

2 CODES & STANDARDS

The following Indian Codes and Standards shall generally be used for design of civil and structural works. In all cases, the latest revisions with amendments, if any, shall be followed.

- a. SP: 6 ISI handbooks for structural engineers.
- b. IS: 2062 Specification for Structural Steel (Standard quality).
- c. IS: 456 Code of practice for plain and reinforced concrete.
- d. IS: 800 Code of practice for general construction in steel.
- e. IS: 806 Code of practice for use of steel tubes in general building construction
- f. IS: 808 Rolled steel beam, channel & angle sections
- g. IS: 813 Scheme of symbols for welding.
- h. IS: 816 Code of practice for use of metal arc welding for general construction in mild steel.
- i. IS: 1080 Code of practice for design and construction of shallow foundations in soils (other than raft, ring and shell).
- j. IS: 875 Code of practice for design loads (other than earthquake) for buildings and structures.
- k. IS: 1893 Criteria for earthquake resistant design of structure
- l. IS: 1904 Code of practice for foundations in soil:-General requirements
- m. IS: 1905 Code of practice for structural safety of buildings
- n. IS: 2074 Ready mixed paint, air drying, red oxide chrome, priming
- o. IS: 2212 Code of practice for brick work
- p. IS: 2911 Code of practice for design & construction of pile foundation

- q. IS: 2950 Code of Practice for design and construction of raft foundations
- r. IS: 2974 Code of Practice for design and construction of machine foundations
- s. IS: 4326 Code of Practice for earthquake resistant design and construction of Buildings
- t. IS: 8009 Code of Practice for calculation of settlement of foundations: (parts 1& 2)
- u. IS: 1829 Code practice for protection of iron and steel (Part I to III) structures for atmosphere corrosion
- v. IS: 13920 Code practice for ductile detailing of reinforced concrete structure subjected to seismic force

3 GENERAL GUIDELINES

- 3.1 All civil works shall be carried out as per applicable Indian Laws, Standards and Codes. All materials shall be of best quality conforming to this specification, relevant Indian Standards and Codes.
- 3.2 The specifications are intended for general description of work, quality and workmanship. The Specifications are not however exhaustive to cover minute details and the work shall be executed according to relevant latest Indian Standards/IRC specifications/CPWD specifications. In the absence of the above, the work shall be executed according to the best prevailing practices in the trade, recommendations of relevant American or British Standards or to the instructions of BSES Project Manager. The IS standards/IRC specifications/CPWD specifications to be followed are mentioned in the technical specifications attached hereto. They shall be latest edition/version of the same issued 15 days prior to the date of opening of this tender. The Contractor is expected to get himself clarified on any doubts about the specifications, etc. before bidding and the discussions recorded in writing with the Owner in respect of interpretation of any portion of this document.
- 3.3 The Contractor shall furnish all design, drawings, labor, tools, equipment, materials, temporary works, constructional plant and machinery, fuel supply, transportation and all other incidental items not shown or specified but as may be required for complete performance of the Works in accordance with approved drawings, specifications and direction of Owner.
- 3.4 The work shall be carried out according to the design/drawings to be developed by the bidder and approved by the Owner. Bidder shall develop design/repair work keeping in view the functional requirement of the substation facilities and providing enough space and access for operation, use and maintenance based on the input provided by the Owner. Certain minimum requirements are indicated in this specification for guidance purposes only.
- 3.5 The Owner shall hand over the substation land on as is basis; the bidder shall visit the substation site to ascertain the quantum of work, present condition of the land before

submitting the offer. No request for commercial changes will be entertained post award of work due to any claim related to site condition / plot condition. The layout and levels of all structure etc shall be made by the bidder at his own cost from the general grids of the plot and benchmarks set by the bidder and approved by the Owner in presence of engineer in charge.

- 3.6 The bidder shall provide all instruments, materials and personnel to the Owner for checking the detailed layout and shall be solely responsible for the correctness of the layout and levels. The contractor shall make his own arrangements for water and electricity.
- 3.7 The work shall be carried out according to the design / drawings to be developed by the Contractor and approved by the Owner. For all buildings, structures, foundations etc. necessary layout and details shall be developed by the Contractor keeping in view the functional requirement of the Sub-Station facilities and providing enough space and access for operation, use and maintenance based on the input provided by the Owner. Certain minimum requirements are indicated in this specification for guidance purposes only. However, the Contractor shall quote according to the complete requirements.
- 3.8 The Contractor shall take all necessary precautions to protect all the existing equipments, structures, facilities & buildings, etc. from damage. In case any damage occurs due to the activities of the Contractor on account of negligence, ignorance, accidental or any other reason whatsoever, the damage shall be made good by the Contractor at his own cost to the satisfaction of the Engineer. The Contractor shall also take all necessary safety measures, at his own cost, to avoid any harm / injury to his workers and staff from the equipment & facilities of the power station.
- 3.9 During the progress of work, the Engineer will exercise supervision of the work to ensure that the technical provisions of the contract are being followed and the work is being executed accurately and properly. However, such supervision shall in no way relieve the Contractor of the responsibility for executing the work in accordance with the specifications.
- 3.10 Before submitting the bid, the Contractor shall inspect and examine the site and its surroundings and shall satisfy himself as to the nature of the ground and subsoil, the availability of materials necessary for completion of the work, means of access to site and in general shall himself obtain all necessary information as to risks, contingencies and other circumstances which may influence or affect his offer. No extra claim consequent on any misunderstanding or otherwise shall be allowed.

4 DETAILED SCOPE OF SUPPLY AND WORK

All material required for civil work mentioned in this specification is included in scope of supply of the bidder. Major works are detailed below

S No	Description	Remarks
4.1	Dismantling of Existing building	If included in tender scope
4.2	Site survey, Soil testing, design and engineering	

TECHNICAL SPECIFICATION FOR CIVIL WORK OF GRID

S No	Description	Remarks
4.3	Substation Building	Building shall be G+1 storey. However, if it is not possible to accommodate the equipment on G+1 storeys due to space constraint at site, G+2 storey shall be constructed to accommodate the equipment
4.3.1	Cable cellar at ground floor	
4.3.2	11kV switchgear room at First Floor	
4.3.3	66/33kV GIS Room at First floor	
4.3.4	EOT Crane for 66kV GIS Room	a. EOT crane not required for 33kV GIS b. Capacity shall be based on heaviest package with appropriate safety margin. Minimum capacity shall be 5 tons
4.3.5	Control Room at First Floor	For housing CRP, ACDB, DCDB, RTU etc
4.3.6	Battery Room at First Floor	
4.3.7	Maintenance Room at First Floor	
4.3.8	Pantry at First floor	
4.3.9	Washroom at First Floor	
4.3.10	Two side entry and exit	
4.3.11	Fire retardant windows and doors	For rooms housing electrical equipment
4.3.12	Motorized Shutter	For Entry and Exit of Switchgears
4.3.13	Table	
4.3.14	Chair	
4.3.15	MS Amirah	
4.3.16	Water tank and booster pump	
4.4	Yard Works	
4.4.1	Foundation Works	For all equipment included in scope of supply including free issue items
4.4.2	Levelling for compete plot area	
4.4.3	Boundary wall with Barbed Wire	
4.4.4	Power Cable Trench	With 50% spare capacity for future use
4.4.5	Control Cable Trench	With 50% spare capacity for future use

TECHNICAL SPECIFICATION FOR CIVIL WORK OF GRID

S No	Description	Remarks
4.4.6	Support Structure and appropriate clamping arrangement	For proper termination of all power and control cables
4.4.7	Chequered Plate for trenches	
4.4.8	Motorized De-Watering system for trenches	
4.4.9	Sump Pit	a. Joining of all Power Transformer with Respective Soak Pit b. Capacity shall be 20000 Liters c. Motorized Dewatering/ De-oiling for Sump Pit
4.4.10	Soak Pit	For All Power Transformers
4.4.11	Fire Walls	For power transformers
4.4.12	Fencing	a. For all outdoor equipment b. Pre-galvanized MS Fencing with powder coating c. Fencing shall be Anticut and anticlimb type
4.4.13	Main Gate	MS gate of size 6.5m
4.4.14	6m Road	Between Gates, Substation Building, Power Transformers, Station Transformer, Auto Switched Capacitor Bank
4.4.15	Yard Development	For Complete outdoor Yard Area
4.4.16	Rain Water Harvesting	
4.4.17	Guard Room	
4.4.18	Drainage and Sewage System	

5 DESIGN AND EXECUTION CRITERIA

5.1 Design Criteria

- The minimum grade of concrete shall be M-25 & Grade of Steel FY-415
- Limit state method of design shall be adopted unless specified otherwise in the specification.
- For detailing of reinforcement IS: 2502 and SP: 16 shall be followed. Cold twisted deformed bars conforming to IS: 1786 shall be used as reinforcement. However, in specific areas mild steel (Grade I) conforming to IS:432 can also be used. Two layers of reinforcement (on inner and outer face) shall be provided for wall & slab sections having thickness of 150 mm and above. Clear cover to reinforcement towards the earth face shall be minimum 40 mm.

- d. The procedure used for the design of the foundations shall be the most critical loading combination of the steel structure and or equipment and/or superstructure and other conditions, which produces the maximum stresses in the foundation or the foundation component and as per the relevant IS Codes of foundation design. Detailed design calculations shall be submitted by the bidder showing complete details of work proposed to be used.
- e. Design shall consider any sub-soil water pressure that may be encountered following relevant standard strictly.
- f. Necessary protection to the foundation work. If required shall be provided to take care of any special requirements for aggressive alkaline soil. Black cotton soil or any other type of soil, which is detrimental / harmful to the concrete foundations.
- g. Foundation system adopted by Bidder shall ensure that relative settlement.

5.2 Design Loads for Equipment

Design criteria shall comprise the codes and standards used. Applicable climatic data including wind loads, earthquake factors maximum and minimum temperatures applicable to the building locations, assumptions of dead and live loads, including equipment loads, impact factors, Safety factors and other relevant information.

- a. Loads of equipment shall be considered as per manufacturer's certified drawings.
- b. The foundation shall be designed considering the net allowable bearing pressure of 200KN/m² at the depth of 2.0m from ground level.
- c. Foundations shall be analyzed for all possible load combinations as per the relevant IS codes.
- d. Minimum reinforcement shall be governed by IS: 2974 and IS: 456.

5.3 Cement

- a. Unless otherwise specified or called for by Engineer, the fresh ordinary Portland cement conforming to IS-8112 of 1976 (latest revision) i.e. 43 grade shall be used for the works.
- b. Make of cement shall be ACC/J.K Laxmi/Ultratech or approved by the owner.
- c. The record of cement shall be maintained in M.A.S register by the contractor and verified by engineer of the BYPL.
- d. Cement shall be stored in a perfectly water-tight and well ventilated site store capable of accommodating cement to ensure continuity of the work and having a raised and perfect dry floor. Each parcel or consignment of cement shall be stacked separately therein to permit easy access for inspection and a record shall be kept so that each

parcel or consignment may be identified. Cement which has become stale or otherwise unsuitable and any bags or the like containing hardened lumps or cakes of cement, consequent to storage at Contractor's site stores will be rejected and shall be removed from the site and disposed of as directed by the Engineer. The cost of such rejected quantities shall be borne by the Contractor.

5.4 Concrete

- a. Design Mix of M-25 grades of concrete as per provisions of IS: 456 and other applicable codes shall generally be used for civil work. RMC must be of ACC/Ultratech/Shree cement.
- b. The curing period shall commence immediately after the concrete is finally screened and continued a period of 21 days all civil works. The top and side surfaces of concrete shall be kept moist and be protected from the direct rays of the sun during the period. The Contractor shall submit to the Engineer's proposals for ensuring continuous protection of the concrete during the curing period.

5.5 Steel

- a. The reinforcing bars shall be Fe-415 generally conform to various requirements of IS: 1786 (for High Strength deformed steel bars and wires for concrete reinforcement).
- b. Only TATA/SAIL/JINDAL make shall be used.

5.6 Aggregates

- a. Aggregates shall consist of natural sand, crushed stone and gravel and shall be chemically inert, strong, hard, clean, durable against weathering of limited porosity, free from deleterious materials and shall conform to the applicable standards. If so desired by the Engineer, they shall be washed and screened.
- b. Sampling and testing shall be as per the applicable standards and shall be carried out under the supervision of Engineer. The cost of all test, sampling, etc. shall be borne by the Contractor.
- c. All coarse and fine aggregates shall be stacked separately and shall avoid contamination with foreign materials. Segregates aggregates shall be rejected.
- d. The necessary arrangements for field test shall be done at site. The material testing register and weighing material register shall be maintained for field and lab mandatory test by the contractor's authorized site engineer, having degree in Civil Engineering or minimum three year experience with diploma in civil engg. The copy of all the certificates shall be submitted to BSES officials.

5.7 Water

- a. Water used for both mixing and curing shall be as per applicable standards.

- b. Potable waters are generally satisfactory. Where water can be shown to contain an excess acid, alkali, sugar or salt, Engineer may refuse to permit its use.
- c. Water test certificate provide by the vendor.

5.8 Bricks

- a. Bricks having minimum 75kg/cm^2 compressive strength can only be used for masonry work. Contractor shall ascertain himself at site regarding the availability of bricks of minimum 75 kg/cm^2 compressive strength before submitting his offer.
- b. Ensure that the bricks are free from cracks, war page and of uniform colour.
- c. Manufacturer's test report & Material Test reports for all the materials shall be submitted for approval prior to the utilization for work.
- d. Contractor shall make his own arrangements for the storage of adequate quantity of material.

5.9 Levelling, Excavation, Backfill & Compaction

- a. The Capacitor bank area shall be properly leveled before construction. If fill material is required, the fill material shall be suitable as per the requirement & level. The fill shall be such a material and the site so designed as to prevent the erosion by wind and water of material from its final compacted position or the in-situ position of undisturbed soil. Backfill material around foundations or other works shall be suitable for the purpose for which it is used and compacted to the density described under Compaction. If rocky strata available at site then bidder have to do all the necessary arrangements for rock cutting & its disposal.
- b. The thickness of fill material under the foundations shall be such that the maximum pressure from the footing, transferred through the fill material and distributed onto the original undisturbed soil will not exceed the allowable soil bearing pressure of the original undisturbed soil. For expansive soils the fill materials and other protections etc. to be used under the foundation is to be got approved by the Owner. All the area excavated in due course of construction must be filled by vendor. The area of future bay must be filled by vendor up to the proper level of yard.
- c. Whenever water table is met during the excavation, it shall be dewatered and water table shall be maintained below the bottom of the excavation level during excavation, concreting and backfilling.
- d. Material unsuitable for founding of foundations shall be removed and replaced by suitable fill material and to be approved by the Owner. Excavated material not suitable or not required for backfill shall be disposed off in areas as directed by Owner. Excavation and backfill for foundations shall be in accordance with the relevant IS code.
- e. The density to which fill materials shall be compacted shall be as per, relevant IS and as per direction of Owner. All compacted sand filling shall be confined as far as

practicable. Backfilled earth shall be compacted to minimum 95% of the Standard Proctor's density at OMC. The sub grade for the roads and embankment filling shall be compacted to minimum 95% of the Standard Proctor's density at OMC. Cohesion less material sub grade shall be compacted to 70% relative density (minimum).

- f. Anti termite chemical treatment shall be given to foundations of Enclosure, filling below the Enclosure floor etc. as per IS: 6313 and other relevant Indian Standards.

5.10 General Requirement Site Surfacing/Stone Filling

The material required for site surfacing/stone filling shall be free from all types of organic materials and shall be of standard quality, and as approved by the Owner. The material to be used for stone filling/site surfacing shall be uncrushed/crushed/broken stone of 20 mm nominal size (ungraded single size) conforming to Table 2 of IS:383 - 1970. Hardness, Flakiness shall be as required for wearing courses are given below:

- a. Sieve Analysis limits (Gradation)
(IS: 383 - Table - 2)

Sieve Size	% passing by weight
100	
40mm	85 – 100
20mm	0 – 20
10mm	0 – 5

'One Test' shall be conducted for every 500 Cu.m.

- b. Hardness

Abrasion value (IS: 2386 Part-IV) - not more than 40%

Impact value (IS: 2386 Part-IV) - not *more* than 30% and frequency shall be one test per 500 cum with a minimum of one test per source

- c. Flakiness Index

One test shall be conducted per 500 cum of aggregate as per IS:2386 Part-I and maximum value is 25%

5.11 Admixtures & Additives

- a. Only approved admixtures shall be used in the concrete for the Works. When more than one admixture is to be used, each admixture shall be batched in its own batch and added to the mixing water separately before discharging into the mixer. Admixtures shall be delivered in suitably labeled containers to enable identification.
- b. Admixtures in concrete shall conform to IS: 9103. The waterproofing cement additives shall conform to IS: 2645. Owner shall approve concrete Admixtures/ Additives.
- c. The contractor may propose and the Owner may improve the use of a water-reducing set-retarding admixture in some of the concrete. The use of such an admixture will not be approved to overcome problems associated with inadequate concrete plant capacity

or improperly planned placing operations and shall only be approved as an aid to overcoming unusual circumstances and placing conditions.

- d. The water-reducing set-retarding admixture shall be an approved brand of Ligno-sulphonate type admixture.

5.12 Anti weed Treatment, Stone Spreading & PCC

- a. The Contractor shall furnish all labour, equipment and materials required for complete performance of the work in accordance with the drawings specification and direction of the Owner.
- b. The contractor shall prepare the specified area before stone spreading. PCC must be carried out in capacitor bank area in two layers. First layer of 75 mm thickness nominal of grade 1:4:8 concreting and second layer of 75 mm thickness of grade 1:2:4 cement concrete.
- c. Along with PCC Stone spreading of 100cm thickness shall be done in the Capacitor Bank area under present scope of work.
- d. Before taking up stone filling, anti weed treatment shall be applied in the specified area wherever gravel filling is to be done, and the area shall be thoroughly de-weeded including removal of roots. The recommendation of local agriculture or horticulture department shall be sought wherever feasible while choosing the type of chemical to be used. Nevertheless the effectiveness of the chemical shall be demonstrated by the contractor in a test area in capacitor bank and monitored over a period of two to three weeks by the Engineer-in-Charge. The final approval shall be given. by Engineer-in-Charge and final approval given based in the results.
- e. The anti weed chemical shall be procured from reputed manufacturers. The dosage and application of chemical shall be strictly followed as per manufacturer's recommendation. The contractor shall be required to maintain the area free of weeds for a period of 1 year from the date of application of 1st dose of anti weed chemicals.
- f. In yard area red sand stone of 50 mm thickness must be laid above nominal PCC or sand. Above sand stone gavel spreading of specified size must be laid.

5.13 Trench

- a. All the material wherever required for trenches shall be supplied by bidder.
- b. Power Cable trench and Control cable trench shall be separate
- c. The precast removable RCC covers (with lifting arrangement) as per the layout drawing shall be provided. The precast covers shall be constructed using RCC of M35 grade. Trench cover must be of pre-cast concrete of grade not less than M-35 of appropriate load bearing capacity.
- d. Cable trench RCC covers shall be designed for self weight of top slab + UDL of 2000 Kg/m² + concentrated load of 200 kg at centre of span on each panel.

- e. Paved portion of cable trenches shall be repaired to withstand class AA Loading of IRC/relevant IS Code
- f. The top of trenches shall be kept at least 100 mm above the finished ground level. The top of cable trench shall be such that the surface rain water do not enter the trench.
- g. All metal parts inside the trench shall be connected to the earthing system at regular intervals.
- h. Wherever required, all the construction joints of cable trenches i.e. between base slab to base slab and the junction of vertical wall to base slab as well as from vertical wall to wall and all the expansion, joints shall be provided with approved quality PVC water stops of approx. 230 x 5 mm size for those sections where the ground water table is expected to rise above the junction of base slab and vertical wall of cable trenches.
- i. The repaired Cable trenches shall be blocked at the ends if required with brick masonry in cement sand mortar 1:6 and plaster with 15mm thick 1:6 cement and mortar.
- j. Angles 50x50x6 mm (minimum) with lugs shall be provided for edge protection all round edges of repaired RCC cable/pipe trenches supporting covers.
- k. Sealing of repaired cable trench must be made in such a manner that no rain water can accumulate in it.
- l. If trench passes through road/load bearing path then Box Culvert of Appropriate load bearing shall be used.
- m. All the floor openings in building shall be covered with 6mm thick Checkered plates
- n. Trench in existing control room may be used for control cable/LT Power Cable laying but repairing and modification of the same shall be in vendor's scope. If new trench is required in control room then the same shall also be in vendor's scope.

5.14 Substation Building

- a. Substation building shall be designed for G+ 2 storeys. Construction shall be carried out for G+1 storeys. However, if the G+1 storey is not suitable for accommodating the equipment due to space constraint at site, G+2 storey shall be constructed to accommodate all equipment.
- b. Ground floor of the building shall be made for cable cellar.
- c. First floor of the building shall be made for Switchgear room, control room and all other utilities.
- d. Height of 4m is recommended for cable cellar. However, height of cable cellar room shall be finalized during detailed engineering based on functional requirements for switchgear. Operation and maintenance considerations shall also be taken into account.

- e. Height of first floor shall be finalized during detailed engineering based on height of equipment and clear space on top of equipment for maintenance. Functional requirement for EOT crane shall also be taken into account for 66kV substations.
- f. Clear space of 1m at the rear and 2.5 m in front is mandatory for all equipment to ensure ease of operation and maintenance. However, clearances shall be optimized subject to functional requirements of equipment during detailed engineering.
- g. There shall be two entries and two exits of cable cellar and switchgear room.
- h. Motorized shutter shall be provided for entry and exit of switchgears.
- i. Doors and windows shall be provided in Building. Doors and windows shall be fire rated with fire rating of 2 hour.
- j. Two staircases shall be provided in substation building with granite finish and SS Railing of 304 grade.
- k. Kota stone shall be provided in cable cellar and switchgear room for flooring purpose.
- l. Finishing of walls shall be with three coats of Plastic Paint i.e. two coats during installation and one coat at the time of handover.
- m. Plaster work, putty and painting all around the building and common area with plastic paint
- n. Epoxy flooring after installation of equipment on kota stone shall be provided in Switchgear room.
- o. Level of cable cellar room shall be above 1200 mm from FGL.
- p. Provision for Cable Entry and Exit in Switchgear room and Cable Cellar Room.
- q. Provision of Lighting, Exhaust Fan, Ceiling Fan, Power Points For Cable Cellar and Switchgear Room shall be provided. All electrical wires/fittings must be of Havel's/Schneider/Crompton/Polycab.
- r. Water proofing in three layers shall be done in roof slab and ground floor trench. Proofing shall be done by using Dr Fixit chemical

5.15 Substation Road

- a. Inside substation roads to be provided for access along with car parking for three cars and two Wheeler parking for three vehicles. Building and parking are in the scope of bidder. Layout of the roads shall be based on layout drawing for the substation. Parking areas shall be provided for Site personnel and visitors as per layout drawing. Adequate turning space for vehicles shall be provided and bend radius shall be set accordingly. It has to be connected suitably with roads.

- b. All substation roads shall be constructed so as to permit transportation of all heavy equipment up to 60MT. The main approach roads upto Control Room Building and other relevant roads will be RCC/Cement Concrete Roads. The other connecting roads and pathways shall be of Paver blocks/ CC Road as per site requirement. The pavers blocks used for the roads shall be minimum 80mm thick with compressive strength not less than 450Kg/cm².
- c. Road construction shall be as per IRC standard.
- d. Adequate provision shall be made for road drainage.
- e. All the culverts and its allied structure (required for road/rail, drain, trench crossings, etc.) shall be designed for class AA loading as per IRC standard/IS code. All trenches inside the substation shall cross the road through culverts.

6 INTERFACING


The proper coordination & execution of all interfacing civil works activities shall plan in advance and execute in such a manner that interfacing activities do not become bottlenecks and dismantling, breakage etc. is reduced to minimum.

7 INSPECTION, TESTING & QUALITY CONTROL

- a. Detailed field quality plan shall be submitted for approval.
- b. Construction Quality shall be properly controlled by the bidder. Bidder shall work as per the Field Quality Plan provided by the owner. All the Tests specified in the Field Quality Plan shall be done by bidder.
- c. Weekly construction status will be updated by the bidder to Owner to assure the work progress & the construction quality.
- d. A Civil Engineer shall be deployed by the bidder for construction quality control. Civil Engineer has to review ongoing construction work, check materials and workmanship.
- e. Necessary arrangements for field tests shall be done at site. Bidder has to do the following tests from NABL accredited labs:
 - Raw material test : For Cement, sand , aggregates, water, brick, Steel
 - Cube Test for compressive strength of concrete

8 STATUTORY RULES

- a. Contractor shall comply with all the applicable statutory rules pertaining to factories act (as applicable far the State). Fire Safety Rules of Tariff Advisory Committee. Water Act for pollution control and coordinate with forest department for necessary approval prior to tree cutting.
- b. Plastering on structural members (in fire prone areas) etc. shall be made according to the recommendations of Tariff Advisory Committee.
- c. Statutory clearance and norms of State Pollution Control Board shall be followed as per Water Act for effluent quality from plant.

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TECHNICAL SPECIFICATION FOR CIVIL WORK OF GRID	

9 DEVIATIONS

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 that the bidder complies fully with this specification. No deviation will be acceptable post order.

10 DOCUMENTATION

- Drawing submission shall be as per the matrix given below. All documents/ drawing shall be provided in Soft & Hard on A3/ A4 sheet in box file with separators for each section. Language of the documents shall be English only. Deficient/ improper document/ drawing submission may liable for rejection
- This list is not exhaustive but indicative of minimum requirement only. Final list of drawings shall be prepared by successful bidder during detailed engineering.

S. No	Detail of Document	Bid	Drawing Approval	Pre construction	Post construction
1	Design calculation, general arrangement drawings, foundation drawing & detailed erection / Construction drawings including R/F drawings for Sub-Station Control Room Building		Required		Required
2	Field quality plan		Required	Required	
3	Foundation design & drawing of all equipment foundations		Required		Required
4	Structural steel fabrication drawings for equipment support structure		Required		Required
5	Foundation design & drawing of Power Transformer		Required		Required
6	Design & drawing of transformer grating, firewall & burnt oil tank		Required		Required
7	Foundation design & drawing for lighting pole		Required		Required
8	Foundation design & drawing for Capacitor Bank, Auxiliary Transformer and design of fencing For both.		Required		Required
9	Complete fencing along with gate for the Sub-Station yard		Required		Required
10	Details of Indoor and Outdoor Cable Trenches with cable tray supports and trench covers		Required		Required

TECHNICAL SPECIFICATION FOR CIVIL WORK OF GRID

S. No	Detail of Document	Bid	Drawing Approval	Pre construction	Post construction
11	Design & drawing of Rainwater Harvesting System, sewerage system including septic tank, Water supply arrangement, landscaping, etc		Required		Required
12	Design & drawing of roads and complete drainage system (with final connection to Rain Water Harvesting recharge pit) within Sub-Station including crossings		Required	Required	Required
13	Design & drawing Security room		Required	Required	Required
14	Design & drawing NIFPS system & underground water tank		Required	Required	Required

11 APPROVED MAKES

S No	Item Detail	Approved make	Remarks
1	Exhaust fan	Crompton/Havells/Bajaj	
2	Lighting fixture	Havells/Crompton/Philips	
3	Air conditioning System	Voltas/carrier/Hitachi	
4	Structural Steel Built up Section	Tata/SAIL/Jindal	
5	Ceramic tiles	Kajaria	Size not less than 600mm X 300 mm
6	Toilets fittings	Jaquar/Hindware make	
7	Toilet door	Green ply	Both Side laminated
8	Toilet Flooring	Kajaria	Anti skid tiles of Size 600 mm X 600 mm
9	Grid building floor	Kota Stone	
10	Glass door fittings	Ozone make	As per approved Drawings
11	Mortise Lock and Door closer	Dorset make	
12	Doors and Windows	Hindalco/Jindal	Aluminium powder coated
13	Electrical cable	Havells/Polycab/Finolex/KEI	

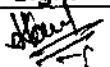
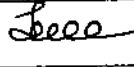
TECHNICAL SPECIFICATION FOR CIVIL WORK OF GRID

S No	Item Detail	Approved make	Remarks
14	Electrical conduit	Setia	Heavy Duty
15	Switch socket	Anchor/Havells/Legrand	
16	Cement	ACC/Ultratech/J K Laxmi	
17	TMT Bar	Tata/Jindal/SAIL	
18	Plastic Paint	Asian/Nerolack/Berger	Three or more coat.
19	Sanitary pipes	Astral/Skipper/Ashirwad	Ring fitted
20	Almirah	Godrej	

BSES

Specification Of Control Cables

Specification no : SP-EWLP-01-R1

Prepared by		Approved by		Revision	Date
Name	Sign.	Name	Sign.		
Hemanshi Kaul		K Sheshadri		01	23, April'2012

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General Specification

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

National Standards

Indian Standards	
IS- 1554 Part-1	PVC insulated Cables
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.

International Standards

IEC 60228 Ed.3.0 b	Conductors of insulated cables.
IEC 60332-3-21 Ed.1.0 b	Tests on electric cables under fire conditions. Part 3-21. Tests on bunched wires or cables.
IEC 60502-1 Ed. 2.1 b	Power cables with extruded insulation and their accessories for rated voltage from 1kV upto 30kV –Part 1: cables for rated voltages of 1kV and 3kV
IEC 60811	Common test methods for insulating and sheathing materials of electric cables.
IEC 60885 Ed.1.0 b	Electric test methods for electric cables.
IEC 60227	PVC insulated cables of rated voltages up to and including 450/750 V.
IEC 60028 Ed. 2.0 b	International Standard of Resistance for Copper

2.0.0	Cable construction Features	Size & dimensions of each item mentioned under this clause shall be followed as detailed out in GTP, refer Annexure B
2.1.1	Conductor	
	Stranded, plain copper, circular	Shall be made from high conductivity copper rods
2.1.2	Insulation	Extruded PVC Insulation Type A as per IS 5831
2.1.3	Core Identification	As per Cl.10.1 (f) of IS-1554 Part-1
2.1.4	Inner Sheath	Extruded Inner Sheath of Black PVC type ST-2 as per IS 5831
2.1.5	Armour	a) As per Cl 13.2 of IS 1554 Part-1: Galvanized steel round wire armour. b) Minimum area of coverage of armouring shall be 90 %.
2.1.6	Outer Sheath	a) Extruded outer sheath of PVC type ST-2 as per IS 5831
		b) Colour : Black
		d) The Outer Sheath shall be embossed with:
		d-1 : The voltage designation
		d-2 : Type of construction / cable code (for e.g. AYWY)
		d-3 : Manufacturers Name or Trade mark
		d-4 : Number of Cores and nominal cross sectional area of conductors

	Continue...Outer Sheath	d-5 : The drum progressive length of cable at every metre.
		d-6 : Name of buyer i.e. BSES
		d-7 : Month & Year of Manufacturing
		d-8: P.O.No. and P.O.Date
2.1.7	Sealing of Cable end	Both ends of the cable shall be sealed with PVC Cap.
4.0.0	Testing & Inspection	Tests shall be carried out in accordance with IEC / IS standards.
		a) Routine Test: As per IS 1554 part -1
		b) Type Test
		b-1: Cables must be of type tested quality . Type test reports shall be submitted for the type, size & rating of cable offered along with bid.
		b-2 : If the manufacturer's lab is accredited by govt. /authorised body then it shall be acceptable for type testing.
		b-3 : Type test on one cable drum of each rating and type , from first lot, shall be conducted at Govt. approved / Internationally accredited labs.
		c) Acceptance test : Shall be conducted as per IS 1554 Part-1 for each lot of cable
		c1) A minimum of two samples per Purchase order shall be drawn after receipt of cable in BSES stores for chemical composition and purity test of aluminium. Bidder to bear cost of test.
		d) Inspection
		d-1 :The Buyer reserves the right to witness all tests specified on completed cables
		d-2 : The Buyer reserves the right to inspect cables at the Sellers works at any time prior to dispatch, to prove compliance with the specifications.
		d-3 : In-process and final inspection call intimation shall be given in advance to purchaser.
		e) Test certificates: Three sets of complete test certificates (routine & acceptance tests) need to be submitted along with the delivery of cables.

5.0.0	Drawing, Data & Manuals	
5.0.1	To be submitted along with bid	The seller has to submit: a) Cross section drawing of cable b) Completely filled GTP c) Type test certificates d) Complete cable catalogue and Manual along with the bid.
5.0.2	After award of contract	Within 15 days, the seller has to submit four sets of above-mentioned drawings for buyer's approval.
5.0.3	Final As Built	6 sets hardcopy + One Soft copy of all documents including type test certificates
6.0.0	Drum Length & tolerance	500+ - 5% Mtr.
6.0.1	Overall tolerance in cable Length	- 2 %
6.0.2	Short length of cables	a) Minimum acceptable short length shall be above 100 Mtrs. Manufacturer shall be required to take prior approval from Engineering for any short length supply. b) Manufacturer shall not be allowed to put two cable pieces of different short lengths in same cable drum.
7.0.0	Packing, Shipping, Handling & Storage	
	a) Drum Identification Labels	
		a-1 Drum identification number
		a-2 Cable voltage grade
		a-3 Cable code (e.g. YWY)
		a-4 Number of cores and cross sectional area
		a-5 Cable quantity (Metres)
		a-6 Purchase order number and SAP item code
		a-7 : Total weight of cable and drum (kg)
		a-8 : Manufacturer's & Buyer's name
		a-9 : Month & Year of Manufacturing
		a-10 : Direction of rotation of drum
		a-11 : Cable length initial reading & end reading shall be marked on drum. Cable starting end shall be taken out from winding to read this drum reading with proper sealing to protect against external damage.
	b) Shipping information	The seller shall give complete shipping information

		concerning the weight, size of each package.
	c) Transit damage	The seller shall be held responsible for all transit damage due to improper packing.
	d) Type of Drum	Wooden drums with anti termite treatment. (The drums shall be with M.S. spindle plate with nut-bolts)
8.0.0	Quality Assurance	
8.0.1	Vendor quality plan	To be submitted for purchaser approval
8.0.2	Inspection points	To be mutually identified & agreed in quality plan
9.0.0	Progress reporting	
9.0.1	Outline Document	To be submitted for purchaser approval for outline of production, inspection, testing, inspection, packing, dispatch, documentation programme
9.0.2	Detailed Progress report	To be submitted to Purchaser once a month containing <ul style="list-style-type: none"> i) Progress on material procurement ii) Progress on fabrication (As applicable) iii) Progress on assembly (As applicable) iv) Progress on internal stage inspection v) Reason for any delay in total programme vi) Details of test failures if any in manufacturing stages vii) Progress on final box up Constraints / Forward path
10.0.0	Deviation	a) Deviations from this specification are only acceptable where the Seller has listed in his quotation the requirements he cannot, or does not, wish to comply with and the Buyer has accepted, in writing, the deviations before the order is placed.
		b) In the absence of a list of deviations, it will be assumed by the Buyer that the Seller complies fully with this specification.

Annexure – A**Scope & Project Specific Details****1.0.0 Scope**

1.0.0	Scope	Design, manufacture, testing & supply of Control cables
2.0.0	Delivery Schedule	To be filled up as per purchase requisition.

2.0.0 Document Submission

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

	Along with offer	For Approval after award of contract	Final approval after	Remarks
Drawings	2 copies (Typical drgs)	2 copies	2 copies + 1 soft copy in CD	See Clause 5.0.0 for details of required drawings
Calculations	2 copies (Typical)	2 copies		
Catalogues	1 copy			
Type Test Report	2 copies			Type test and sample routine test reports

Annexure- B**GUARANTEED TECHNICAL PARTICULARS**

(Standard Cable sizes are 4c x2.5, 8c x 2.5, 12c x2.5, 16c x 2.5, 19 c x 2.5, 27c x 2.5 Sqmm & 4c x 4, 8c x 4, 10c x 4 Sqmm)

For each size separate GTP need to be furnished

Sr.	Description	Buyer's requirement	Seller's data
	Purchase Req. No.	
	Guarantee Period: 5 Years	60/66 Months	
1.0	Make	
2.0	Type (AS PER IS 1554 part -1)	YWY	
3.0	Voltage Grade (KV)	1.1	
4.0	Maximum Conductor temperature		
A	Continuos (° C)	70°C	
B	Short time (° C)	160°C	
5.0	Conductor		
A	Size (mm ²)	2.5 / 4 sq mm	
B	No. of wires in each conductor Nos.	As per Manufacturer standard	
C	Dia. of wires in each conductor before compaction (mm)	As per Manufacturer standard	
D	Shape of Conductor	As per Cl.2.1.1 of specification	
E	Diameter over conductor mm	
F	Maximum Conductor resistance at 20 ° C (Ohm/Km)	As per Table 2 of IS 8130	
6.0	Insulation	As per Table 1 of IS:5831 – 1984	
A	Nominal thickness (mm)	As per Cl.2.1.2 of specification & Table 2 of IS 1554(Part-1)	
B	Minimum thickness (mm)		
C	Core Identification	As per Cl.10.1 (f) of IS: 1554 (Part-1)	
D	Diameter over Insulation (mm) Approx.	
7.0	Inner Sheath	As per Table 2 of IS:5831 – 1984	
A	Minimum thickness (mm)	As per Table 4 of IS 1554(Part-1)	

B	Approx. dia. Over sheath (mm)- Apprx.	
8.0	Galvanised Steel Armour	As per Cl 2.1.5 of specification	
A	Number of armour wire	As per Manufacturer Std.	
B	Nominal Dia of Round Wire	As per Table 5 of IS 1554(Part-1)	
C	Dia. over Armour – Apprx.	
D	Lay Ratio	
E	Confirm minimum 90% coverage (submit calculation)		
9.0	Outer Sheath	As per Table 2 of IS:5831 – 1984	
A	Thickness (Minimum)	As per Table 7 of IS 1554(Part-1)	
B	Colour	Black	
10.0	Approx. overall dia. (mm)	
11.0	Drum Length & tolerance	As per Spec.Cl. 6.0.0	
12.0	End Cap	Required	
13.0	Drums provide with MS Spindle plate & Nut bolts arrangement	Required	
14.0	Net Weight of cable (Kg/Km.) – Apprx.	
15.0	Continuous current rating for standard I.S. condition laid Direct		
	a) In ground 30° C Amps	
	b) In duct 30° C Amps	
	c) In Air 40° C Amps	
16.0	Short circuit current for 1 sec of conductor. (KAmp)	
17.0	Electrical Parameters at Maximum Operating temperature:		
A	Resistance (Ohm/Km) (AC Resistance)	
B	Reactance at 50 C/s (Ohm/Km)	
C	Impedance (Ohm/Km)	
D	Capacitance (Micro farad / KM)	
18.0	Recommended minimum bending radius x O/D	

TECHNICAL SPECIFICATION

OF

SCADA

TECHNICAL SPECIFICATION FOR SCADA

1. CRP(s) SCADA Interface:

BYPL already has SCADA Control Centre implementation consisting of MCC (Master Control Centre) and (BCC) Business Continuity Centre (commissioned by M/s ABB Ltd. with Network Manager Ver 5.5) through which currently 54 grid stations and approx 90 DMS stations are being controlled and monitored .The proposed CRP(s) are to be interfaced with the existing SCADA RTU/ DCU and Network Automation system (as per Table 1[a]) through Relays and MFMs for the purpose of remote SCADA monitoring and controlling of the Breaker(s).

Table 1[a] Make of Existing RTUs		
Sr.No.	Make	Type
1	ABB	RTU560A
2	Schneider	Sietel DP
3	Synnergy	Husky
4	Siemens	AK3

SCADA indications, measurands and commands data (as per the attached Signal List) is to be mapped to the existing RTU on the protocols defined for protection relays (IEC 61850 protocol) and MFMs (Serial Modbus slave RS485).

The scope to interface the SCADA CRP(s) relays and MFMs with RTU/ DCU lies solely with the supplier/ BA (Business Associate) as per the SCADA supply and services details mentioned below.

1.1. SCADA Supply:

- The proposed CRP(s) relays and MFMs should be completely wired up and fitted with all the required accessories for SCADA RTU/ DCU interface network, suitable to interface with the existing RTU/ DCU on defined communication protocol with all the required network accessories. The detail of SCADA RTU/ DCU network and accessories is as per Table 1[b].

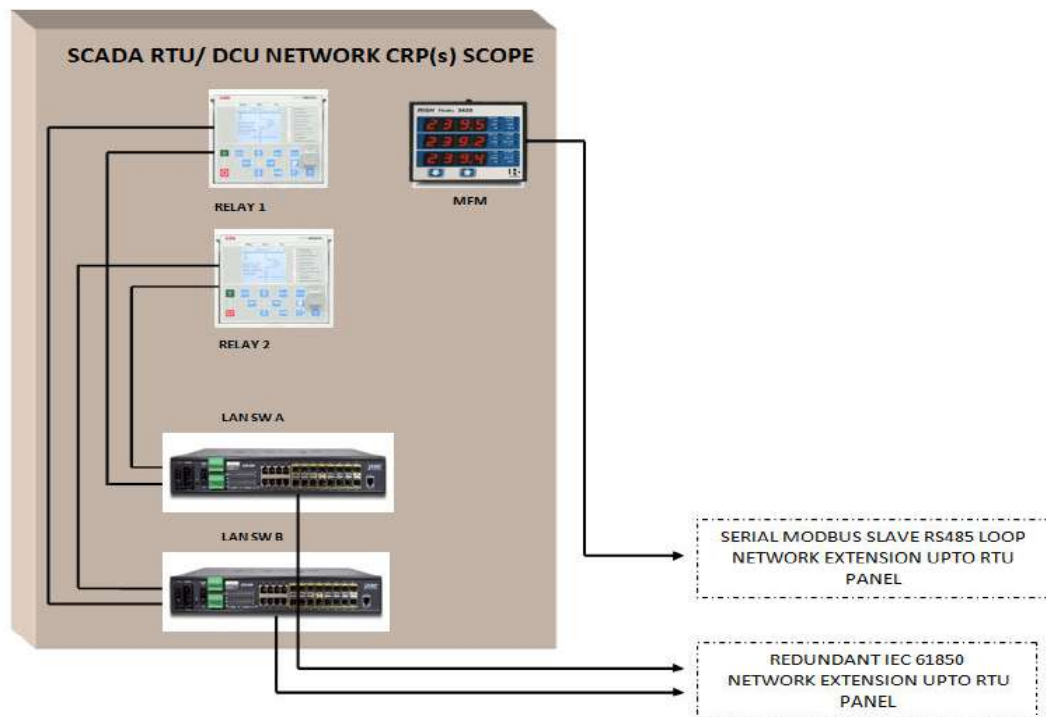
Table 1[b]Technical Specifications and Make of SCADA RTU/ DCU Network Interface			
Sr. No	Description	BYPL Approved Makes	Mandatory Specifications
1	IEC 61850 compliant Managed Ethernet Switch	1. Ruggedcom 2. Hirschman 3. GarrettCom	<ul style="list-style-type: none"> Industrial grade KEMA certified

TECHNICAL SPECIFICATION FOR SCADA

2	Multi Function Meter (MFM)	1. RISH 3440 2. RISH Delta Energy	<ul style="list-style-type: none"> Panel cut out size: 92X92mm Display type Front Programmable CT/ PT Auxiliary supply: 40V- 300V AC/DCA
3	RS485 Cable	Belden Class or equivalent	<ul style="list-style-type: none"> 4 core Twisted pair Shielded
4	Configuration tools & software	Suitable for RTU/ DCU network devices & accessories	<ul style="list-style-type: none"> For programming & troubleshooting

- SCADA RTU/ DCU interface network spares for the proposed CRP(s) should be supplied as a part of CRP(s). The minimum spares should be 20% of the utilized SCADA RTU/ DCU interface network hardware supplied (consider ≤ 0.5 as 1 No. item).
- As built SCADA RTU/ DCU interface network drawings, configuration software and tools to be handed over at the time of commissioning.
- The reference architecture of SCADA RTU/ DCU interface network is given below.

❖ **Scope of Supplier/ BA**

TECHNICAL SPECIFICATION FOR SCADA

* Indicative Architecture Drawing. The actual architecture will be decided at the time of drawing approval

1.2. SCADA Services:

- Installation and erection of the SCADA RTU/ DCU interface network up to the RTU panel is to be carried out by the supplier/ BA under the guidance of SCADA engineering in-charge.
- Configuration of the relays and MFMs in proposed CRP(s) is to be done by the supplier/ BA using their own software and configuration tools and make the necessary modifications to integrate it with the existing RTU/ DCU on the defined communication protocols.
- Mapping table or ICD (IED Capability Description) file to be provided by supplier/ BA to BYPL before final testing for the purpose of RTU/ DCU configuration.
- Testing and commissioning of the relays and MFMs in proposed CRP(s) lies in the supplier/ BA's scope.
- Trainings and hands-on is to be provided by the supplier/ BA.

1.3. Exclusion:

- RTU, MCC/ BCC configuration of the proposed CRP(s) are excluded from the scope of supplier/ BA.

TECHNICAL SPECIFICATION FOR SCADA

1.4 Signal List

A. 11kV Outgoing feeders- IEC 61850 Protocol

S.No.	Signal List	DI/ AI soft through N.Relay/ BCU	DO soft through N.Relay/ BCU	Signal Type
1.	Breaker ON	✓		DPI
2.	Breaker OFF			SPI
3.	Trip Ckt Healthy	✓		SPI
4.	Spring Charge	✓		SPI
5.	Breaker in Service	✓		SPI
6.	Breaker in Test	✓		SPI
7.	Auto Trip (86) Operated	✓		SPI
8.	Panel DC Fail	✓		SPI
9.	L/R switch in SCADA	✓		SPI
10.	Relay Int Fault	✓		SPI
11.	Over Current Operated	✓		SPI
12.	Earth Fault Operated	✓		SPI
13.	BKR Close COMMAND		✓	DCO
14.	BKR Open COMMAND			
15.	Auto Trip (86) relay reset from Remote		✓	SCO
16.	3Phase R, Y, B- Current & Voltage, Active Power, Reactive Power, Power factor, Max. Demand, Neu. Current	✓		AI/ MV
17.	Fault current and phase indication of faulty phase viz. R, Y, B, Earth, Unbalance (O/C & E/F Relay), Disturbance Records, Fault Graphs for Remote diagnosis purpose	✓		AI

Note: Signals like Panel DC Fail and Relay Int Fault to be taken from adjacent panel

B. 33 & 66 kV Incomers/ Outgoing- IEC 61850 Protocol

S.No.	Signal List	DI/ AI soft through N.Relay/ BCU	DO soft through N.Relay/ BCU	Signal Type
1.	Breaker On	✓		DPI

TECHNICAL SPECIFICATION FOR SCADA

2.	Breaker OFF			
3.	Front Bus (89A) ISO ON (In-case of O/D)	✓		DPI
4.	Front Bus (89A) ISO OFF (In-case of O/D)			
5.	Rear Bus (89B) ISO ON (In-case of O/D)	✓		DPI
6.	Rear Bus (89B) ISO OFF (In-case of O/D)			
7.	LINE ISO (89L) ON (In-case of O/D)	✓		DPI
8.	LINE ISO (89L) OFF (In-case of O/D)			
9.	EARTH SWITCH (89LE)- 1 ON (In-case of O/D)	✓		DPI
10.	EARTH SWITCH (89LE)- 1 OFF (In-case of O/D)			
11.	EARTH SWITCH (89LE)- 2 ON (In-case of O/D)	✓		DPI
12.	EARTH SWITCH (89LE)- 2 OFF (In-case of O/D)			
13.	Breaker in Service (In-case of I/D BKR)	✓		SPI
14.	Breaker in Test (In-case of I/D BKR)	✓		SPI
15.	Trip Ckt Healthy- 1 & 2	✓		SPI
16.	Spring Charge	✓		SPI
17.	Master Trip (86) Operated	✓		SPI
18.	SF6 Pressure Low & SF6 Lock Out	✓		SPI
19.	VT fuse Fail	✓		
20.	L/R Switch in Remote	✓		SPI
21.	LBB Operated	✓		SPI
22.	Panel DC Fail	✓		SPI
23.	Relay Int. Fault	✓		SPI
24.	Over Current Operated (All Stages)	✓		SPI
25.	Earth Fault Operated (All Stages)	✓		SPI
26.	DIFF. Prot Operated	✓		SPI
27.	DIST. Prot Operated	✓		SPI
28.	BKR Close COMMAND		✓	DCO
29.	BKR Open COMMAND			
30.	Front Bus (89A) ISO OPN COMMAND (In-case of O/D)		✓	DCO

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31.	Front Bus (89A) ISO CLS COMMAND (In-case of O/D)			
32.	Rear Bus (89B) ISO OPN COMMAND (In-case of O/D)		✓	DCO
33.	Rear Bus (89B) ISO CLS COMMAND (In-case of O/D)			
34.	LINE ISO (89L) OPN COMMAND (In-case of O/D)		✓	DCO
35.	LINE ISO (89L) CLS COMMAND (In-case of O/D)			
36.	Master trip (86) relay reset from remote		✓	SCO
37.	3phase R, Y, B- Curr & Volt, Active & React. Pow, Pow Factor, Max Demand, Neu. Curr etc.	✓		AI/ MV
38.	Fault current and phase indication of faulty phase viz. R, Y, B, Earth, Unbalance (O/C & E/F Relay), Disturbance Records, Fault Graphs for Remote diagnosis purpose	✓		AI

C. Signals Related with CRP

Sr. No.	Signal Detail	Type of Signal on IEC61850
1	Signals of Differential Relay	
	Digital Input Signals	
1	Differential Trip Bph	Single Point Information
2	Differential Trip Rph	Single Point Information
3	Differential Trip Yph	Single Point Information
4	Differential Highset Trip	Single Point Information
5	Differential Trip	Single Point Information
6	Inrush detected	Single Point Information
7	REF Trip	Single Point Information
8	Trafo. Differential lockout operated	Single Point Information
9	Trafo. Differential watchdog operated	Single Point Information
10	Trafo. Differential communication fail	Single Point Information

TECHNICAL SPECIFICATION FOR SCADA

11	Trafo Trouble Trip	Single Point Information
	Measurement Signals	
1	Current Bph	Measured Float
2	Current Rph	Measured Float
3	Current Yph	Measured Float
4	Fault Current Bph	Measured Float
5	Fault Current Rph	Measured Float
6	Fault Current Yph	Measured Float
7	Fault Current Nph	Measured Float
8	Fault locator in some relays	Measured Float
9	Sigma kA square	Measured Float
2	Signals of Distance Relay	
	Digital Input Signals	
1	Distance Relay Lockout Operated	Single Point Information
2	Distance Trip	Single Point Information
3	Distance Zone-1 operated	Single Point Information
4	Distance Zone-2 operated	Single Point Information
5	Distance Zone-3 operated	Single Point Information
6	Line Distance Relay Communication Fail	Single Point Information
7	Line Distance Relay watchdog operated	Single Point Information
3	Signals of Line Differential Relay	
	Digital Input Signals	
1	Conductor Broken	Single Point Information
2	Differential Trip	Single Point Information
3	Rph Differential Trip	Single Point Information
4	Yph Differential Trip	Single Point Information
5	Bph Differential Trip	Single Point Information
6	Distance Trip	Single Point Information
7	Distance Zone-1 operated	Single Point Information
8	Distance Zone-2 operated	Single Point Information
9	Distance Zone-3 operated	Single Point Information
10	Earth Fault high set trip	Single Point Information
11	Earth Fault IDMT trip	Single Point Information
12	General Trip	Single Point Information
13	Inter-trip	Single Point Information
14	Line differential block	Single Point Information
15	Line differential Channel-1 fail	Single Point Information
16	Line differential Channel-2 fail	Single Point Information
17	Line differential operated	Single Point Information
18	Line differential relay watchdog operated	Single Point Information
19	Phase fault high set trip	Single Point Information
20	Phase fault IDMT trip	Single Point Information
21	PT Fuse Fail	Single Point Information

TECHNICAL SPECIFICATION FOR SCADA

22	Sync fail	Single Point Information
	Digital Output Signals	
1	General trip	Single Command Output
2	Line Diff. Operated	Single Command Output
	Measurement Signals	
1	Active Power	Measured Float
2	Current Bph	Measured Float
3	Current Rph	Measured Float
4	Current Yph	Measured Float
5	Fault Current Bph	Measured Float
6	Fault Current Rph	Measured Float
7	Fault Current Yph	Measured Float
8	Fault Current Nph	Measured Float
9	Fault Locator in some relays	Measured Float
10	Frequency	Measured Float
11	Power Factor	Measured Float
12	Reactive Power	Measured Float
13	Sigma kA square	Measured Float
14	Voltage BR	Measured Float
15	Voltage RY	Measured Float
16	Voltage YB	Measured Float
4	Signals of Overcurrent Earthfault Relay	
	Digital Input Signals	
1	50BF/LBB Operated	Single Point Information
2	86 Supervision	Single Point Information
3	Relay Communication fail	Single Point Information
4	Relay watchdog operated	Single Point Information
5	Isolator A status	Double Point Information
6	Isolator B status	Double Point Information
7	Cable door open	Single Point Information
8	CB in Remote	Single Point Information
9	CB Status	Double Point Information
10	Earth Fault General Trip	Single Point Information
11	Earth Fault High set Trip	Single Point Information
12	Earth Fault IDMT Trip	Single Point Information
13	Earth Switch AE status	Double Point Information
14	Earth Switch BE status	Double Point Information
15	Earth Switch LE status	Double Point Information
16	Line Isolator status	Double Point Information
17	Breaker L/R switch	Single Point Information
18	Negative Phase Sequence	Single Point Information
19	Phase Fault General Trip	Single Point Information
20	Phase Fault Highset Trip	Single Point Information
21	Phase Fault IDMT Trip	Single Point Information
22	Phase Fault Overload Trip	Single Point Information

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23	PT Fuse Failure	Single Point Information
24	Relay Reset	Single Point Information
25	SF6 Gas Pressure Low	Single Point Information
26	SF6 Lockout Operated	Single Point Information
27	Spring Charged	Single Point Information
28	TCS Alarm-1	Single Point Information
29	TCS Alarm-2	Single Point Information
Digital Output Signals		
1	CB Command	Double Command Output
2	Relay Reset	Single Command Output
	Spare Output	
Measurement Signals		
1	Active Power	Measured Float
2	Current Bph	Measured Float
3	Current Rph	Measured Float
4	Current Yph	Measured Float
5	Fault Current Bph	Measured Float
6	Fault Current Rph	Measured Float
7	Fault Current Yph	Measured Float
8	Fault Current Nph	Measured Float
9	Fault Locator in some relays	Measured Float
10	Frequency	Measured Float
11	Power Factor	Measured Float
12	Reactive Power	Measured Float
13	Sigma kA square	Measured Float
14	Voltage BR	Measured Float
15	Voltage RY	Measured Float
16	Voltage YB	Measured Float

D. MFM Signals, All Feeders- Modbus Protocol

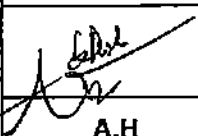
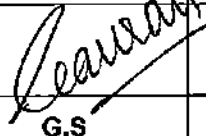
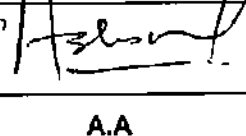
S.No.	Signal List	Data Type
1.	R-Ph Current	MV/ MFI
2.	Y-Ph Current	MV/ MFI
3.	B-Ph Current	MV/ MFI
4.	Neutral Current	MV/ MFI
5.	R-Y Ph Voltage	MV/ MFI
6.	Y-B Ph Voltage	MV/ MFI
7.	B-R Ph Voltage	MV/ MFI
8.	Active Power	MV/ MFI
9.	Active Energy	MV/ MFI
10.	Reactive Power	MV/ MFI
11.	Power Factor	MV/ MFI
12.	Max Demand	MV/ MFI

TECHNICAL SPECIFICATION FOR SCADA

13.	Phase angle 1	MV/ MFI
14.	Phase angle 2	MV/ MFI
15.	Phase angle 3	MV/ MFI
16.	THD Mean Current	MV/ MFI
17.	THD Mean Voltage	MV/ MFI

TECHNICAL SPECIFICATION FOR EARTHING PRACTICE IN GRID SUBSTATION

TECHNICAL SPECIFICATION
FOR
EARTHING PRACTICE IN GRID SUBSTATION

PREPARED BY	REVIEWED BY	APPROVED BY	REV	0
 A.H	 G.S	 A.A	DATE 18/10/2017	

TECHNICAL SPECIFICATION FOR EARTHING PRACTICE IN GRID SUBSTATION

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TECHNICAL SPECIFICATION FOR EARTHING PRACTICE IN GRID SUBSTATION**1. SCOPE**

This specification covers the guidelines of earthing at 66/11, 33/11, 66/33/11 kV Grid substation and the technical requirements of material required for earthing.

2. STANDARDS & CODES

2.1.	CEA guidelines	Technical standards for construction of electrical plants and electrical lines
2.2.		IE Rules of 1956
2.3.	IEEE Std 80	IEEE guide for safety in AC substation grounding
2.4.	CBIP :2006 – publication no. 229	Manual on substation layout
2.5.	IS 3043: 1987	Code of practice for earthing
2.6.	IS 2629 (1985)	Recommended practice for hot dip galvanizing of Iron & Steel
2.7.	IS 2633 (1986)	Method for testing uniformity of coating on zinc coated article
2.8.	IS 5358 (1969)	Specification for hot dip galvanized coating on fasteners
2.9.	IS 4759 (1996)	Specification of Hot dip zinc coatings on structural steel and other allied products
2.10.	IS 1239 (2004)	Steel tubes, tubular and other wrought steel fittings- specification
2.11.	IEC 62561-2	Requirements for conductors and earth electrodes
2.12.	IEC 62561-7	Requirements for earthing enhancing compounds
2.13.	UL 467	Standard for safety - Grounding and bonding equipment
2.14.		Handbook on Electrical Earthing (Ministry of Railways)

TECHNICAL SPECIFICATION FOR EARTHING PRACTICE IN GRID SUBSTATION

3. REQUIREMENT OF EARTHING

3.1.	Primary guidelines	<p>Following are primary guidelines for a good earthing system in a Grid substation:</p> <ol style="list-style-type: none"> The impedance to ground should be as low as possible. In general it should not exceed 0.5 ohm. The step and touch potentials shall be within safe limits. The contractor shall do the calculation for number of earthing rods being used in a substation for achieving the desired earth resistance.
3.2.	Earthing lead size	<ol style="list-style-type: none"> The actual size of earthing lead will depend on the maximum fault current which the earthing lead will be required to carry safely. Please refer Annexure A1 for HT fault level.
3.3.	Earthing type	<ol style="list-style-type: none"> Rod earthing shall be provided for the Grid substation. The size of the rod depends upon the current to be carried and the type of the soil. Soil resistivity testing will be carried out by vendor. The Earth Electrode should be embedded vertically. Wherever hard rock is encountered, the rod can be inclined at an angle of about 30deg to the horizontal as per clause 9.2.2 of IS 3043. The vertically driven rods shall be interconnected with each other using horizontal grid conductors.
3.4.	Earth Pit	<ol style="list-style-type: none"> As per clause 20.5.2 of IS 3043, the minimum distance between the vertical earth electrodes shall not be less than the length of rod. Minimum of 1m distance of earth pit from electrical equipment and structures shall be maintained. The earth pits shall be backfilled with earth enhancing material as per Drawing . Treated Earth pits shall be used where earth resistance value is getting over the prescribed value in specification i.e. 0.5 ohms.
3.5.	Horizontal Conductor	<ol style="list-style-type: none"> The entire earth rod driven in ground vertically shall be interconnected with earth grid conductors horizontally under the ground. The Horizontal conductors shall be laid 600 mm below FGL. Minimum earth coverage of 300 mm shall be provided between the Horizontal conductor and the bottom of trench/foundation/underground pipe at the crossing. Horizontal conductors around a building /switchyard fence shall be buried outside the boundary at a minimum distance of 2000 mm. Risers shall be provided 300mm above the ground level for equipment earthing. Two number earth pits shall be provided with riser for connection of transformer neutral. All the joints between rods flats shall be exothermic type for creating better electrical contact between two. Welding between rods to flat, flat to flat should be arc welding type. Wherever bolted connection is done, it shall be done through two bolts at each joint to ensure tightness and avoid loosening with passage of time.
3.6.	Equipment earthing	<ol style="list-style-type: none"> GI strips shall be used for the equipment earthing. Two separate and distinct earth connections shall be provided for earthing of electrical frameworks.

TECHNICAL SPECIFICATION FOR EARTHING PRACTICE IN GRID SUBSTATION

		<ul style="list-style-type: none"> c. The connection of GI strip with riser of earth mat shall be electric arc welding arrangement; connection of equipment with earthing end shall be double bolted arrangement. d. The transformer neutral shall be earthed with two independent grounding conductors connected to two separate earth pits. e. Fence within the earth grid shall be bonded to the plant earth system at regular interval not exceeding 10 meters. Fence gate shall be separately earthed with flexible connection to permit movement. f. Bolted connection shall be made only for earthing of equipment/devices and for some removable structures. The contact surfaces shall be thoroughly cleaned before connection to ensure good electrical contact. g. Cable armor shall be earthed at both ends for multi core cables. For single core cables, the earthing shall be at switchgear end only. h. Metallic stairs and hand rails shall be earthed as for columns. Additionally a 25x6 GI flat shall run the entire length of the stairs. The GI flat shall be welded to the stairs and hand rails at intervals of 1500 mm. i. The main earth conductor shall be securely fixed to the columns /walls/trays by welding /clamping at the intervals not exceeding 1500 mm. The earth conductors shall be interconnected between them and to the main earth grid through risers.
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4. SPECIFICATION OF EARTHING MATERIALS

4.1.	GI earthing strip	<ul style="list-style-type: none"> a. Fully galvanized iron strips shall be used conforming to IS 2629. b. The zinc deposition shall not be less than 610gm/sqm of the galvanized surface area of the MS Earthing strips. c. The zinc coating used for the galvanization shall be of 9.99 % purity grade as per IS 209. d. All the galvanized material shall be checked for uniformity and weight as per IS. e. The standard length of galvanized iron earthing strip shall be minimum 7Mtrs.
4.2.	Vertical and Horizontal Earth Electrode	<ul style="list-style-type: none"> a. Copper clad steel rod driven in the earth vertically shall be a high tensile-low carbon steel rod of adequate diameter(as per the clause 6.0 of the specs) and 3 m length complying UL467, IEC62561-2 and IS 3043, molecularly bonded by 99.99% pure high conductivity copper on the outer surface with copper coating thickness 254 microns or more with sufficient amount of earth enhancement compound as per IEC 62561-7. b. Copper bonding must be UL/CPRI/ERDA certified. c. Rod shall be tested and certified from CPRI/ERDA for a short circuit current withstanding of desired value. d. There shall be following marking on the rod-Dimension Detail, product model no, Reference number of certification. e. It shall have high corrosion resistance and shall eliminate electrolytic action. f. The rod shall have thread profile at both the ends to ensure no copper is removed from the steel.

TECHNICAL SPECIFICATION FOR EARTHING PRACTICE IN GRID SUBSTATION

4.3.	Earth enhancing compound	<ul style="list-style-type: none"> a. It shall be as per IEC 62561-7. b. It shall be chemically inert to subsoil. c. It shall not pollute the environment. The RoHS certificate shall be provided from any NABL accredited lab for not having any toxic chemical in earth enhance material. d. It shall provide a stable environment in terms of physical and chemical properties and exhibit low resistivity. e. The earthing enhancing compound shall not be corrosive to the earth electrodes being used. f. It shall be maintenance free. g. The earth enhancement material shall be supplied in sealed, moisture proof bags. These bags shall be marked with manufacturer's name or trade name, quantity, batch no. & date of manufacturer, resistivity, Buyer's name, PO no. & date. h. As per IEEE 80-2013 clause 14.5 d, grounding material shall be tested and certified for resistivity less than 0.12 Ω-m.
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5. SIZES OF THE EARTHING MATERIALS FOR EQUIPMENT EARTHING

S.No.	Title	Material	Sizes of the earthing	Type	UOM	No of Lead
	Main Earthing Grid					
5.1	Vertical Rods	Cu Bonded Rods	25	Rod	mm (dia)	
5.2	Above Ground risers	GI	50x10	Flat	sqmm	2
5.3	Horizontal Rods	Cu Bonded Rods	25	Rod	mm (dia)	
5.4	Treated Earth Pit	Cu Bonded Rods	25	Rod	mm (dia)	
	Power Transformers					
5.5	Frame	GI	75X10	Flat	sqmm	2
5.6	Marshalling Box	GI	50X6	Flat	sqmm	2
5.7	Radiator	GI	50X6	Flat	sqmm	2
5.8	Neutral	GI	65x10	Flat	sqmm	2
5.9	Fan	GI		As per sizes mentioned for fans		
	11 KV System					
5.10	11 KV Switchgear	GI	50X6	Flat	sqmm	2

TECHNICAL SPECIFICATION FOR EARTHING PRACTICE IN GRID SUBSTATION

5.11	11 KV Bus Duct	GI	50X6	Flat	sqmm	2
5.12	11 KV Cable Box	GI	50X6	Flat	sqmm	2
	415 V System					
5.13	ACDB	GI	50X6	Flat	sqmm	2
5.14	Station Trafo Frame	GI	50X6	Flat	sqmm	2
	DC System					
5.15	Battery Charger	GI	50X6	Flat	sqmm	2
5.16	DCDB	GI	50X6	Flat	sqmm	2
	Other Electrical Items					
5.17	Three phase receptacles, welding outlet	GI	25x3	Flat	sqmm	1
5.18	C&R Panel	GI	50X6	Flat	sqmm	2
5.19	Push Button	GI	8	Wire	swg	1
5.20	Cable Trays(one run along the tray section)	GI	50X6	Flat	sqmm	1
	Other Non Electrical Items					
5.21	Railway Tracks	GI	25x6	Flat	sqmm	At suitable Points
5.22	Metallic noncurrent carrying structures like stair case	GI	25x6	Flat	sqmm	1
5.23	Columns, Structures	GI	50X6	Flat	sqmm	2
5.24	Steel pipe racks	GI	25x6	Flat	sqmm	1
5.25	Fence/Gate	GI	50X6	Flat	sqmm	At suitable Points(2 min)
5.26	Hand Rail	GI	8	Wire	swg	1

TECHNICAL SPECIFICATION FOR EARTHING PRACTICE IN GRID SUBSTATION

6. TESTING AND INSPECTION

6.1.	Earthing materials	<p>a. The purchaser reserves the right to inspect the material at the time of tests. All tests shall be performed in the presence of BYPL representative. The bidder shall give intimation in advance to witness the test.</p> <p>b. Acceptance test for GI earthing strips – Tests for Visual examination, dimensional verification and galvanization shall be witnessed at the time of inspection.</p> <p>c. Acceptance test of Earth enhancement compound – Tests for leaching, sulphur determination, corrosion and resistivity shall be done as per IEC 62561-7</p> <p>d. Type test reports of the earthing materials from CPRI/ERDA/Equivalent lab shall be submitted. The bidder shall submit UL-467/CPRI/ERDA test reports for copper clad steel rod.</p>
6.2.	Measurement of Earth resistance	<p>a. After the completion of work ground resistance of each installation shall be measured by BYPL/Contractor.</p> <p>b. The measurement of resistance shall be witnessed and signed by representative of BYPL as well as the contractor. The test certificates shall be generated for each installation clearly indicating the details of the transformer, name of the substation, location, district, serial no. of testing equipment and name of testing engineer.</p> <p>c. The desired ground resistance shall be measured after interconnection of earth pits is completed. The value of earth resistance shall not be more than 0.5 ohm.</p> <p>d. In case where this value exceeds 0.5 ohms, the earthing design shall be redesigned. The pit location, earth electrode, soil treatment, earth conductor, GI strip used shall be checked whether properly used at site. If not, these shall be changed as per the redesigned plan.</p>

7. DEVIATIONS

7.1.	Deviation	<p>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 that the bidder complies fully with this specification. No deviation will be acceptable post order.</p>
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TECHNICAL SPECIFICATION FOR EARTHING PRACTICE IN GRID SUBSTATION

8. DOCUMENTS SUBMISSION

The bidder has to submit the following documents along with bid:-

8.1.	Complete earthing calculation
8.2.	Complete product catalogue, Manual and calibration certificate of the equipment
8.3.	Type test reports
8.4.	Deviation Sheet (if any)

9. GUARANTEED TECHNICAL PARTICULARS

S. No	Parameter	BYPL Requirement	Vendor Data
9.1	Rod to rod welding	Exothermic	
9.2	Zinc deposition of GI earthing Strip	610gm/sqm	
9.3	Length of GI Strip	7m (Minimum)	
9.4	Diameter of Cu clad Rod	25 mm	
9.5	UL/CPRI/ERDA Certification of Cu Bonding	Test certificate to be provided	
9.6	Cu bonding	250 Micron	
9.7	Length of Copper bonded rod	3 m	
9.8	Purity of Copper	99.99%	
9.9	Short circuit withstand test of Rod	31.5kA	
9.10	Marking on the rod-Dimension Detail, product model no, Reference number of certification	Sample Required	
9.11	ROHS Certificate from NABL accredited lab for not having toxic chemical in earth enhance material	Test certificate to be provided	
9.12	Resistivity of earth enhancing material	0.12 ohm-m(Max)	

TECHNICAL SPECIFICATION FOR EARTHING PRACTICE IN GRID SUBSTATION

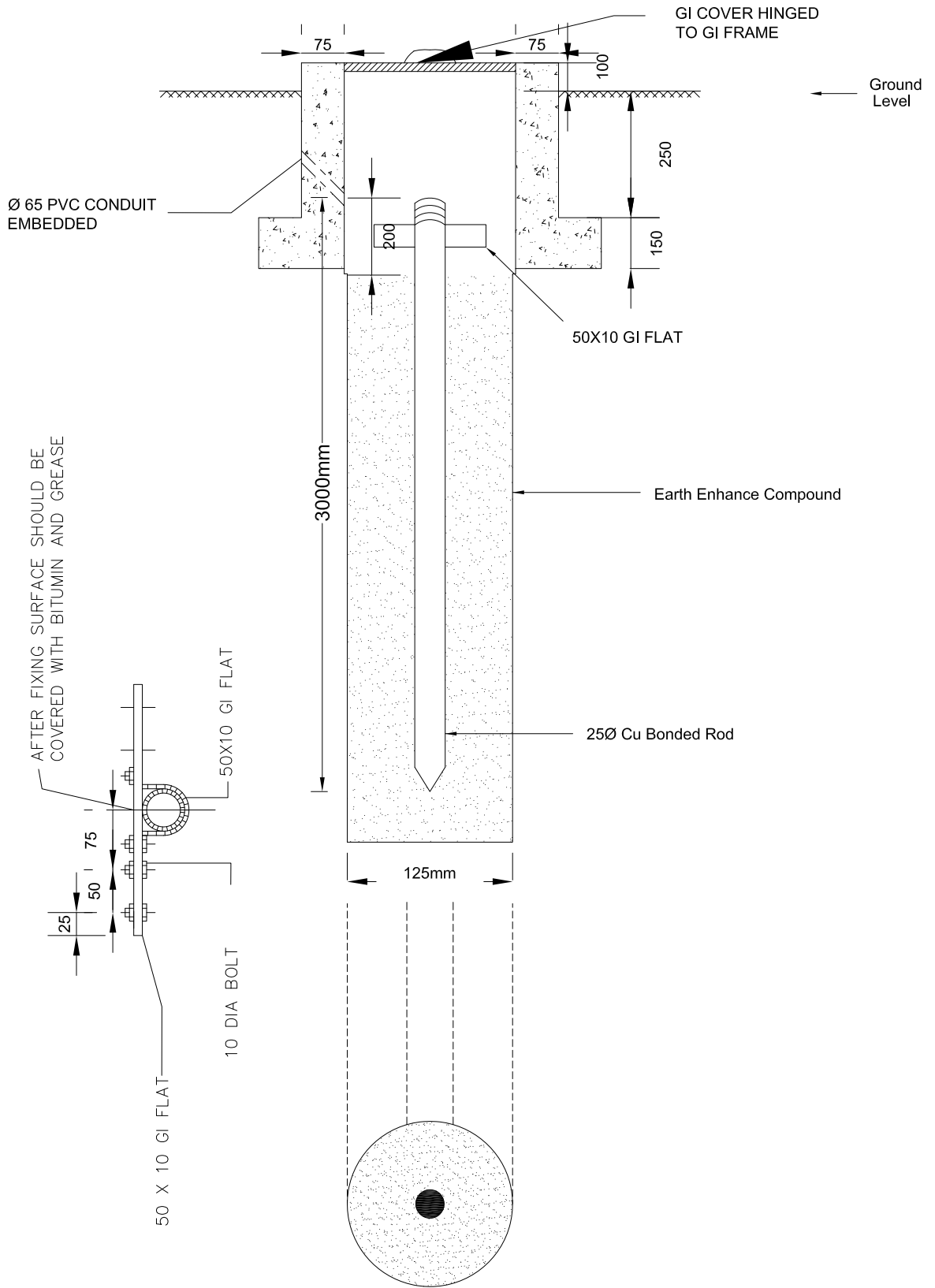
9.13	Exothermic welding material	IEEE 837 Complied	
9.14	Make of Steel	SAIL/ESSAR/TATA	


ANNEXURE A1 : REFERENCE FAULT LEVEL

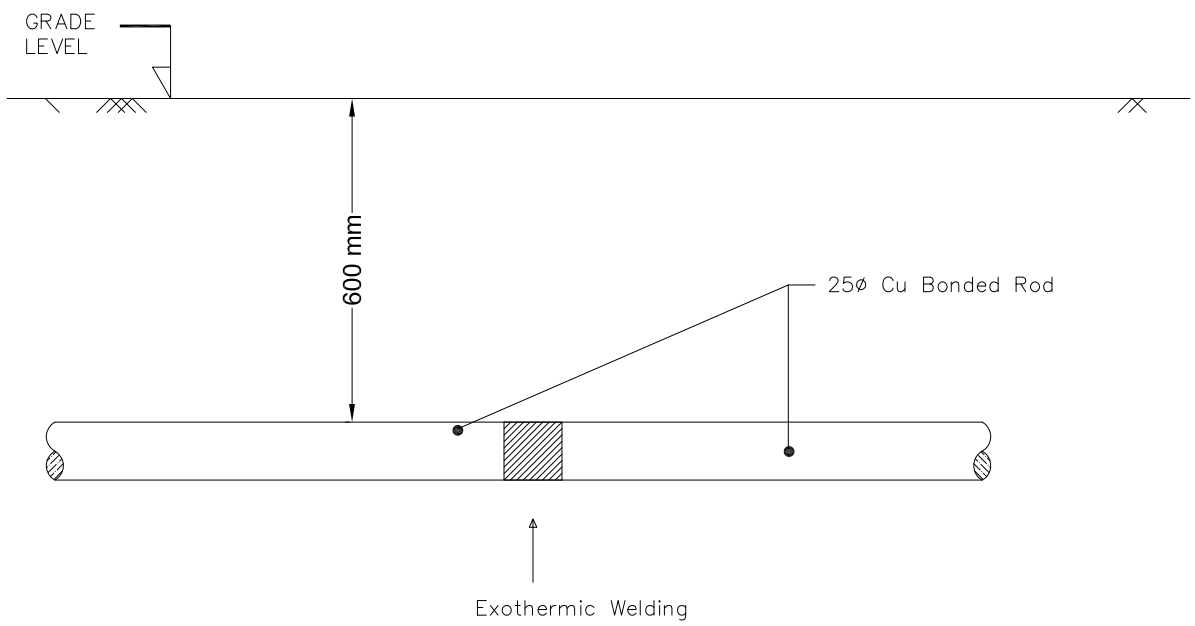
Voltage Level(kV)	Design Fault Level
66/11	31.5 KA
33/11	25 KA

TECHNICAL SPECIFICATION FOR EARTHING PRACTICE IN GRID SUBSTATION

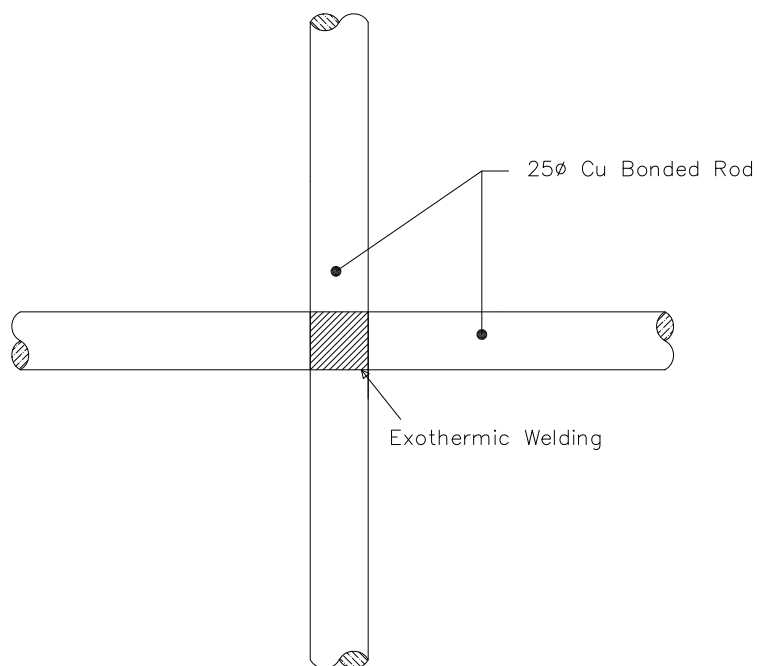
ANNEXURE A2: REFERENCE DRAWINGS




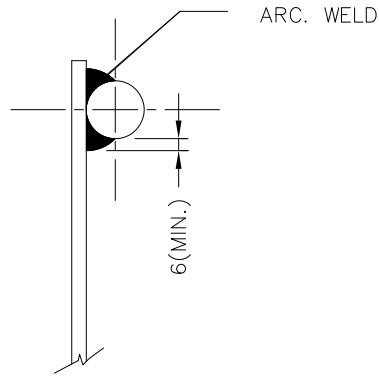
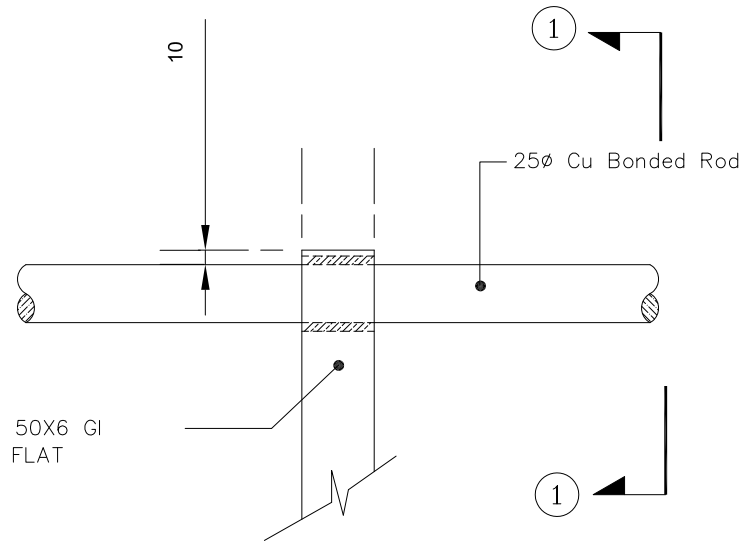
DRAWN	A.H	TITLE: – EARTH ELECTRODE	 BSES Yamuna Power Limited
CHECKED	G.S		
APPD.	A.A		
DATE	17.10.17		
SCALE	NTS		




DRAWN	A.H	TITLE:— LAP JOINT BETWEEN RODS	
CHECKED	G.S		
APPD.	A.A		
DATE	17.10.17		
SCALE	NTS		



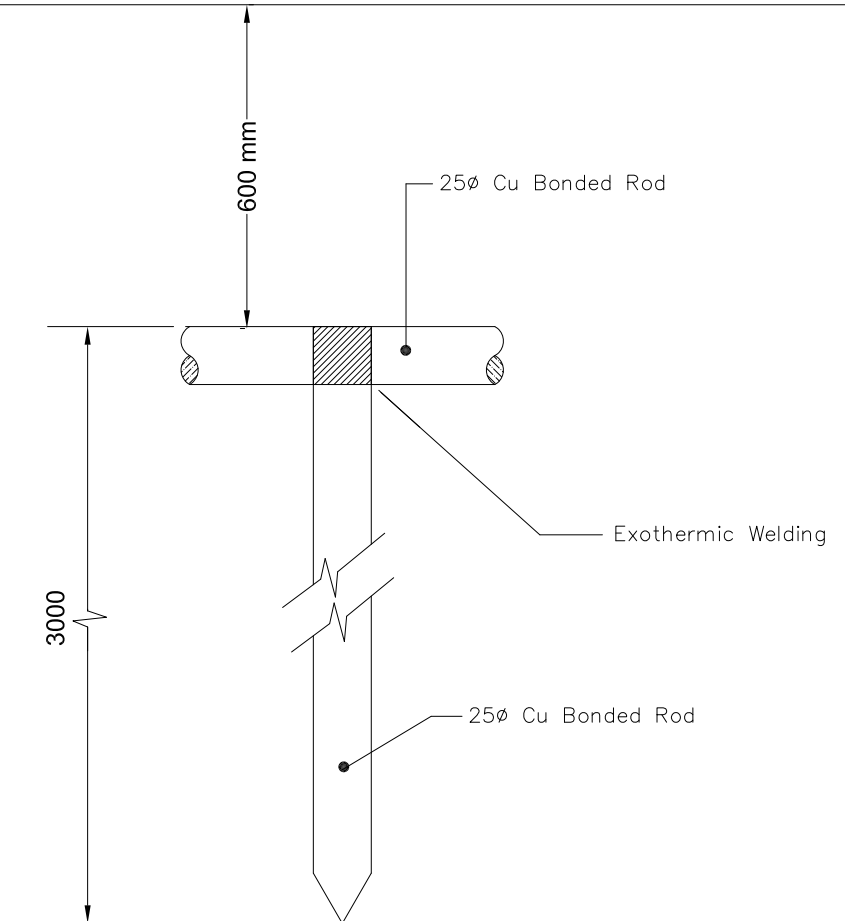
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CHECKED	G.S		
APPD.	A.A		
DATE	17.10.17		
SCALE	NTS		




SECTION - 1

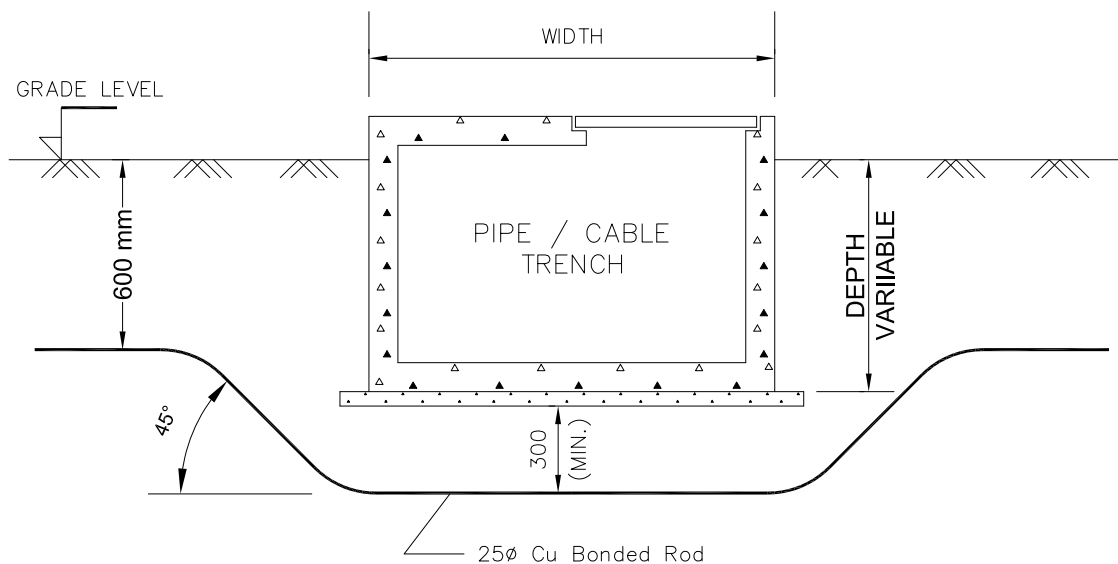
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APPD.	A.A		
DATE	17.10.17		
SCALE	NTS		


GRADE
LEVEL

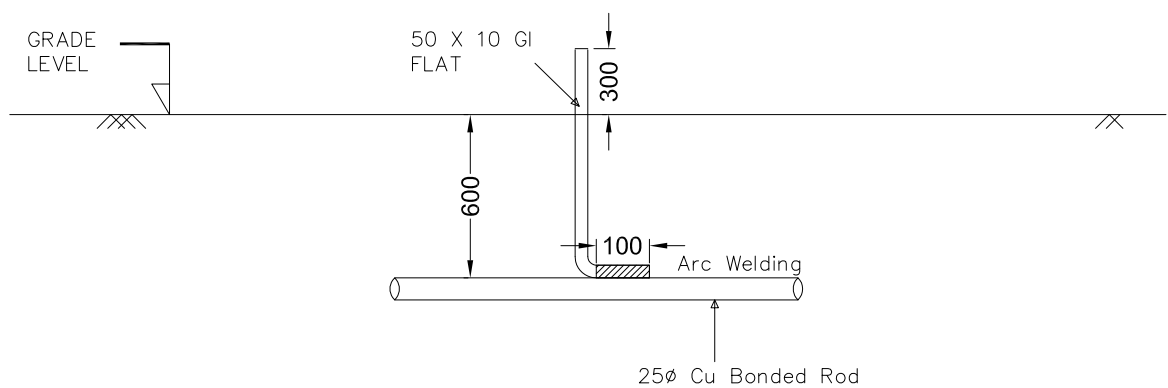



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APPD.	A.A		
DATE	17.10.17		
SCALE	NTS		

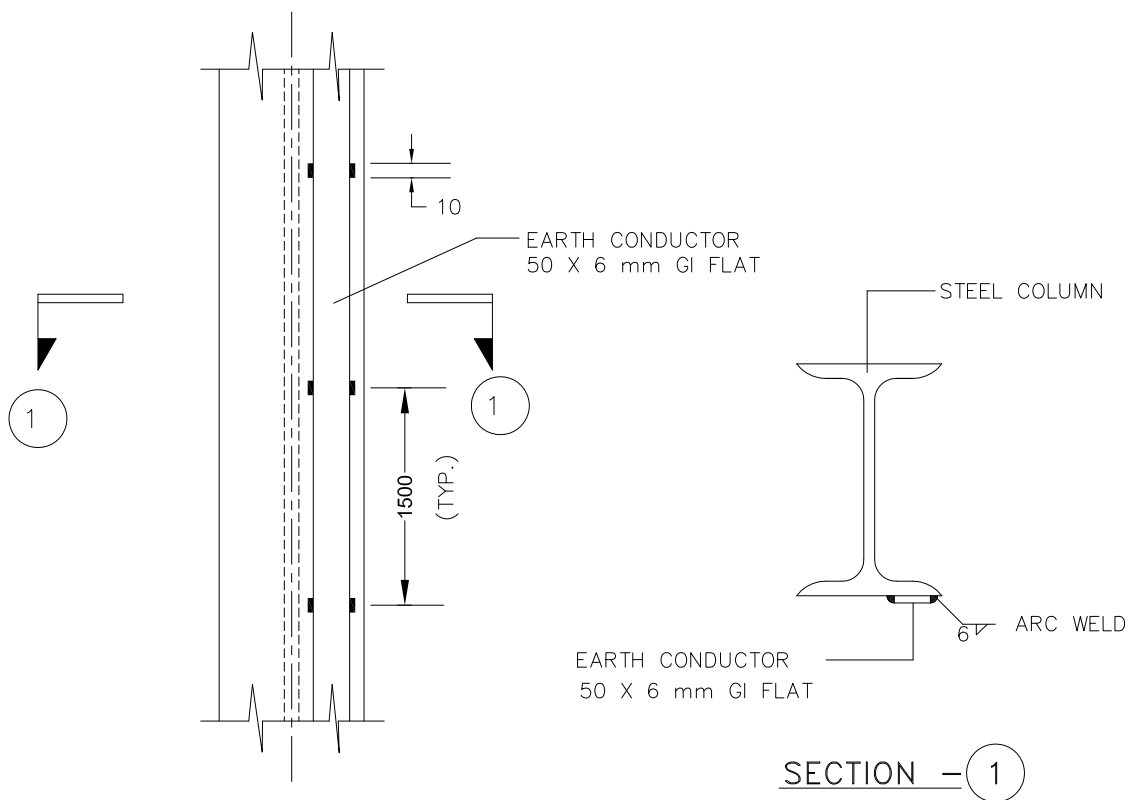
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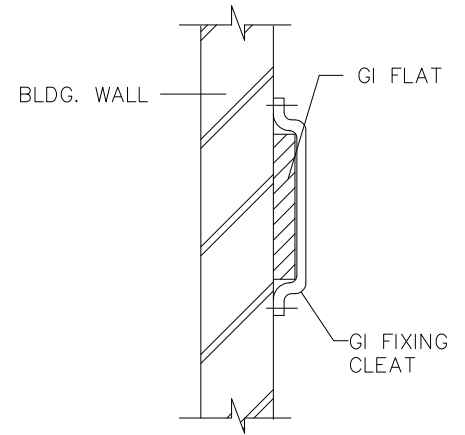
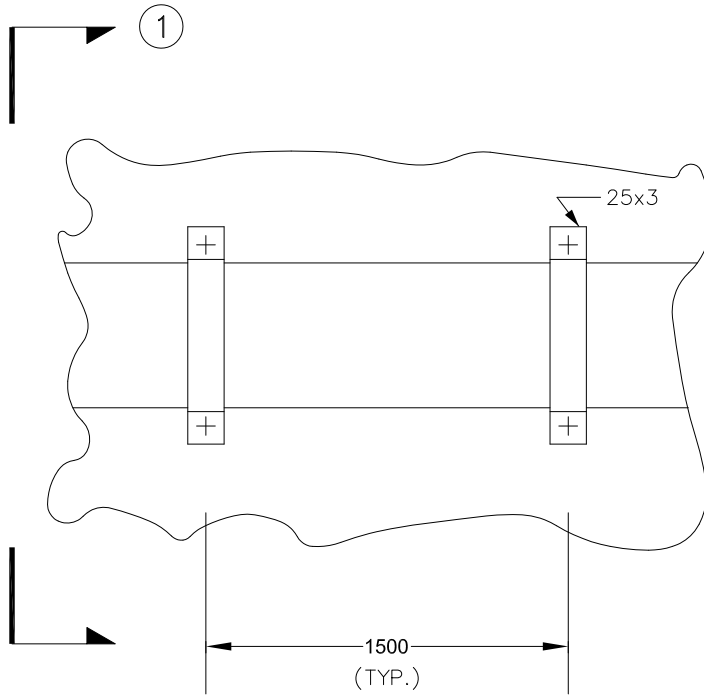
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APPD.	A.A		
DATE	17.10.17		
SCALE	NTS		




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APPD.	A.A		
DATE	17.10.17		
SCALE	NTS		

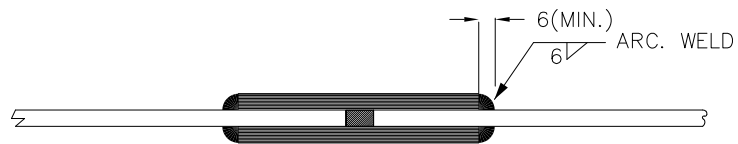
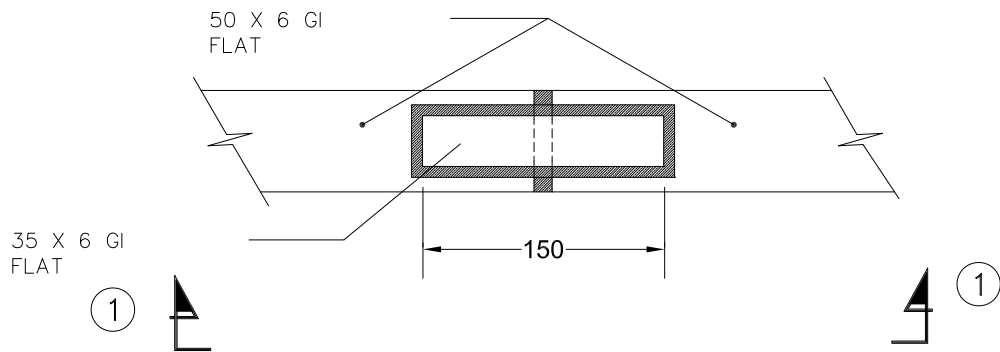


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APPD.	A.A		
DATE	17.10.17		
SCALE	NTS		



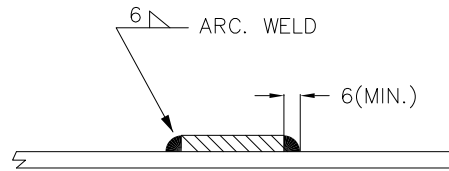
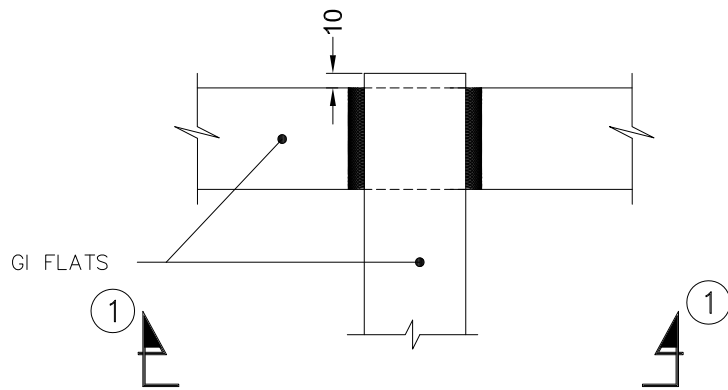
SECTION - 1

DRAWN	A.H	TITLE:— EARTHING CONDUCTOR ALONG BUILDING WALL	
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APPD.	A.A		
DATE	17.10.17		
SCALE	NTS		




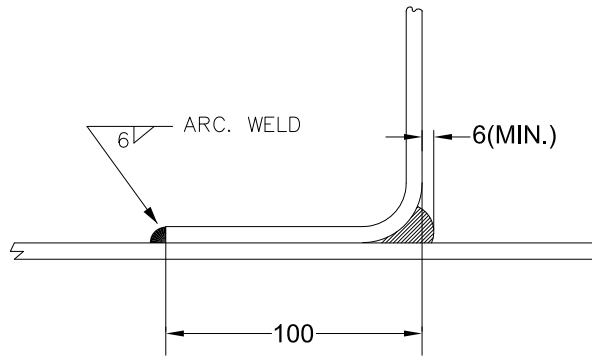
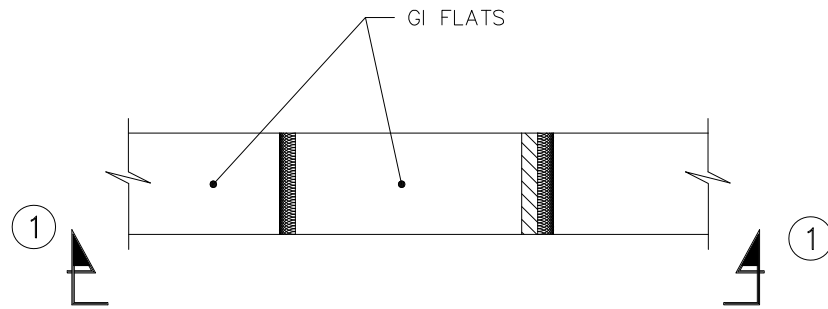
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APPD.	A.A		
DATE	17.10.17		
SCALE	NTS		




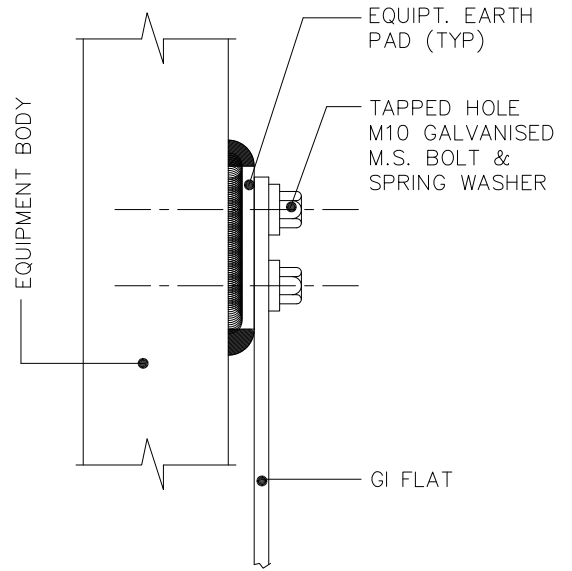
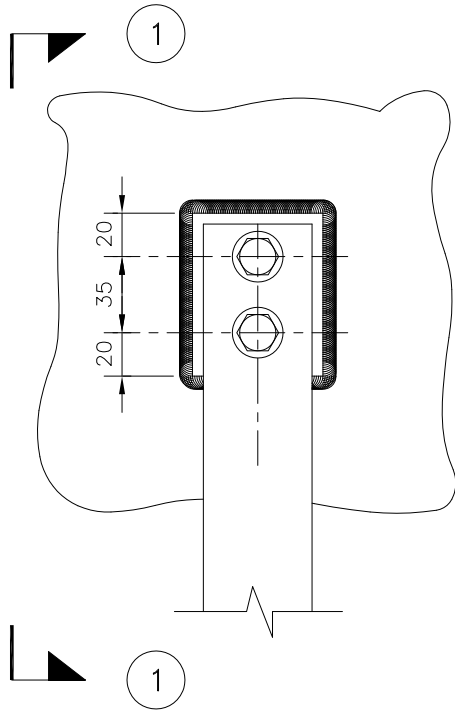
SECTION - ①

DRAWN	A.H	TITLE:— CROSS JOINT BETWEEN GI FLATS	
CHECKED	G.S		
APPD.	A.A		
DATE	17.10.17		
SCALE	NTS		



SECTION - ①

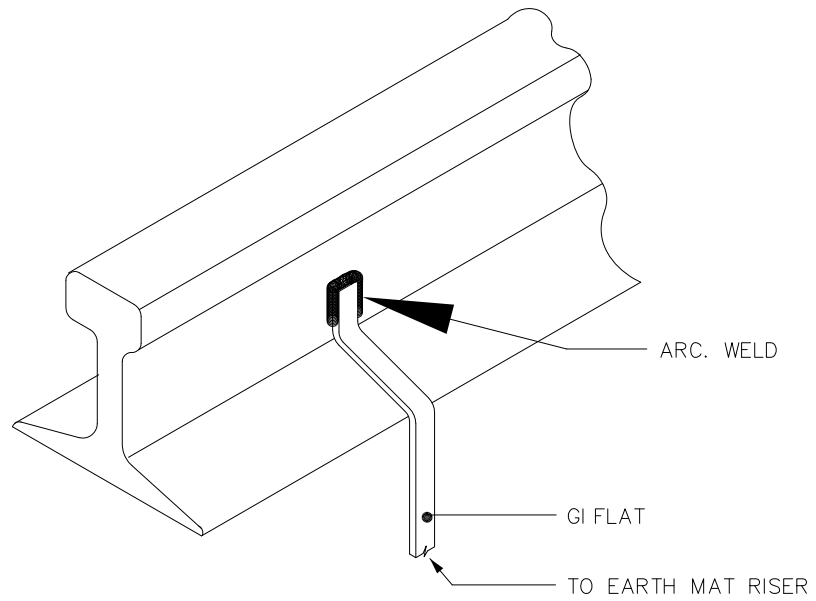
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CHECKED	G.S		
APPD.	A.A		
DATE	17.10.17		
SCALE	NTS		




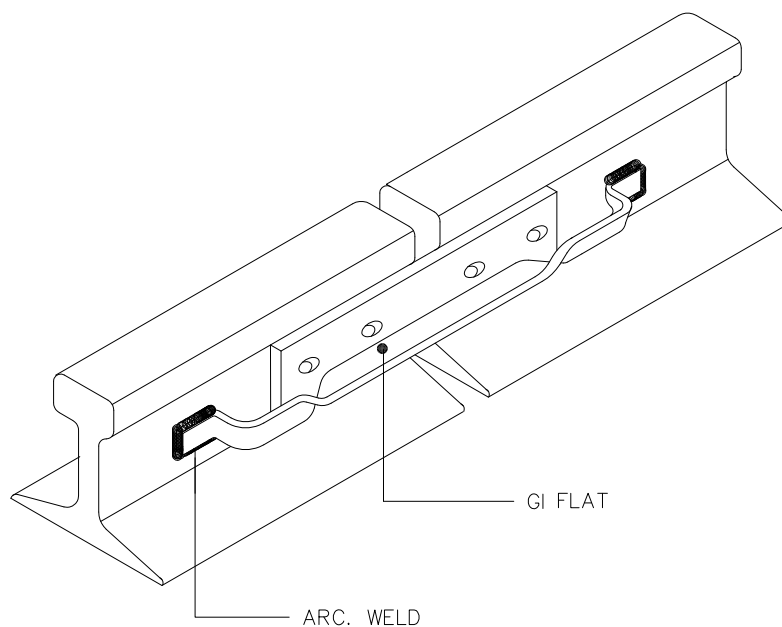
SECTION - ① - ①


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APPD.	A.A	
DATE	17.10.17	
SCALE	NTS	

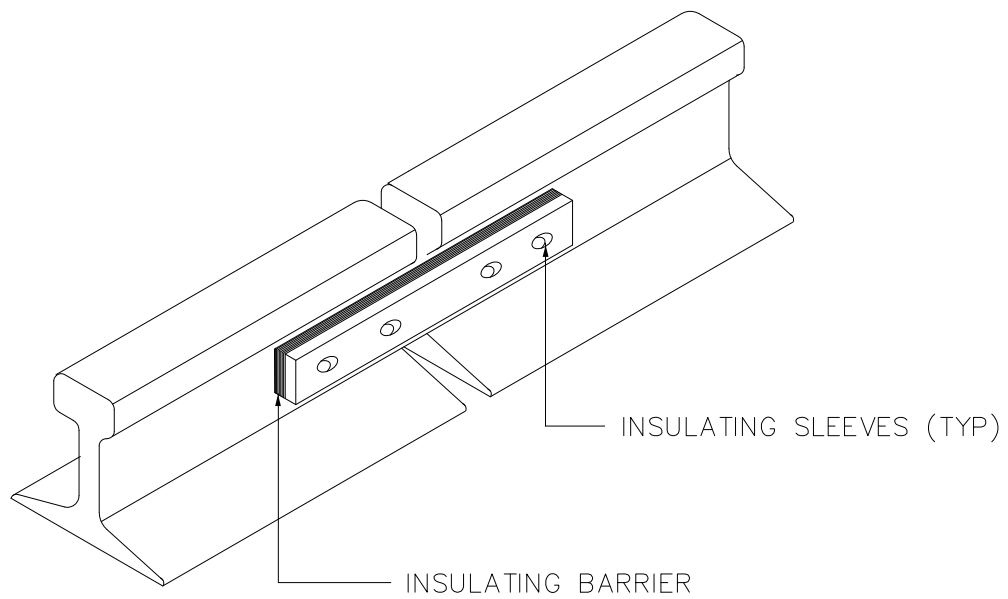
BSES
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APPD.	A.A		
DATE	17.10.17		
SCALE	NTS		

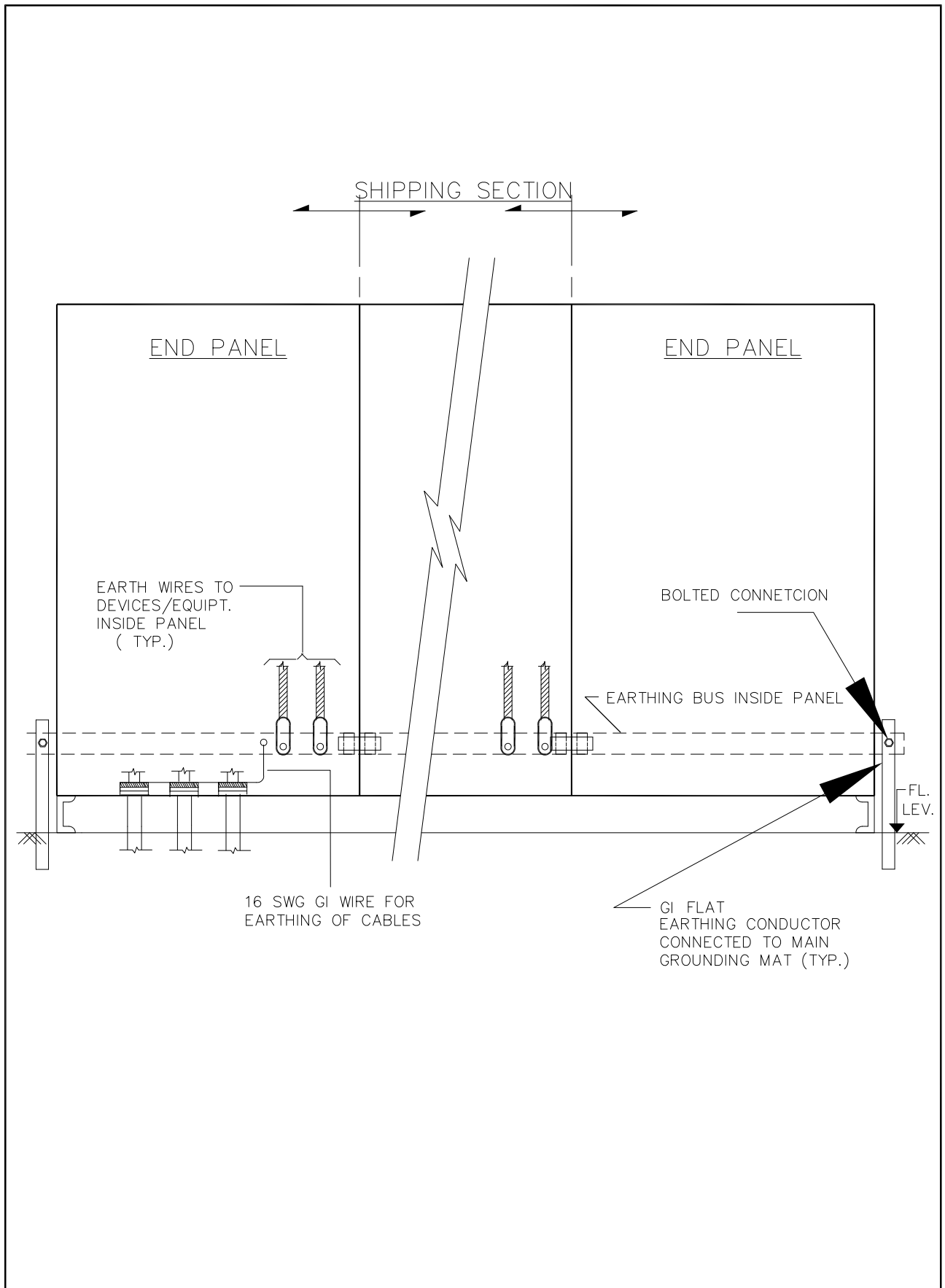


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APPD.	A.A		
DATE	17.10.17		
SCALE	NTS		

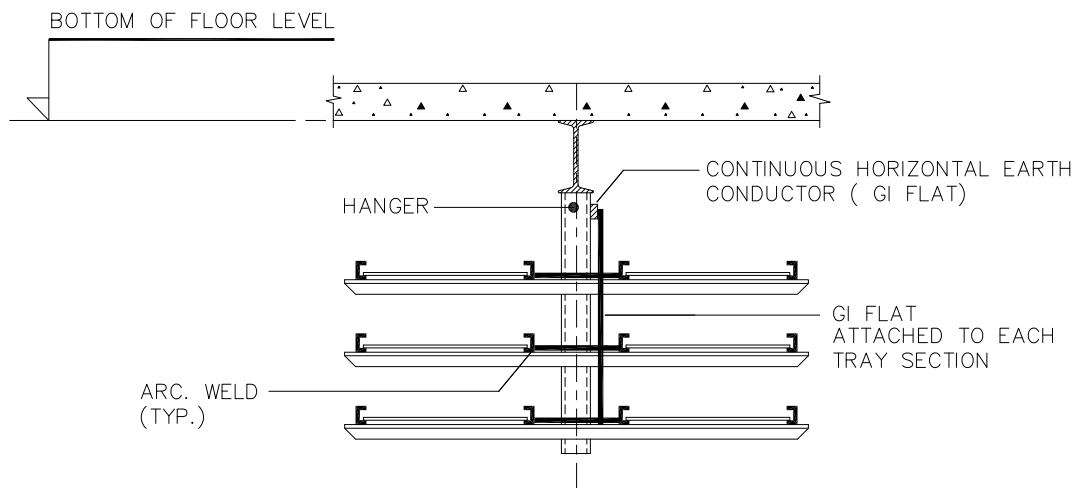


Note: Such installation shall be provided at points where the rail track leaves the earth grid(typically at the plant boundary)

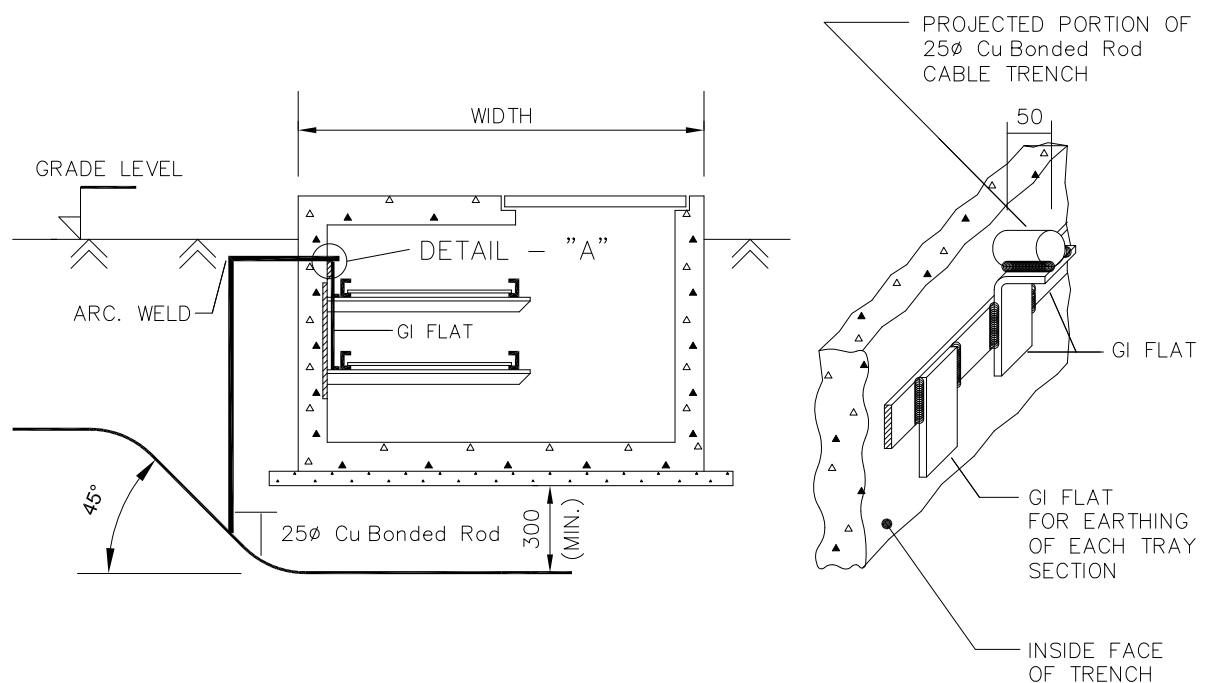
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CHECKED	G.S		
APPD.	A.A		
DATE	17.10.17		
SCALE	NTS		



DRAWN	A.H	TITLE:— EARTHING OF MCC, SWITCHGEAR	
CHECKED	G.S		
APPD.	A.A		
DATE	17.10.17		
SCALE	NTS		



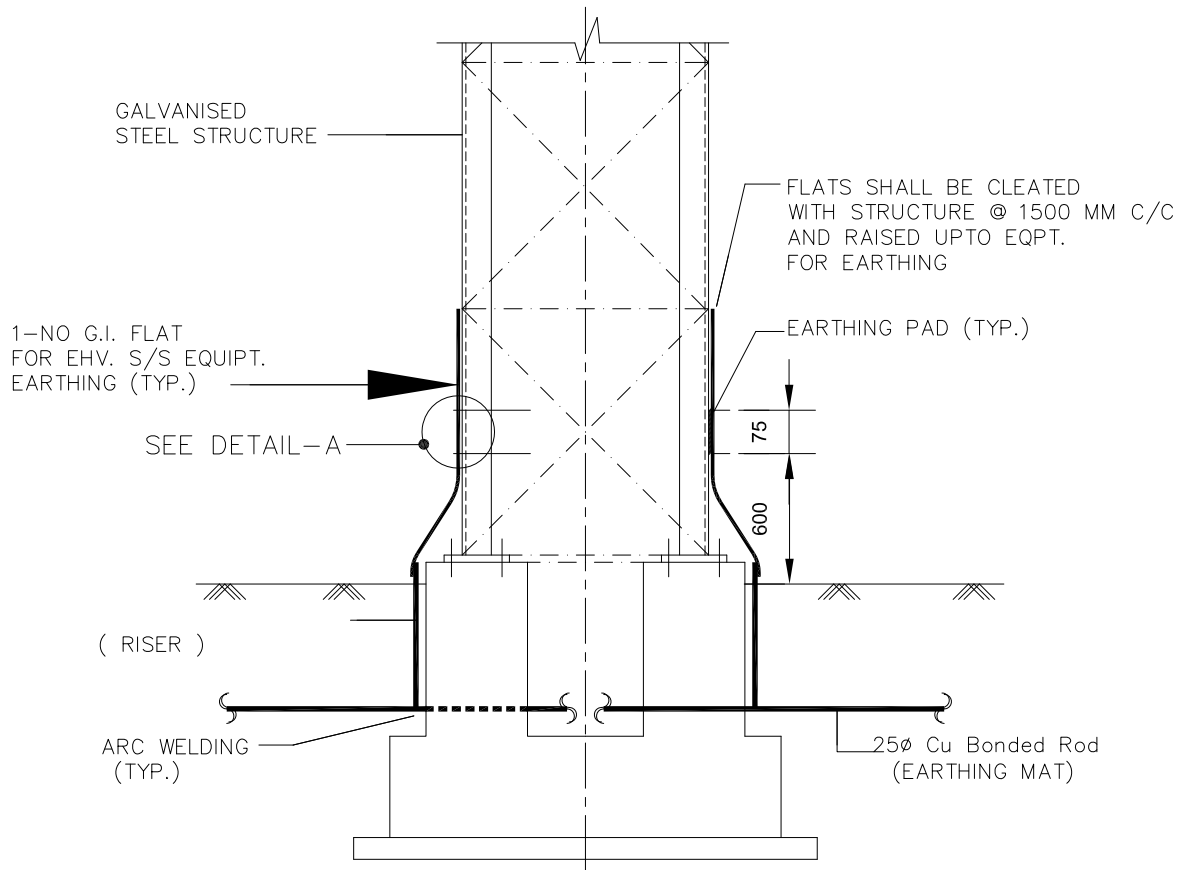
OVERHEAD CABLE TRAY EARTHING



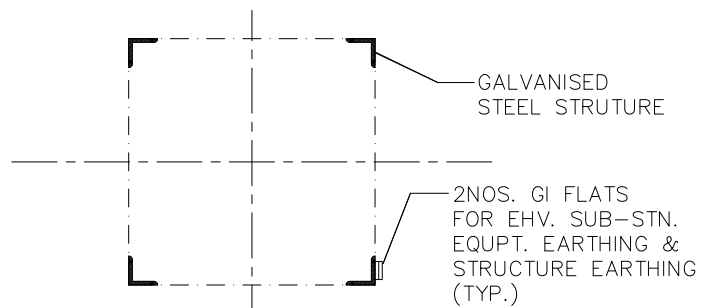
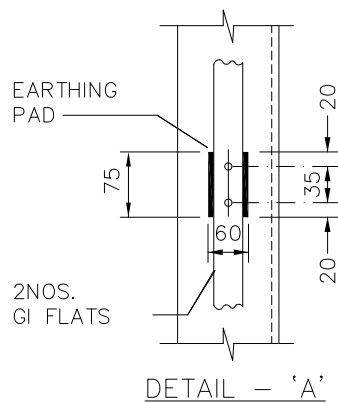
DETAIL - A

DRAWN	A.H	TITLE: - CABLE TRANCH/TRAY EARTHING
CHECKED	G.S	
APPD.	A.A	
DATE	17.10.17	
SCALE	NTS	

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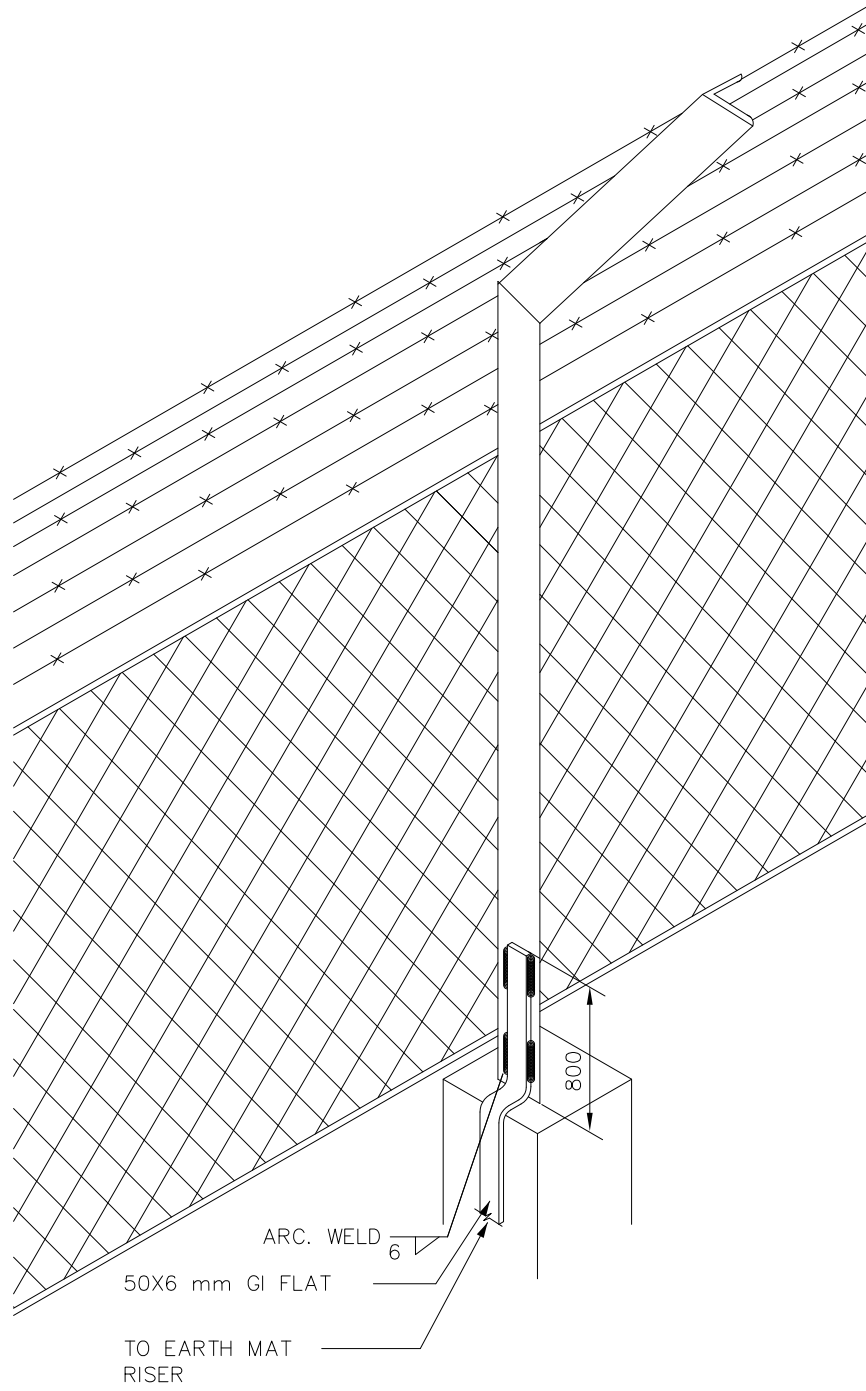



SECTION

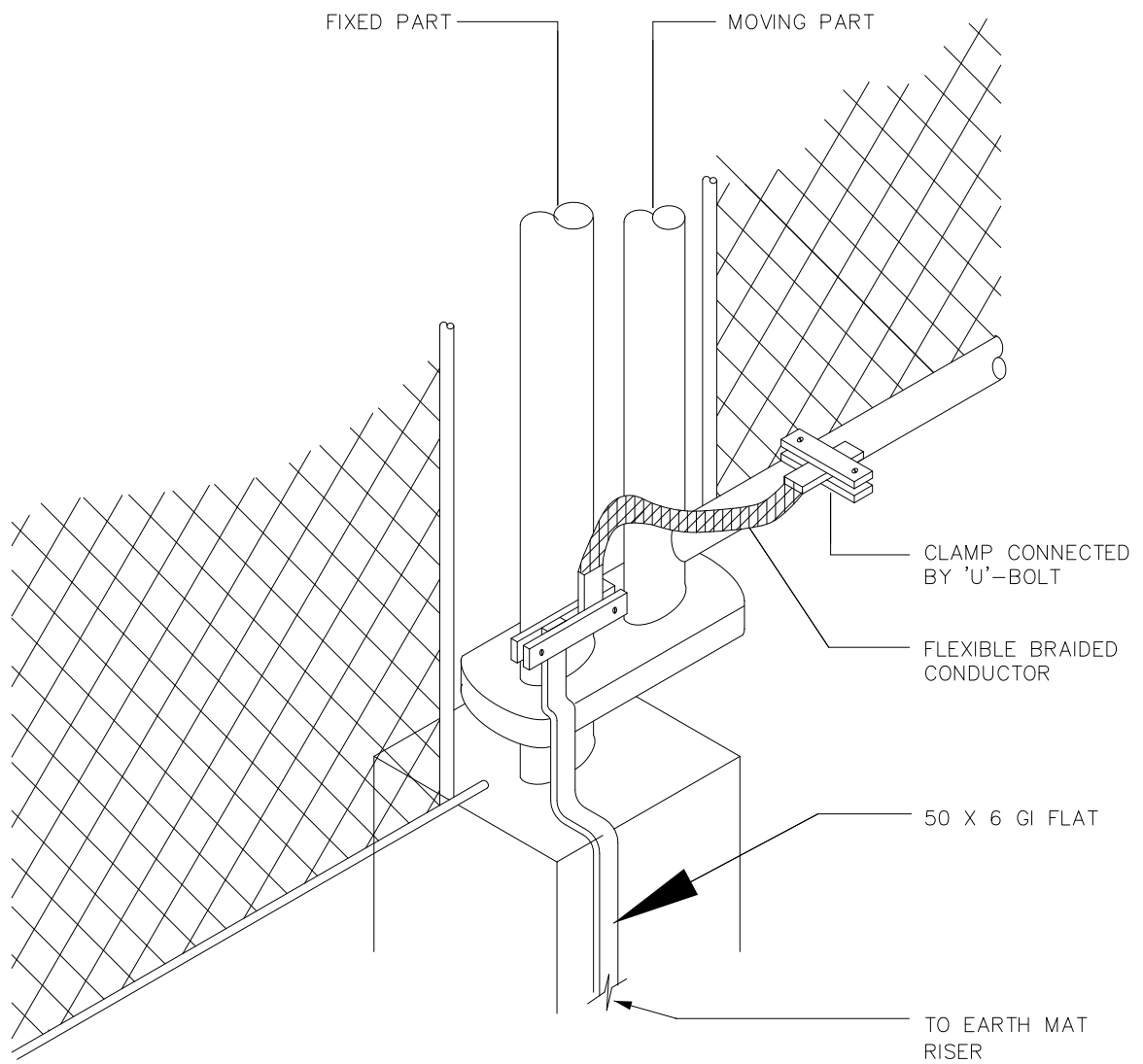


PLAN

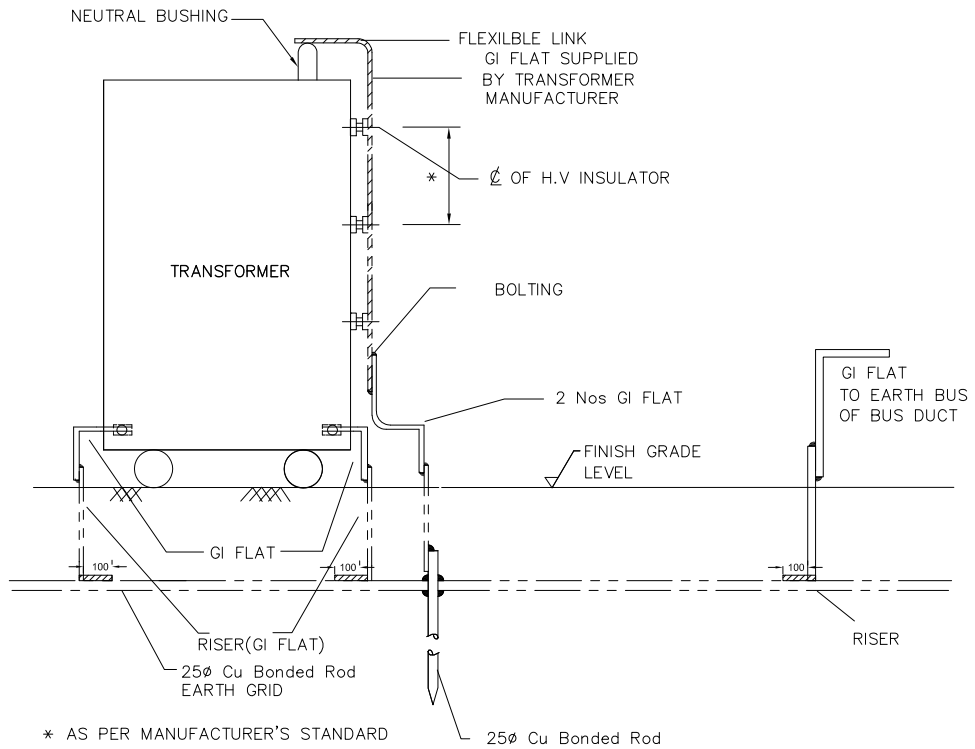
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CHECKED	G.S		
APPD.	A.A		
DATE	17.10.17		
SCALE	NTS		



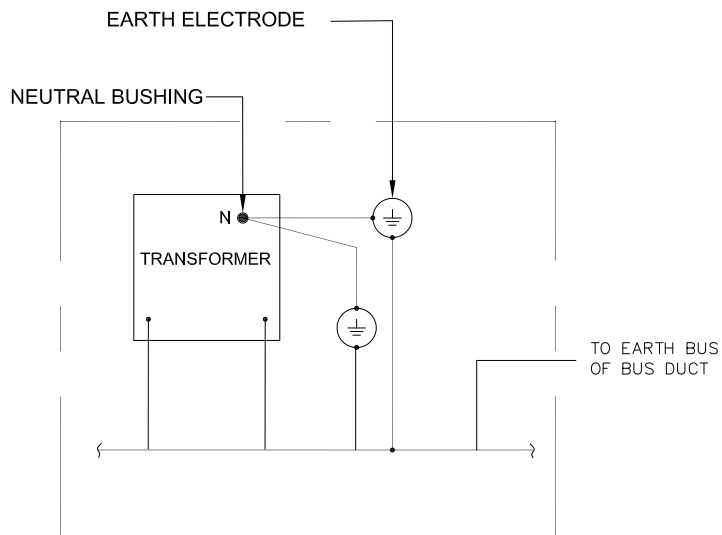
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APPD.	A.A		
DATE	17.10.17		
SCALE	NTS		




DRAWN	A.H	TITLE:— FENCE GATE EARTHING	
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APPD.	A.A		
DATE	17.10.17		
SCALE	NTS		

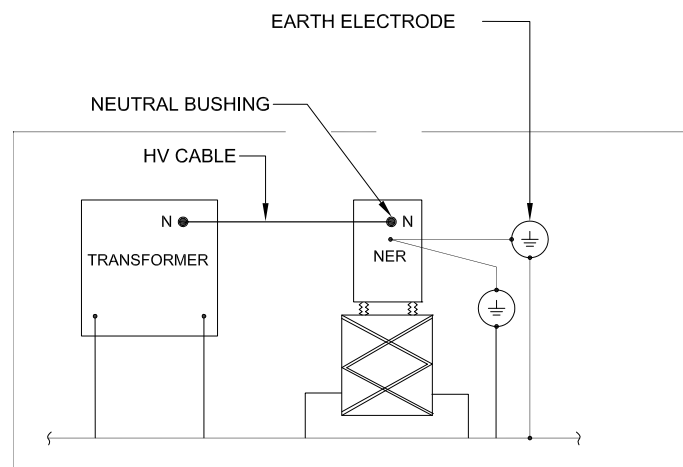
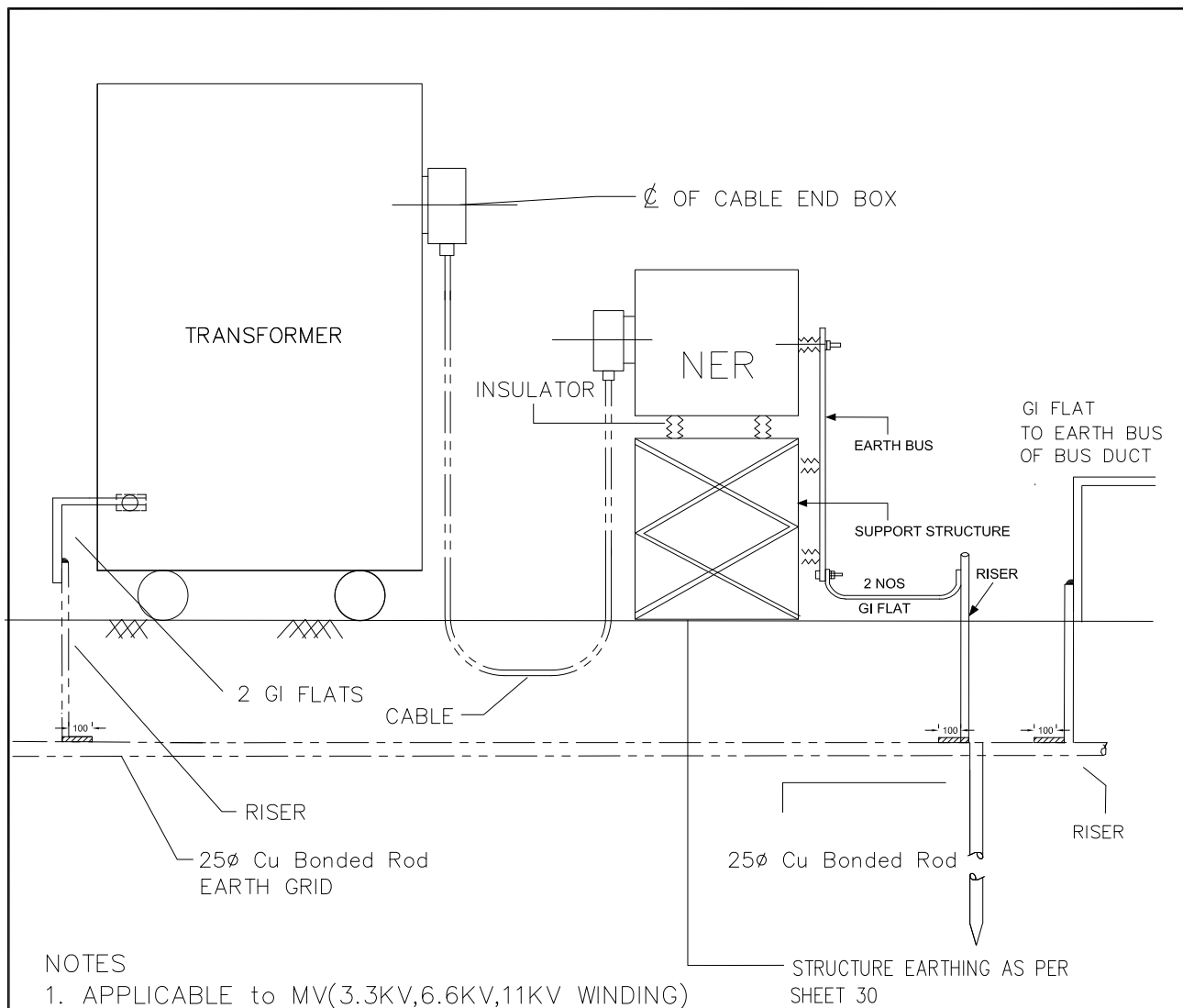


NOTE: APPLICABLE TO EHV WINDINGS AND LV (415V) WINDINGS OF TRANSFORMERS
REQUIRING DIRECT EARTHING OF NEUTRALS.



LINE DIAGRAM
SOLID NEUTRAL EARTHING

DRAWN	A.H	TITLE:— TRANSFORMER NEUTRAL EARTHING (DIRECT)	 BSES Yamuna Power Limited
CHECKED	G.S		
APPD.	A.A		
DATE	17.10.17		
SCALE	NTS		



LINE DIAGRAM
NEUTRAL EARTHING THROUGH NER

DRAWN	A.H	TITLE:— TRANSFORMER NEUTRAL EARTHING (THROUGH NGR)
CHECKED	G.S	
APPD.	A.A	
DATE	17.10.17	
SCALE	NTS	

BSES
BSES Yamuna Power Limited

**TECHNICAL SPECIFICATION
FOR
LIGHTNING/SURGE ARRESTER
Specification No. SP-LA-64-R0**

PREPARED BY	REVIEWED BY	APPROVED BY	REV	0
Minita Kumari	Gaurav Sharma	Devender Sharma	DATE	18/11/2015
<i>Minita</i>	<i>Gaurav</i>	<i>Devender Sharma</i>	PAGE	Page 1 of 20

TECHNICAL SPECIFICATION FOR LIGHTNING/SURGE ARRESTER**CONTENTS**

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TECHNICAL SPECIFICATION FOR LIGHTNING/SURGE ARRESTER**1.0 SCOPE**

This specification covers the design, manufacture, assembly, testing at manufacturer's works, packing and delivery of 66kV, 33kV, and 11kV Metal Oxide (gapless) Lightning/Surge arresters with polymeric housing. Scope of supply is given in Annexure A.

2.0 CODES & STANDARDS

The Lightning/Surge arresters shall be designed, manufactured and tested in accordance with the latest applicable Indian Standard, IEC standard, ASTM standard and CBIP manuals as listed below:

S. No.	Standard Code	Standard Description
2.1		Indian Electricity Rules
2.2		Indian electricity act
2.3		CBIP manual
2.4		ASTMD 2303 standard
2.5	IS : 3070 – Part 3	Lightning Arresters for Alternating Current Systems
2.6	IS : 2071 - Part I	Method of high voltage testing
2.7	IS : 2629 - 1985	Recommended Practice for Hot-Dip Galvanizing of Iron and Steel
2.8	IS : 5621 - 1980	Hollow insulators for use in electrical equipment
2.9	IS : 6639 - 1972	Specification for Hexagon Bolts for Steel Structures
2.10	IEC 60099-4-2001	Metal-Oxide Surge Arresters without gaps for AC Systems
2.11	IEC 60815-3	Polymer Insulators for AC system

3.0 SERVICE CONDITIONS

3.1	Average grade atmosphere	Heavily polluted, dry
3.2	Maximum altitude above sea level	1000
3.3	Ambient air temperature	Highest 50Deg C Average 40Deg C
3.4	Minimum ambient air temperature	0 Deg C

TECHNICAL SPECIFICATION FOR LIGHTNING/SURGE ARRESTER

3.5	Relative Humidity	100%
3.6	Seismic Zone	4
3.7	Rainfall	750 mm concentrated in four months

4.0 DESIGN FEATURES

4.1	System	66kV	33kV	11kV
4.1.1	Voltage	66kV \pm 10%	33kV \pm 10%	11kV \pm 10%
4.1.2	Frequency	50Hz \pm 5%		
4.1.3	Short circuit rating	31.5kA for 3 sec	26.3kA for 3 sec	26.3kA for 3 sec
4.1.4	Earthing	Solidly grounded		
4.2	Application	To be used for protection of transformers, circuit breakers and other sub-station equipment against lightning and switching surges.		
4.3	Installation	Outdoor for 66kV system, Outdoor/Indoor for 33kV system based on site requirement, and Indoor for 11kV System.		
4.4	Arrestor Type	<ul style="list-style-type: none"> a. Gap-less metal oxide type (ZnO Type) with absolutely no air volume inside b. Arresters shall be of cage design so that arrester does not explode during the short circuit test condition. The housing should be directly molded on stack of MOV blocks without any intermediate interface. 		
4.5	Arrester housing	<ul style="list-style-type: none"> a. Silicon rubber housing b. The housing material shall be highly hydrophobic in nature. c. Polymer housing shall be free from lamination cavities or other flaws affecting the mechanical and electrical strengths. d. The surge arrester shall not fail due to housing contamination. e. Housing shall be so coordinated that external 		

TECHNICAL SPECIFICATION FOR LIGHTNING/SURGE ARRESTER

		<p>flashover will not occur due to application of any impulse or switching surge voltage up to maximum design value of surge arrester. The polymer housing should comply with the requirement of IEC 60815-3.</p> <p>f. The housing shall be of Grey colour.</p>
4.6	Connecting lead	Insulated copper cable or copper strip of minimum cross section area 50sq mm with minimum 1.5m length shall be used for connecting LA and surge counter (for outdoor type only)
4.7	Mounting	<p>a. Vertical on steel structures with insulating bases.</p> <p>b. Surge counters shall be suitable for mounting on structure of lightning arrester.</p>
4.8	Line side Terminal Connectors	<p>a. Aluminium alloy terminal clamps Suitable for ACSR Zebra (dia 28.62mm) / Goat conductor (25.97mm) for 66kV/33kV outdoor LA</p> <p>b. 25X3 mm Copper flat for 33kV/11kV Indoor LA</p>
4.9	Ground Terminal Connectors	Suitable for 50x6 mm GI flat
4.10	End fittings	The end fittings used in polymer arrester shall be made out of aluminum through machining process/pressure die-casting process. Sand casted and gravity casted end fittings are not acceptable due to poor microstructure and porosity issues.
4.11	Surge Counter and Leakage current meters	<p>a. The surge counters and leakage current meters shall be provided with 66kV and 33kV outdoor LAs.</p> <p>b. The surge counter shall be Non-resettable type and shall be enclosed in weather proof enclosures.</p> <p>c. Suitable leakage current meters shall be supplied in the surge counter enclosure.</p> <p>d. The reading of milli-ammeter and counter shall be visible through an inspection glass panel to a man standing on ground.</p> <p>e. Paint shade of the enclosure shall be Polyurethane, 692 of IS-5.</p> <p>f. Ingress protection of the enclosure shall be IP-67</p>

TECHNICAL SPECIFICATION FOR LIGHTNING/SURGE ARRESTER

4.12	Atmospheric protection for clamp and fitting of iron and steel	All the metal parts including nuts, bolts, and washers shall be Hot dip galvanized as per IS 2633. The minimum thickness of galvanization should be 610g/sqmm.
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5.0 NAME PLATE & MARKINGS

5.1	Material	Anodized aluminum 16SWG
5.1.1	Background	SATIN SILVER
5.1.2	Letters, diagram & border	Black
5.1.3	Process	Etching
5.2	Rating plate details	<ul style="list-style-type: none"> a. Name of the manufacturer b. Type and serial No. c. Rated voltage d. Max. continuous Operating Voltage e. Nominal discharge current f. Pressure Relief Class g. Identification mark on each separately housed unit to enable it to be replaced in correct position after the multiunit arrester has been dismantled. h. Month and year of manufacturer i. BSES PO No. and Date j. Warranty Period

6.0 QUALITY ASSUARANCE PLAN, INSPECTION AND TESTING

S. No.	Description	Requirement / Rating
6.1	Quality Assurance Plan	To be submitted for purchaser approval
6.2	Type test	<ul style="list-style-type: none"> a. The product must be type tested. Type test reports not older than 5 years carried out from Government recognized / internationally accredited test Labs shall be submitted for the type, size & rating of equipment offered along with bid.

TECHNICAL SPECIFICATION FOR LIGHTNING/SURGE ARRESTER

		b. Type test reports of TERT (Tracking & Erosion resistance test) of the housing not older than 5 years carried out from Government recognized/ Internationally accredited test labs as per ASTM D 2303 shall be submitted with the bid.
6.3	Routine test	As per QAP and relevant IS / IEC.
6.4	Acceptance test	As per QAP and relevant IS / IEC.
6.5	Tests on fitting and Accessories	As per Manufacturer's Standards and relevant IS / IEC.
6.6	Inspection and Testing	<p>a. The Buyer reserves the right to inspect the product at the Seller's works at any time prior to dispatch, to verify compliance with the specifications. Inspection hold points shall be as per QAP.</p> <p>b. In-process and final inspection call intimation shall be given in advance to purchaser at least 15 days in advance.</p>

7.0 DOCUMENTS SUBMISSION

7.1	To be submitted along with bid	<p>The seller has to submit :</p> <p>a. Tentative GA / cross sectional drawing of product showing all the views / sections.</p> <p>b. Assembly drawings and weight of main component parts</p> <p>c. LA mounting arrangement</p> <p>d. Rating Plate diagram</p> <p>e. Terminal clamps detail</p> <p>f. Detailed reference list of customers already using the offered product during the last 5 years with similar design and rating.</p> <p>g. Completely filled GTP</p> <p>h. Detailed calculation of 'energy discharge capability'.</p> <p>i. Deviations from this specification. Only deviations</p>
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TECHNICAL SPECIFICATION FOR LIGHTNING/SURGE ARRESTER

		<p>approved in writing before award of contract shall be accepted.</p> <p>j. Details of manufacturer's quality assurance standards and programme and ISO 9000 series or equivalent national certification.</p> <p>k. 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.</p> <p>l. Complete product Manual along with the bid.</p> <p>m. Recommended spare parts and consumable items for five years of operation with prices and spare parts catalogue with price list for future requirements</p> <p>n. Bill of material with make, model & quantity of items.</p>
7.2	To be submitted after award of contract	<p>a. Program for production and testing</p> <p>b. Guaranteed Technical Particulars</p> <p>c. Calculations to substantiate choice of electrical, structural, mechanical component size / ratings</p> <p>d. Detailed dimension drawing for all components, general arrangement drawing showing detailed component layout</p> <p>e. Rating and diagram plate</p> <p>f. Detailed loading drawing to enable the buyer to design and construct foundations (as applicable)</p> <p>g. Transport / Shipping dimensions with weights</p> <p>h. Detailed Bill of Materials for all fittings and accessories with their make, model & tag no. etc</p> <p>i. Detailed installation and commissioning instructions</p> <p>j. Quality plan</p>
7.3	Submittals required prior to dispatch	<p>a. Inspection and test reports, carried out in manufacturer's works (R)</p> <p>b. Test certificates of all bought out items</p> <p>c. Operation and maintenance Instruction as well as trouble shooting charts/ manuals</p>

TECHNICAL SPECIFICATION FOR LIGHTNING/SURGE ARRESTER

7.4	Drawing and document sizes	Standard size paper A0, A1, A2, A3, A4
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8.0 PROGRESS REPORTING

8.1	Outline Document	To be submitted for purchase approval for outline of production, inspection, testing, inspection, packing, dispatch, documentation programme.
8.2	Detailed Progress Report	To be submitted to purchaser once a month containing a. Progress on material procurement b. Progress on fabrication (As applicable) c. Progress on assemble (As applicable) d. Progress on internal stage inspection e. Reason for any delay in total programme f. Details of test failures if any in manufacturing stages g. Progress on final box up constraints / forward path

9.0 PACKING, SHIPPING, HANDLING & SITE SUPPORT

9.1	Packing Protection	The packing shall be fit to withstand rough handling during transit and storage at destination. The test set should be properly protected against corrosion, dampness & damage.
9.2	Packing for accessories and spares	Robust non-returnable packing case with all the above protection & identification Label. The bidder should get the packing list approved before dispatching the material.
9.3	Packing Identification Label	On each packing case, following details are required:
9.3.1	Individual serial number	
9.3.2	Purchaser's name	
9.3.3	PO number (along with SAP item code, if any) & date	
9.3.4	Equipment Tag no. (if any)	
9.3.5	Destination	
9.3.6	Manufacturer / Supplier's name	

TECHNICAL SPECIFICATION FOR LIGHTNING/SURGE ARRESTER

9.3.7	Address of Manufacturer / Supplier / it's agent	
9.3.8	Description	
9.3.9	Country of origin	
9.3.10	Month & year of Manufacturing	
9.3.11	Case measurements	
9.3.12	Gross and net weight	
9.3.13	All necessary slinging and stacking instructions	
9.4	Shipping	The seller shall be responsible for all transit damage due to improper packing.
9.5	Handling and Storage	Manufacturer instruction shall be followed. Detail handling & storage instruction sheet / manual to be furnished before commencement of supply.

10.0 DEVIATIONS

10.1	Deviation	Deviations from this Specification shall be stated in writing with the tender by reference to the Specification clause/GTP/Drawing and a description of the alternative offer. In absence of such a statement, it will be assumed that the bidder complies fully with this specification. No deviation will be acceptable post order.
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TECHNICAL SPECIFICATION FOR LIGHTNING/SURGE ARRESTER

ANNEXURE A : SCOPE OF SUPPLY

S. No.	Description	Descriptive requirement
1	Main Equipment	Polymeric type Lightning/Surge Arresters of 66/33/11 kV
2	Accessories	a. Line terminal connectors b. Surge counter with leakage current ammeter (For outdoor only) c. Grounding terminal bracket d. Necessary flanges along with all hot dip galvanized hardware such as nut bolts/ washers etc. for mounting of LA & surge Counter e. Suitably sized Cu flat or insulated copper cable for connection between LA and surge counter f. Any other item necessary or usual for efficient performance and satisfactory maintenance under the various operating and atmospheric conditions
3	Documentation	Submission of all drawings & documents pertaining to the equipment.

ANNEXURE B: Guaranteed Tech. Particulars for 66KV Lightning Arrester

Sr. No.	Description	BSES Requirement	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.	

TECHNICAL SPECIFICATION FOR LIGHTNING/SURGE ARRESTER

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) (8/20 micro sec. wave) peak value	10KA	
12	System Particulars		
i)	Highest System Voltage	72.5 KV	
ii)	Frequency	50HZ \pm 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	Min 6kJ/kV	
17	Maximum residual voltage at switching impulse current of 1KAp (30/60 micro sec. wave)	136 KVp	
18	Max. residual voltage for discharge current (8/20 micro sec)		
i)	At 05 KAp		
ii)	At 10 KAp		
iii)	At 20 KAp		
19	Minimum creepage distance	25 mm/KV	
20	Pressure relief class	40KA	
21	Leakage current at COV (mA)		
i)	Resistive		

TECHNICAL SPECIFICATION FOR LIGHTNING/SURGE ARRESTER

ii)	Capacitive		
22	Dry and wet power frequency withstand voltage of arrester insulation (KVrms)		
23	Virtual steepness for front of wave for above (KV/micro sec.)		
24	Ratio of system voltage withstand level to protection level of surge arrester		
25	High current impulse withstand 4/10 micro second peak value (KA)		
26	Long duration current Impulse		
i)	Current peak. (Amps)		
ii)	Virtual duration (micro sec)		
27	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.		
28	Weight of complete unit (Kg)		
29	Height of complete unit from base to the line side (mm)		
30	Minimum recommended spacing between arresters Centre to Centre (mm)		
31	Clearance required from ground equipment at various heights of arresters unit (mm)		
32	Earthing arrangement provided for earthing side of arresters.		
33	Mounting flanges dimensional details.		

TECHNICAL SPECIFICATION FOR LIGHTNING/SURGE ARRESTER

34	Type and specifications of the surge connectors.	As per specs	
35	Surge Counter		
i)	Make		
ii)	Model no.		
iii)	Type	Non resettable type	
iv)	Surge counter min. current for recording a lightning stroke	200 Amp	
v)	Surge counter max. disch. Current withstand	100KA peak for 4/10 wave shape.	
vi)	Counter operation	One count per surge	
vii)	Paint shade of surge counter housing	Polyurethane, 692 of IS-5	
viii)	Degree of protection of the surge counter	IP-67	
36	Mili-ampere meter	To be provided	
i)	Type and range of milli-ampere meter.		
ii)	Range of continuous leakage current at rated voltage with variation due to change in temperature & frequency		
iii)	Safe leakage current (mA) , and its indication		
iv)	Indication of deterioration of surge arrester		
37	Size and length of flexible Cu cable for connection between LA & surge counter	Min 50sqmm size, min 1.5m length	
38	Voltage time curve for thermal stability of LA after a stroke	To be provided	
39	Housing of LA	Silicon rubber	
i)	Type	Silicon rubber	
ii)	Colour	Grey	
40	Supporting Insulators	FRP rods	
41	Life expectancy of LA		

TECHNICAL SPECIFICATION FOR LIGHTNING/SURGE ARRESTER

ANNEXURE C: 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 / Indoor	
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) (8/20 micro sec. wave) peak value)	10KA	
12	System Particulars		
i)	Highest System Voltage	36 KV	
ii)	Frequency	50HZ \pm 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	100KA _p	
15	Long Duration discharge class	3	
16	Minimum single impulse energy capability	Min 6kJ/kV	

TECHNICAL SPECIFICATION FOR LIGHTNING/SURGE ARRESTER

17	Maximum residual voltage at switching impulse current of 1KAp (30/60 micro sec. wave)	70KVp	
18	Max. residual voltage for discharge current (8/20 micro sec)		
i)	At 05 KAp		
ii)	At 10 KAp		
iii)	At 20 KAp		
19	Minimum creepage distance	25 mm/KV	
20	Pressure relief class	40KA	
21	Leakage current at COV (mA)		
i)	Resistive		
ii)	Capacitive		
22	Dry and wet power frequency withstand voltage of arrester insulation (KVrms)		
23	Virtual steepness for front of wave for above (KV/micro sec.)		
24	Ratio of system voltage withstand level to protection level of surge arrester		
25	High current impulse withstand 4/10 micro second peak value (KA)		
26	Long duration current Impulse		
i)	Current peak. (Amps)		
ii)	Virtual duration (micro sec)		
27	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.		

TECHNICAL SPECIFICATION FOR LIGHTNING/SURGE ARRESTER

28	Weight of complete unit (Kg)		
29	Height of complete unit from base to the line side (mm)		
30	Minimum recommended spacing between arresters Centre to Centre (mm)		
31	Clearance required from ground equipment at various heights of arresters unit (mm)		
32	Earthing arrangement provided for earthing side of arresters.		
33	Mounting flanges dimensional details.		
34	Type and specifications of the surge connectors.	As per specs	
35	Surge Counter for outdoor type		
i)	Make		
ii)	Model no.		
iii)	Type	Non resettable type	
iv)	Surge counter min. current for recording a lightning stroke	200 Amp	
v)	Surge counter max. disch. Current withstand	100KA peak for 4/10 wave shape.	
vi)	Counter operation	One count per surge	
vii)	Paint shade of surge counter housing	Polyurethane, 692 of IS-5	
viii)	Degree of protection of the surge counter	IP-67	
36	Mili-ampere meter for outdoor type		
i)	Type and range of milli-ampere meter.		
ii)	Range of continuous leakage current at rated voltage with variation due to change in temperature & frequency		
iii)	Safe leakage current (mA) , and its indication		

TECHNICAL SPECIFICATION FOR LIGHTNING/SURGE ARRESTER

iv)	Indication of deterioration of surge arrester		
37	Size and length of flexible Cu cable for connection between LA & surge counter	Min 50sqmm size, min 1.5m length	
38	Voltage time curve for thermal stability of LA after a stroke	To be provided	
39	Housing of LA		
i)	Type	Silicon rubber	
ii)	Colour	Grey	
40	Supporting Insulators	FRP rods	
41	Life expectancy of LA		

ANNEXURE D: Guaranteed Technical Particulars for 11KV Surge 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	Indoor	
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	Copper flat	
9	Construction	Single Phase	
10	Rated voltage of arrester (KVrms)	9 KV	
11	Nominal discharge current (Amps)	10KA	
12	System Particulars		
i)	Highest System Voltage	12 KV	
ii)	Frequency	50HZ \pm 5%	
iii)	System neutral	Solidly earthed	

TECHNICAL SPECIFICATION FOR LIGHTNING/SURGE ARRESTER

iv)	Max. value of temporary over voltage & its max. duration		
	- Insulation level of equipment to be protected	75 KVp	
	- System short circuit level	26.3kA for 3 seconds.	
13	Maximum continuous operating voltage (MCOV)	7.65 KV	
14	Impulse withstand current	100KAp	
15	Long Duration discharge class	2	
16	Minimum single impulse energy capability	Min 2.5kJ/kV	
17	Maximum residual voltage at switching impulse current of 1KAp (30/60 micro sec. wave)		
18	Max. residual voltage for discharge current (8/20 micro sec)		
i)	At 05 KAp		
ii)	At 10 KAp		
iii)	At 20 KAp		
19	Minimum creepage distance	25 mm/KV	
20	Pressure relief class	40KA	
21	Leakage current at COV (mA)		
i)	Resistive		
ii)	Capacitive		
22	Dry and wet power frequency withstand voltage of arrester insulation (KV rms)		
23	Virtual steepness for front of wave for above (KV/micro sec.)		
24	Ratio of system voltage withstand level to protection level of surge arrester		

TECHNICAL SPECIFICATION FOR LIGHTNING/SURGE ARRESTER

25	High current impulse withstand 4/10 micro second peak value (KA)		
26	Long duration current Impulse		
i)	Current peak. (Amps)		
ii)	Virtual duration (micro sec)		
27	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.		
28	Weight of complete unit (Kg)		
29	Height of complete unit from base to the line side (mm)		
30	Minimum recommended spacing between arresters Centre to Centre (mm)		
31	Clearance required from ground equipment at various heights of arresters unit (mm)		
32	Earthing arrangement provided for earthing side of arresters.		
33	Mounting flanges dimensional details.		
34	Voltage time curve for thermal stability of SA after a stroke	To be provided	
35	Housing of SA		
i)	Type	Silicon rubber	
ii)	Colour	Grey	
36	Supporting Insulators	FRP rods	
37	Life expectancy of SA		

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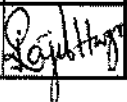
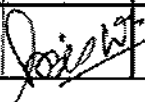
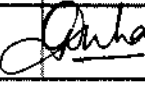
A Dhirubhai Ambani Enterprise

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 a) Open and close position indication of breaker. b) Spring Charged indication

		<p>c) Local / Remote indication</p> <p>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.</p> <p>An operation counter shall also be provided with each breaker.</p>
		<p>SF6 gas density monitor shall be provided at 1.5 metre from ground level, tubing between gauge & breaker shall be stainless steel.</p>
2.5.0	Closing Coil	<p>Closing coil shall operate correctly at all values of voltage between 85% and 110% of the rated voltage.</p>
2.6.0	Tripping Coil	<p>a) Shunt trip shall operate correctly at all values of supply voltage between 70% and 110% of rated voltage.</p> <p>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.</p>
2.7.0	Remote / Local Closing & Tripping	<p>a) Operating mechanism shall normally be operated by remote electrical control. Electrical tripping shall be performed by shunt trip coils.</p> <p>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.</p>
2.8.0	Manual Spring Charging	<p>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</p>

		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

		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	<p>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.</p> <p>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</p>

		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

		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

		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.

		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) In case, 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 Seller's 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 a) Progress on material procurement b) Progress on fabrication (As applicable) c) Progress on assembly (As applicable) d) Progress on internal stage inspection e) Reason for any delay in total programme f) Details of test failures if any in manufacturing stages g) Progress on final box up h) Constraints / forward path

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.
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Annexure - A Scope of supply
1.0 The scope of supply shall include following

- 1.1 Design, manufacture, testing at manufacturer works before dispatch, packing, delivery 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 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 Of 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 a) 1 Hour 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) (a) For 1 Second (b) For 3 Second	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: a) On supply side b) 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: a) On supply side. 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) a) Total 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.) Thickness of silver coating on main contacts (mm).	15 +/- 5 microns (min)	
46.0	Contact pressure on arcing contacts (kg/m ²).		
47.0	Type of arcing contacts		
48.0	Contact pressure on main contact (kg/m ²).		
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: (a)Opening. (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 a) Control wire size b) Insulation c) Colour	1.5 Sqmm 650V 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 Of 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 c) 1 Hour 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) (a) For 1 Second (b) For 3 Second	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 : breaking capacity and corresponding over-voltage recorded in test: c) On supply side 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: a) On supply side. 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) c) Total d) Protected	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: (a)Opening. (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: a) Give alarm. b) Cut off.		
65.11	Name of SF-6 supplier and country of origin.		
65.12	Quantity of SF-6 gas supplied for: a) Actual use in breaker (kg). b) As spare (kg).		
65.13	Chemical composition of gas: a) Qty. of air by weight (ppm). b) Qty. of H ₂ O by weight (ppm). c) Qty. of CF ₄ 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 a) Control wire size b) Insulation c) Colour	1.5 Sqmm 650V 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			
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**TECHNICAL SPECIFICATION
FOR
OUTDOOR CURRENT TRANSFORMER
(11KV, 33KV & 66 KV)**

PREPARED BY	REVIEWED BY	APPROVED BY	REV	00
SG	GS	DS	DATE	AUG 06, 2014
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TECHNICAL SPECIFICATION FOR OUTDOOR CURRENT TRANSFORMER**RECORD OF REVISION**

Clause No.	Change in Specification	Approved by	Rev

TECHNICAL SPECIFICATION FOR OUTDOOR CURRENT TRANSFORMER**1.0 SCOPE OF SUPPLY**

For scope of supply, refer Annexure A

2.0 CODES & STANDARDS

The manufacturing, rating & performance of the Earth Resistance Tester shall conform to the latest edition of following standards:-

Indian Electricity Rules	
Indian electricity act	
CBIP manual	
IS- 335	New insulating oil
IS-2705 (Part I to V)	Specification for current transformer.
IS-4201	Application guide for current transformer.
IS-2099	High voltage porcelain bushings
IS-731	Insulator for O/H power line
IS-335	New insulating oil for transformer and switchgear.
IS-9676	Reference ambient temperature of electrical equipment
IS-5561	Specification of electric power connectors
IS-9676	Summation current transformer
IS-4201	Application guide for current transformer
IS-2099	High voltage porcelain bushings
IS-5621	Hollow insulator for use in electrical equipment
IEC: 137	Bushing for alternating current above 1000V
IEC: 185	Specification for current transformers
IEC: 439	Specification for Terminal box / Marshalling box

3.0 CURRENT TRANSFORMER DESIGN FEATURES

3.1.0	Type	Shall be dead tank type, oil immersed, self-cooled outdoor type
3.2.0	Construction	Oil immersed CT shall be hermetically sealed to eliminate breathing and to prevent air and moisture ingress. The core and winding shall be provided in porcelain bushing. Provision for oil expansion without

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		breathing (diaphragm or bellow as per manufacturer design).
3.3.0	Core	The core shall be of high-grade non-ageing, electrical silicon laminated steel of low hysteresis loss and high permeability to ensure high accuracy at both normal and over current conditions. The saturation factor of the core shall be low enough not to cause any damage to measuring instruments in the event of maximum short circuit current.
3.4.0	Winding	The winding shall be suitable for simultaneous 100% full load continuous rating. The winding shall be capable of desired output as per specified limit.
3.5.0	Insulation	The current transformer shall withstand satisfactorily the dielectric test voltage corresponding to basic insulation level specified.
3.6.0	Insulation Oil	The quantity of insulating oil in each current transformer shall be best available and the complete specification of the oil shall be furnished with the tender. The current transformer offered shall be hermetically sealed completely filled with insulating oil with provision to replace the oil. Oil level indication shall be provided.
3.7.0	Bushing	Porcelain used in bushing manufacture shall be homogenous, free from laminations, cavities and other flaws or imperfections that might effect the mechanical or dielectric quality. Glazing of the porcelain shall be uniform brown color free blisters, burns and similar defects. The bushing shall be designated to have ample insulation, mechanical strength and rigidity.
3.7.1	Creepage distance	Not less than 31mm /KV
3.7.2	Protected creepage distance	At least 50 % of total creepage distance
3.8.0	Terminals	
3.8.1	Primary terminals	The current transformers offered shall be supplied with aluminium- alloy grade A6 terminal connector with

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		bimetallic sleeve, suitable for connection with double ACSR conductor
3.8.2	Primary Terminal connectors	Universal type, Suitable for termination of Twin Zebra ACSR conductor. Connector should be of Aluminium alloy A6. Bimetallic sleeve of 1mm thickness should be provided for primary connection.
3.8.3	Secondary terminals	All the secondary terminals shall be bought in IP55 box with brass/ copper stud type terminals. The secondary terminals shall be shorted by brass/copper links before dispatch. Terminal box to be provided with earthing stud.
3.8.4	Terminal Marking	Terminal marking shall be as per IS 2705
3.9.0	Atmospheric protection for clamp and fitting of iron and steel	Hot dip galvanizing as per IS 2633. The Minimum thickness of galvanization should be 610 g/ sq mm.
3.10.0	Gland Plate	Min. 3 mm thick detachable undrilled gland plate.
3.11.0	Cable entry	Bottom for all cables
3.12.0	Earthing	The CT assembly comprising of the chasis, frame work and fixed parts of metal casing shall be provided with two separate body earthing terminals.
3.13.0	Drain Plug on tank Base	Required
3.14.0	Painting surface preparation	Shot blasting or chemical 7 tank process
3.15.0	Painting	Polyurethane based paints shall be used. The color for the finishing paint shall be light gray as per shade No. 692 as per IS-5

4.0 APPROVED MAKE OF COMPONENTS

4.1.0	Insulator	ABIL, WSI, Modern, Saravana, BHEL, CJI
4.2.0	Primary Terminal Connector	Exalt, Tyco, Rashtraudyog
4.3.0	Note	Any other make of component to be approved by Owner

TECHNICAL SPECIFICATION FOR OUTDOOR CURRENT TRANSFORMER**5.0 RATING PLATE**

5.1.0	Material	Anodized aluminum 16SWG
5.1.1	Background	SATIN SILVER
5.1.2	Letters, diagram & border	Black
5.1.3	Process	Etching
5.2.0	Rating plate details	As per IS 2705
5.2.1	Other details required on rating plate	BSES PO No. and Date
		Warranty Period
		Connection Diagram

6.0 QUALITY ASSURANCE, TESTING & INSPECTION

6.1.0	Vendor quality plan	To be submitted for purchaser approval
6.2.0	Inspection points	To be mutually identified & agreed in quality plan
6.3.0	Type test	a) Following type test shall be carried out on current transformer- - Short-time current test - Temperature-rise test - Lightning impulse test - HV power frequency wet withstand voltage test on CT - Determination of errors
		b) Current transformer must be of type tested quality
		c) In case, 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.
		d) If the manufacturer's lab is accredited by govt. / authorized body then it shall be acceptable for type testing.
6.4.0	Inspection and testing during manufacture	
6.4.1	Tank	i) Checking of dimensions as per approved drawing. ii) Checking for leakage by pressure testing. iii) Thickness of Paint or Galvanisation, as applicable
6.4.2	Porcelain	i) Check dimension.

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		<ul style="list-style-type: none">ii) Check finish of sealing surface.iii) Check creepage distance.iv) Check for routine electrical test.v) Check for porosity and temperature cycle test.
6.4.3	Insulating Materials	<ul style="list-style-type: none">i) Sample check for physical properties of materials.ii) Check for dielectric strength.iii) Visual and dimensional checks.
6.4.4	Copper conductor	<ul style="list-style-type: none">i) Check for dimension.ii) Check for elongation.iii) Check for unidirectional scrap.iv) Heat shock.
6.4.5	Oil	<ul style="list-style-type: none">i) Check for break down voltage.ii) Check for density.iii) Check for flash point.iv) Check for moisture content.v) Check for neutralization value.vi) Check for inter facial tension at 27 Deg c.vii) Check for sludge content.viii) Check for specific resistance.ix) Check for pour point.
6.4.6	Secondary terminals	<ul style="list-style-type: none">i) Check for one min AC Test
6.5.0	Routine Test	Test shall be carried out in accordance with IS-2705
6.6.0	Acceptance test	<p>To be performed in presence of Owner's representative at manufacturer works:-</p> <ul style="list-style-type: none">a. Routine tests as per ISb. Physical inspection of dimensions and BOM.c. Pressure test on tankd. IP55 test on secondary compartmente. Creepage distance of bushingf. Test on accessories as per manufacturer's standard
6.7.0	Inspection and Testing	<ul style="list-style-type: none">a. The buyer reserves the right to witness all tests specified on completed productb. The buyer reserves the right to inspect the product at the sellers works at any time prior to dispatch, to verify

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		<p>compliance with the specifications.</p> <p>c. In-process and final inspection call intimation shall be given atleast 15 days in advance.</p>
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7.0 DRAWINGS, DATA & MANUALS

7.1.0	To be submitted along with bid	The seller has to submit :
		a-1: Complete assembly, GA drawing outdoor current transformer showing plan, elevation and typical section view.
		a-2: Typical connection diagram and winding connection of current transformer
		a-3: Secondary box details
		a-4: Structural drawing for CT mounting arrangement
		a-5: Rating Plate diagram
		a-6: 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 program 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.

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		h) Recommended spare parts and consumable items for five years of operation with prices and spare parts catalogue with price list for future requirements
7.2.0	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, mechanical component size / ratings (A)
		d-1: General arrangement drawing of the current transformer (A).
		d-2: Typical connection diagram and winding connection of current transformer (A)
		d-5: Terminal connector drawings. (A)
		d-7: General arrangement drawing secondary terminal box (A)
		e) Detailed installation and commissioning instructions (R)
		f) Quality plan
7.3.0	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
7.4.0	Drawing and document sizes	Standard size paper A0, A1, A2, A3, A4
7.5.0	No of drgs. / Documents required at different stages	As per Annexure-A

8.0 PACKING, SHIPPING, HANDLING & STORAGE

8.1.0	Packing Protection	Against corrosion, dampness, heavy rains, breakage and vibration
8.1.1	Packing for accessories and	Robust wooden non returnable packing case with

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	spares	all the above protection & identification Label
8.1.2	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
8.2.0	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.
8.3.0	Handling & Storage	Manufacturer instruction shall be followed. Detail handling & storage instruction sheet / manual needs to be furnished before commencement of supply.

9.0 PROGRESS REPORTING

9.1.0	Outline Document	To be submitted for purchaser approval for outline of production, inspection,
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		testing, packing, dispatch, documentation program
9.2.0	Detailed Progress report	To be submitted to Purchaser once a month containing a) Progress on material procurement b) Progress on fabrication (As applicable) c) Progress on assembly (As applicable) d) Progress on internal stage inspection e) Reason for any delay in total program f) Details of test failures if any in manufacturing stages g) Progress on final box up h) Constraints / forward path

10.0 DEVIATIONS

10.1.0	Deviation from the Specification	Deviations from this Specification shall be stated in writing with the tender by reference to the Specification clause/GTP/Drawing and a description of the alternative offer. In absence of such a statement, it will be assumed by the Buyer that the Seller complies fully with this specification.
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TECHNICAL SPECIFICATION FOR OUTDOOR CURRENT TRANSFORMER**ANNEXURE – A SCOPE OF SUPPLY****1.0 The scope of supply shall include following**

- a. Design, manufacture, assembly, testing at stages of manufacture as per this specification, final testing at manufacturer works on completely assembled Current Transformer before dispatch, packing and delivery of Current Transformer
- b. Primary terminal connectors (Universal type)
- c. Fixing bolts and other accessories as per this specification.
- d. Submission of all documentation for the Current transformer and all accessories as mentioned below

2.0 Submission of documents

	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)	3 copies (Typical)	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 current transformer	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

ANNEXURE – B SERVICE CONDITIONS

S No.	ENVIRONMENTAL CONDITION	REQUIREMENT
1	Average grade atmosphere	Heavily polluted, dry
2	Maximum altitude above sea level	1000 M
3	Ambient air temperature	Highest 50Deg C Average 40Deg C
4	Minimum ambient air temperature	0 Deg C
5	Relative Humidity	100%
6	Seismic Zone	4
7	Rainfall	750 mm concentrated in four months

TECHNICAL SPECIFICATION FOR OUTDOOR CURRENT TRANSFORMER
ANNEXURE- C1 GUARANTEED TECHNICAL PARTICULARS (66KV, 2000-1000/1/1/1/1A)

S No.	Description	Data By Purchaser				Data By Supplier			
1	Name of Manufacturer								
2	Address and contact details								
3	Type	Outdoor, Oil cooled, Hermetically sealed, Single phase, Dead tank CT							
4	Rated nominal voltage	66kV							
5	Highest system voltage	72.5kV							
6	Rated frequency	50 Hz							
7	Rated primary current	2000-1000 A							
8	Rated secondary current	1A							
9	Number of core	Four							
10.0		Core-1	Core-2	Core-3	Core-4				
10.1	Secondary current (A)	1	1	1	1				
10.2	Application	Metering	Protection (O/C & E/F)	Protection (Bus Bar)	Protection (Spare)				
10.3	Rated Output (VA)	15	30						
10.4	Class of accuracy	0.2s	5P	PS	PS				
10.5	Instruments security factor	≤20	-	-	-				
10.6	Accuracy limit factor	-	20	-	-				
10.7	Knee point voltage and corresponding exciting current	-	-	$\geq 40(R_{ct} + \frac{8}{8})$	$\geq 40(R_{ct} + \frac{8}{8})$				
10.8	Magnetizing current at $V_k/4$ (mA)	-	-	≤30	≤30				
10.9	Resistance at secondary winding at 75 Deg. C (ohms)								
10.10	Secondary limiting voltage								
11	Short time thermal rating of primary								
11.1	One second								

TECHNICAL SPECIFICATION FOR OUTDOOR CURRENT TRANSFORMER

11.2	Three seconds	31.5 KA	
12	Rated dynamic current of primary		
13	Rated continuous thermal current		
14	Temperature rise at ambient temp 50 deg. C		
14.1	Winding		
14.2	Oil at top		
14.3	Exposed current carrying parts		
15	One minute power frequency dry withstand voltage	140kV (rms)	
16	One minute power frequency wet withstand voltage	140kV (rms)	
17	1.2/50 microsecond impulse withstand test voltage	325 KV (peak)	
18	Minimum creepage distance in mm	31KV / mm	
19	Protective creepage distance in mm		
20	Magnetization curve of CT core		
21	Variation in ratio and phase angle error due to variation in		
21.1	Voltage by 1 volts		
21.2	Frequency by 1 Hz		
22	Current density in primary winding (A/sqmm)		
23	Weight of oil		
24	Total weight		
25	Mounting details		
26	Overall dimensions		
27	Terminal connector		

TECHNICAL SPECIFICATION FOR OUTDOOR CURRENT TRANSFORMER
ANNEXURE- C2 GUARANTEED TECHNICAL PARTICULARS (66KV, 1000-500/1/1/1/1A)

S No.	Description	Data By Purchaser				Data By Supplier			
1	Name of Manufacturer								
2	Address and contact details								
3	Type	Outdoor, Oil cooled, Hermetically sealed, Single phase, Dead tank CT							
4	Rated nominal voltage	66kV							
5	Highest system voltage	72.5kV							
6	Rated frequency	50 Hz							
7	Rated primary current	1000-500 A							
8	Rated secondary current	1A							
9	Number of core	Four							
10.0		Core-1	Core-2	Core-3	Core-4				
10.1	Secondary current (A)	1	1	1	1				
10.2	Application	Metering	Protection (O/C & E/F)	Protection (Bus Bar)	Protection (Spare)				
10.3	Rated Output (VA)	15	30						
10.4	Class of accuracy	0.2s	5P	PS	PS				
10.5	Instruments security factor	≤20	-	-	-				
10.6	Accuracy limit factor	-	20	-	-				
10.7	Knee point voltage and corresponding exciting current	-	-	$\geq 40(R_{ct} + \frac{8}{8})$	$\geq 40(R_{ct} + \frac{8}{8})$				
10.8	Magnetizing current at $V_k/4$ (mA)	-	-	≤30	≤30				
10.9	Resistance at secondary winding at 75 Deg. C (ohms)								
10.10	Secondary limiting voltage								
11	Short time thermal rating of primary								
11.1	One second								

TECHNICAL SPECIFICATION FOR OUTDOOR CURRENT TRANSFORMER

11.2	Three seconds	31.5 KA	
12	Rated dynamic current of primary		
13	Rated continuous thermal current		
14	Temperature rise at ambient temp 50 deg. C		
14.1	Winding		
14.2	Oil at top		
14.3	Exposed current carrying parts		
15	One minute power frequency dry withstand voltage	140kV (rms)	
16	One minute power frequency wet withstand voltage	140kV (rms)	
17	1.2/50 microsecond impulse withstand test voltage	325 KV (peak)	
18	Minimum creepage distance in mm	31KV / mm	
19	Protective creepage distance in mm		
20	Magnetization curve of CT core		
21	Variation in ratio and phase angle error due to variation in		
21.1	Voltage by 1 volts		
21.2	Frequency by 1 Hz		
22	Current density in primary winding (A/sqmm)		
23	Weight of oil		
24	Total weight		
25	Mounting details		
26	Overall dimensions		
27	Terminal connector		

TECHNICAL SPECIFICATION FOR OUTDOOR CURRENT TRANSFORMER
ANNEXURE- C3 GUARANTEED TECHNICAL PARTICULARS (66KV, 800-400/1/1/1/1A)

S No.	Description	Data By Purchaser				Data By Supplier			
1	Name of Manufacturer								
2	Address and contact details								
3	Type	Outdoor, Oil cooled, Hermetically sealed, Single phase, Dead tank CT							
4	Rated nominal voltage	66kV							
5	Highest system voltage	72.5kV							
6	Rated frequency	50 Hz							
7	Rated primary current	800-400 A							
8	Rated secondary current	1A							
9	Number of core	Four							
10.0		Core-1	Core-2	Core-3	Core-4				
10.1	Secondary current (A)	1	1	1	1				
10.2	Application	Metering	Protection (O/C & E/F)	Protection (Bus Bar)	Protection (Spare)				
10.3	Rated Output (VA)	15	30						
10.4	Class of accuracy	0.2s	5P	PS	PS				
10.5	Instruments security factor	≤20	-	-	-				
10.6	Accuracy limit factor	-	20	-	-				
10.7	Knee point voltage and corresponding exciting current	-	-	$\geq 40(R_{ct} + \frac{8}{8})$	$\geq 40(R_{ct} + \frac{8}{8})$				
10.8	Magnetizing current at $V_k/4$ (mA)	-	-	≤30	≤30				
10.9	Resistance at secondary winding at 75 Deg. C (ohms)								
10.10	Secondary limiting voltage								
11	Short time thermal rating of primary								
11.1	One second								

TECHNICAL SPECIFICATION FOR OUTDOOR CURRENT TRANSFORMER

11.2	Three seconds	31.5 KA	
12	Rated dynamic current of primary		
13	Rated continuous thermal current		
14	Temperature rise at ambient temp 50 deg. C		
14.1	Winding		
14.2	Oil at top		
14.3	Exposed current carrying parts		
15	One minute power frequency dry withstand voltage	140kV (rms)	
16	One minute power frequency wet withstand voltage	140kV (rms)	
17	1.2/50 microsecond impulse withstand test voltage	325 KV (peak)	
18	Minimum creepage distance in mm	31KV / mm	
19	Protective creepage distance in mm		
20	Magnetization curve of CT core		
21	Variation in ratio and phase angle error due to variation in		
21.1	Voltage by 1 volts		
21.2	Frequency by 1 Hz		
22	Current density in primary winding (A/sqmm)		
23	Weight of oil		
24	Total weight		
25	Mounting details		
26	Overall dimensions		
27	Terminal connector		

TECHNICAL SPECIFICATION FOR OUTDOOR CURRENT TRANSFORMER
ANNEXURE- C4 GUARANTEED TECHNICAL PARTICULARS (66KV, 400-200/1/1/1/1A)

S No.	Description	Data By Purchaser				Data By Supplier			
1	Name of Manufacturer								
2	Address and contact details								
3	Type	Outdoor, Oil cooled, Hermetically sealed, Single phase, Dead tank CT							
4	Rated nominal voltage	66kV							
5	Highest system voltage	72.5kV							
6	Rated frequency	50 Hz							
7	Rated primary current	400-200 A							
8	Rated secondary current	1A							
9	Number of core	Four							
10.0		Core-1	Core-2	Core-3	Core-4				
10.1	Secondary current (A)	1	1	1	1				
10.2	Application	Metering	Protection (O/C & E/F)	Protection (Bus Bar)	Protection (Spare)				
10.3	Rated Output (VA)	15	30						
10.4	Class of accuracy	0.2s	5P	PS	PS				
10.5	Instruments security factor	≤20	-	-	-				
10.6	Accuracy limit factor	-	20	-	-				
10.7	Knee point voltage and corresponding exciting current	-	-	$\geq 40(R_{ct} + \frac{8}{8})$	$\geq 40(R_{ct} + \frac{8}{8})$				
10.8	Magnetizing current at $V_k/4$ (mA)	-	-	≤30	≤30				
10.9	Resistance at secondary winding at 75 Deg. C (ohms)								
10.10	Secondary limiting voltage								
11	Short time thermal rating of primary								
11.1	One second								

TECHNICAL SPECIFICATION FOR OUTDOOR CURRENT TRANSFORMER

11.2	Three seconds	31.5 KA	
12	Rated dynamic current of primary		
13	Rated continuous thermal current		
14	Temperature rise at ambient temp 50 deg. C		
14.1	Winding		
14.2	Oil at top		
14.3	Exposed current carrying parts		
15	One minute power frequency dry withstand voltage	140kV (rms)	
16	One minute power frequency wet withstand voltage	140kV (rms)	
17	1.2/50 microsecond impulse withstand test voltage	325 KV (peak)	
18	Minimum creepage distance in mm	31KV / mm	
19	Protective creepage distance in mm		
20	Magnetization curve of CT core		
21	Variation in ratio and phase angle error due to variation in		
21.1	Voltage by 1 volts		
21.2	Frequency by 1 Hz		
22	Current density in primary winding (A/sqmm)		
23	Weight of oil		
24	Total weight		
25	Mounting details		
26	Overall dimensions		
27	Terminal connector		

TECHNICAL SPECIFICATION FOR OUTDOOR CURRENT TRANSFORMER
ANNEXURE- C5 GUARANTEED TECHNICAL PARTICULARS (33KV, 2000-1000/1/1/1/1A)

S No.	Description	Data By Purchaser				Data By Supplier			
1	Name of Manufacturer								
2	Address and contact details								
3	Type	Outdoor, Oil cooled, Hermetically sealed, Single phase, Dead tank CT							
4	Rated nominal voltage	33kV							
5	Highest system voltage	36kV							
6	Rated frequency	50 Hz							
7	Rated primary current	2000-1000 A							
8	Rated secondary current	1A							
9	Number of core	Four							
10.0		Core-1	Core-2	Core-3	Core-4				
10.1	Secondary current (A)	1	1	1	1				
10.2	Application	Metering	Protection (O/C & E/F)	Protection (Bus Bar)	Protection (Spare)				
10.3	Rated Output (VA)	15	30						
10.4	Class of accuracy	0.2s	5P	PS	PS				
10.5	Instruments security factor	≤20	-	-	-				
10.6	Accuracy limit factor	-	20	-	-				
10.7	Knee point voltage and corresponding exciting current	-	-	$\geq 40(R_{ct} + 8)$	$\geq 40(R_{ct} + 8)$				
10.8	Magnetizing current at $V_k/4$ (mA)	-	-	≤30	≤30				
10.9	Resistance at secondary winding at 75 Deg. C (ohms)								
10.10	Secondary limiting voltage								
11	Short time thermal rating of primary								
11.1	One second								
11.2	Three seconds	26.3 KA							
12	Rated dynamic current of primary								

TECHNICAL SPECIFICATION FOR OUTDOOR CURRENT TRANSFORMER

13	Rated continuous thermal current		
14	Temperature rise at ambient temp 50 deg. C		
14.1	Winding		
14.2	Oil at top		
14.3	Exposed current carrying parts		
15	One minute power frequency dry withstand voltage	70 kV (rms)	
16	One minute power frequency wet withstand voltage	70 kV (rms)	
17	1.2/50 microsecond impulse withstand test voltage	170 KV (peak)	
18	Minimum creepage distance in mm	31KV / mm	
19	Protective creepage distance in mm		
20	Magnetization curve of CT core		
21	Variation in ratio and phase angle error due to variation in		
21.1	Voltage by 1 volts		
21.2	Frequency by 1 Hz		
22	Current density in primary winding (A/sqmm)		
23	Weight of oil		
24	Total weight		
25	Mounting details		
26	Overall dimensions		
27	Terminal connector		

TECHNICAL SPECIFICATION FOR OUTDOOR CURRENT TRANSFORMER
ANNEXURE- C6 GUARANTEED TECHNICAL PARTICULARS (33KV, 1000-500/1/1/1/1A)

S No.	Description	Data By Purchaser				Data By Supplier			
1	Name of Manufacturer								
2	Address and contact details								
3	Type	Outdoor, Oil cooled, Hermetically sealed, Single phase, Dead tank CT							
4	Rated nominal voltage	33kV							
5	Highest system voltage	36kV							
6	Rated frequency	50 Hz							
7	Rated primary current	1000-500 A							
8	Rated secondary current	1A							
9	Number of core	Four							
10.0		Core-1	Core-2	Core-3	Core-4				
10.1	Secondary current (A)	1	1	1	1				
10.2	Application	Metering	Protection (O/C & E/F)	Protection (Bus Bar)	Protection (Spare)				
10.3	Rated Output (VA)	15	30						
10.4	Class of accuracy	0.2s	5P	PS	PS				
10.5	Instruments security factor	≤20	-	-	-				
10.6	Accuracy limit factor	-	20	-	-				
10.7	Knee point voltage and corresponding exciting current	-	-	$\geq 40(R_{ct} + 8)$	$\geq 40(R_{ct} + 8)$				
10.8	Magnetizing current at $V_k/4$ (mA)	-	-	≤30	≤30				
10.9	Resistance at secondary winding at 75 Deg. C (ohms)								
10.10	Secondary limiting voltage								
11	Short time thermal rating of primary								
11.1	One second								
11.2	Three seconds	26.3 KA							
12	Rated dynamic current of primary								

TECHNICAL SPECIFICATION FOR OUTDOOR CURRENT TRANSFORMER

13	Rated continuous thermal current		
14	Temperature rise at ambient temp 50 deg. C		
14.1	Winding		
14.2	Oil at top		
14.3	Exposed current carrying parts		
15	One minute power frequency dry withstand voltage	70 kV (rms)	
16	One minute power frequency wet withstand voltage	70 kV (rms)	
17	1.2/50 microsecond impulse withstand test voltage	170 KV (peak)	
18	Minimum creepage distance in mm	31KV / mm	
19	Protective creepage distance in mm		
20	Magnetization curve of CT core		
21	Variation in ratio and phase angle error due to variation in		
21.1	Voltage by 1 volts		
21.2	Frequency by 1 Hz		
22	Current density in primary winding (A/sqmm)		
23	Weight of oil		
24	Total weight		
25	Mounting details		
26	Overall dimensions		
27	Terminal connector		

TECHNICAL SPECIFICATION FOR OUTDOOR CURRENT TRANSFORMER
ANNEXURE- C7 GUARANTEED TECHNICAL PARTICULARS (33KV, 800-400/1/1/1/1A)

S No.	Description	Data By Purchaser				Data By Supplier			
1	Name of Manufacturer								
2	Address and contact details								
3	Type	Outdoor, Oil cooled, Hermetically sealed, Single phase, Dead tank CT							
4	Rated nominal voltage	33kV							
5	Highest system voltage	36kV							
6	Rated frequency	50 Hz							
7	Rated primary current	800-400 A							
8	Rated secondary current	1A							
9	Number of core	Four							
10.0		Core-1	Core-2	Core-3	Core-4				
10.1	Secondary current (A)	1	1	1	1				
10.2	Application	Metering	Protection (O/C & E/F)	Protection (Bus Bar)	Protection (Spare)				
10.3	Rated Output (VA)	15	30						
10.4	Class of accuracy	0.2s	5P	PS	PS				
10.5	Instruments security factor	≤20	-	-	-				
10.6	Accuracy limit factor	-	20	-	-				
10.7	Knee point voltage and corresponding exciting current	-	-	$\geq 40(R_{ct} + 8)$	$\geq 40(R_{ct} + 8)$				
10.8	Magnetizing current at $V_k/4$ (mA)	-	-	≤30	≤30				
10.9	Resistance at secondary winding at 75 Deg. C (ohms)								
10.10	Secondary limiting voltage								
11	Short time thermal rating of primary								
11.1	One second								
11.2	Three seconds	26.3 KA							
12	Rated dynamic current of primary								

TECHNICAL SPECIFICATION FOR OUTDOOR CURRENT TRANSFORMER

13	Rated continuous thermal current		
14	Temperature rise at ambient temp 50 deg. C		
14.1	Winding		
14.2	Oil at top		
14.3	Exposed current carrying parts		
15	One minute power frequency dry withstand voltage	70 kV (rms)	
16	One minute power frequency wet withstand voltage	70 kV (rms)	
17	1.2/50 microsecond impulse withstand test voltage	170 KV (peak)	
18	Minimum creepage distance in mm	31KV / mm	
19	Protective creepage distance in mm		
20	Magnetization curve of CT core		
21	Variation in ratio and phase angle error due to variation in		
21.1	Voltage by 1 volts		
21.2	Frequency by 1 Hz		
22	Current density in primary winding (A/sqmm)		
23	Weight of oil		
24	Total weight		
25	Mounting details		
26	Overall dimensions		
27	Terminal connector		

TECHNICAL SPECIFICATION FOR OUTDOOR CURRENT TRANSFORMER**ANNEXURE- C8 GUARANTEED TECHNICAL PARTICULARS (66KV, NCT 2000-1000/1-1A)**

S No.	Description	Data By Purchaser		Data By Supplier	
1	Name of Manufacturer				
2	Address and contact details				
3	Type	Outdoor, Oil cooled, Hermetically sealed, Single phase, Dead tank CT			
4	Rated nominal voltage	66kV			
5	Highest system voltage	72.5kV			
6	Rated frequency	50 Hz			
7	Rated primary current	2000-1000 A			
8	Rated secondary current	1A			
9	Number of core	2			
10.0		Core-1	Core-2		
10.1	Secondary current (A)	1	1		
10.2	Application	Protection	Protection		
10.3	Rated Output (VA)				
10.4	Class of accuracy	PS	PS		
10.5	Instruments security factor	-	-		
10.6	Accuracy limit factor				
10.7	Knee point voltage and corresponding exciting current	$\geq 40(R_{ct}+8)$	$\geq 40(R_{ct}+8)$		
10.8	Magnetizing current at $V_k/4$ (mA)	≤ 30 mA	≤ 30 mA		
10.9	Resistance at secondary winding at 75 Deg. C (ohms)				
10.10	Secondary limiting voltage				
11	Short time thermal rating of primary				
11.1	One second				

TECHNICAL SPECIFICATION FOR OUTDOOR CURRENT TRANSFORMER

11.2	Three seconds	31.5 kA	
12	Rated dynamic current of primary		
13	Rated continuous thermal current		
14	Temperature rise at ambient temp 50 deg. C		
14.1	Winding		
14.2	Oil at top		
14.3	Exposed current carrying parts		
15	One minute power frequency dry withstand voltage	140kV (rms)	
16	One minute power frequency wet withstand voltage	140kV (rms)	
17	1.2/50 microsecond impulse withstand test voltage	325 KV (peak)	
18	Minimum creepage distance in mm	31KV / mm	
19	Protective creepage distance in mm		
20	Magnetization curve of CT core		
21	Variation in ratio and phase angle error due to variation in		
21.1	Voltage by 1 volts		
21.2	Frequency by 1 Hz		
22	Current density in primary winding (A/sqmm)		
23	Weight of oil		
24	Total weight		
25	Mounting details		
26	Overall dimensions		
27	Terminal connector		

TECHNICAL SPECIFICATION FOR OUTDOOR CURRENT TRANSFORMER**ANNEXURE- C9 GUARANTEED TECHNICAL PARTICULARS (33KV, NCT 2000-1000/1-1A)**

S No.	Description	Data By Purchaser		Data By Supplier	
1	Name of Manufacturer				
2	Address and contact details				
3	Type	Outdoor, Oil cooled, Hermetically sealed, Single phase, Dead tank NCT			
4	Rated nominal voltage	33kV			
5	Highest system voltage	36kV			
6	Rated frequency	50 Hz			
7	Rated primary current	2000-1000 A			
8	Rated secondary current	1A			
9	Number of core	2			
10.0		Core-1	Core-2		
10.1	Secondary current (A)	1	1		
10.2	Application	Protection	Protection		
10.3	Rated Output (VA)				
10.4	Class of accuracy	PS	PS		
10.5	Instruments security factor	-	-		
10.6	Accuracy limit factor				
10.7	Knee point voltage and corresponding exciting current	$\geq 40(R_{ct}+8)$	$\geq 40(R_{ct}+8)$		
10.8	Magnetizing current at $V_k/4$ (mA)	≤ 30 mA	≤ 30 mA		
10.9	Resistance at secondary winding at 75 Deg. C (ohms)				
10.10	Secondary limiting voltage				
11	Short time thermal rating of primary				
11.1	One second				

TECHNICAL SPECIFICATION FOR OUTDOOR CURRENT TRANSFORMER

11.2	Three seconds	26.3 KA	
12	Rated dynamic current of primary		
13	Rated continuous thermal current		
14	Temperature rise at ambient temp 50 deg. C		
14.1	Winding		
14.2	Oil at top		
14.3	Exposed current carrying parts		
15	One minute power frequency dry withstand voltage	70kV (rms)	
16	One minute power frequency wet withstand voltage	70kV (rms)	
17	1.2/50 microsecond impulse withstand test voltage	170 KV (peak)	
18	Minimum creepage distance in mm	31KV / mm	
19	Protective creepage distance in mm		
20	Magnetization curve of CT core		
21	Variation in ratio and phase angle error due to variation in		
21.1	Voltage by 1 volts		
21.2	Frequency by 1 Hz		
22	Current density in primary winding (A/sqmm)		
23	Weight of oil		
24	Total weight		
25	Mounting details		
26	Overall dimensions		
27	Terminal connector		

TECHNICAL SPECIFICATION FOR OUTDOOR CURRENT TRANSFORMER**ANNEXURE- C10 GUARANTEED TECHNICAL PARTICULARS (33KV, NCT 10/1-1A)**

S No.	Description	Data By Purchaser		Data By Supplier	
1	Name of Manufacturer				
2	Address and contact details				
3	Type	Outdoor, Oil cooled, Hermetically sealed, Single phase, Dead tank NCT			
4	Rated nominal voltage	33kV			
5	Highest system voltage	36kV			
6	Rated frequency	50 Hz			
7	Rated primary current	10 A			
8	Rated secondary current	1A			
9	Number of core	2			
10.0		Core-1	Core-2		
10.1	Secondary current (A)	1	1		
10.2	Application	Protection (O/C & E/F)	Protection (O/C & E/F)		
10.3	Rated Output (VA)	15	15		
10.4	Class of accuracy	5P	5P		
10.5	Instruments security factor	-	-		
10.6	Accuracy limit factor	10	10		
10.7	Knee point voltage and corresponding exciting current	-			
10.8	Magnetizing current at $V_k/4$ (mA)	-			
10.9	Resistance at secondary winding at 75 Deg. C (ohms)				
10.10	Secondary limiting voltage				
11	Short time thermal rating of primary				
11.1	One second				

TECHNICAL SPECIFICATION FOR OUTDOOR CURRENT TRANSFORMER

11.2	Three seconds	100 times of rated primary current	
12	Rated dynamic current of primary		
13	Rated continuous thermal current		
14	Temperature rise at ambient temp 50 deg. C		
14.1	Winding		
14.2	Oil at top		
14.3	Exposed current carrying parts		
15	One minute power frequency dry withstand voltage	70kV (rms)	
16	One minute power frequency wet withstand voltage	70kV (rms)	
17	1.2/50 microsecond impulse withstand test voltage	170 KV (peak)	
18	Minimum creepage distance in mm	31KV / mm	
19	Protective creepage distance in mm		
20	Magnetization curve of CT core		
21	Variation in ratio and phase angle error due to variation in		
21.1	Voltage by 1 volts		
21.2	Frequency by 1 Hz		
22	Current density in primary winding (A/sqmm)		
23	Weight of oil		
24	Total weight		
25	Mounting details		
26	Overall dimensions		
27	Terminal connector		

TECHNICAL SPECIFICATION FOR OUTDOOR CURRENT TRANSFORMER
ANNEXURE- C11 GUARANTEED TECHNICAL PARTICULARS (11KV, NCT 1600/1-1A)

S No.	Description	Data By Purchaser		Data By Supplier	
1	Name of Manufacturer				
2	Address and contact details				
3	Type	Outdoor, Oil cooled, Hermetically sealed, Single phase, Dead tank NCT			
4	Rated nominal voltage	11kV			
5	Highest system voltage	12kV			
6	Rated frequency	50 Hz			
7	Rated primary current	1600A			
8	Rated secondary current	1A			
9	Number of core	2			
10.0		Core-1	Core-2		
10.1	Secondary current (A)	1	1		
10.2	Application	Protection (O/C & E/F)	Protection (Busbar)		
10.3	Rated Output (VA)	15			
10.4	Class of accuracy	5P	PS		
10.5	Instruments security factor	-	-		
10.6	Accuracy limit factor	20			
10.7	Knee point voltage and corresponding exciting current	-	$\geq 40(R_{ct}+8)$		
10.8	Magnetizing current at $V_k/4$ (mA)	-	$\leq 30\text{mA}$		
10.9	Resistance at secondary winding at 75 Deg. C (ohms)				
10.10	Secondary limiting voltage				
11	Short time thermal rating of primary				
11.1	One second				

TECHNICAL SPECIFICATION FOR OUTDOOR CURRENT TRANSFORMER

11.2	Three seconds	26.3 KA	
12	Rated dynamic current of primary		
13	Rated continuous thermal current		
14	Temperature rise at ambient temp 50 deg. C		
14.1	Winding		
14.2	Oil at top		
14.3	Exposed current carrying parts		
15	One minute power frequency dry withstand voltage		
16	One minute power frequency wet withstand voltage	28kV (rms)	
17	1.2/50 microsecond impulse withstand test voltage	75 KV (peak)	
18	Minimum creepage distance in mm	31KV / mm	
19	Protective creepage distance in mm		
20	Magnetization curve of CT core		
21	Variation in ratio and phase angle error due to variation in		
21.1	Voltage by 1 volts		
21.2	Frequency by 1 Hz		
22	Current density in primary winding (A/sqmm)		
23	Weight of oil		
24	Total weight		
25	Mounting details		
26	Overall dimensions		
27	Terminal connector		

TECHNICAL SPECIFICATION FOR OUTDOOR CURRENT TRANSFORMER**ANNEXURE- C12 GUARANTEED TECHNICAL PARTICULARS (11KV, NCT 1200/1-1A)**

S No.	Description	Data By Purchaser		Data By Supplier	
1	Name of Manufacturer				
2	Address and contact details				
3	Type	Outdoor, Oil cooled, Hermetically sealed, Single phase, Dead tank NCT			
4	Rated nominal voltage	11kV			
5	Highest system voltage	12kV			
6	Rated frequency	50 Hz			
7	Rated primary current	1200A			
8	Rated secondary current	1A			
9	Number of core	2			
10.0		Core-1	Core-2		
10.1	Secondary current (A)	1	1		
10.2	Application	Protection (O/C & E/F)	Protection (Busbar)		
10.3	Rated Output (VA)	15			
10.4	Class of accuracy	5P	PS		
10.5	Instruments security factor	-	-		
10.6	Accuracy limit factor	20			
10.7	Knee point voltage and corresponding exciting current	-	$\geq 40(R_{ct}+8)$		
10.8	Magnetizing current at $V_k/4$ (mA)	-	$\leq 30\text{mA}$		
10.9	Resistance at secondary winding at 75 Deg. C (ohms)				
10.10	Secondary limiting voltage				
11	Short time thermal rating of primary				
11.1	One second				

TECHNICAL SPECIFICATION FOR OUTDOOR CURRENT TRANSFORMER

11.2	Three seconds	26.3 KA	
12	Rated dynamic current of primary		
13	Rated continuous thermal current		
14	Temperature rise at ambient temp 50 deg. C		
14.1	Winding		
14.2	Oil at top		
14.3	Exposed current carrying parts		
15	One minute power frequency dry withstand voltage		
16	One minute power frequency wet withstand voltage	28kV (rms)	
17	1.2/50 microsecond impulse withstand test voltage	75 KV (peak)	
18	Minimum creepage distance in mm	31KV / mm	
19	Protective creepage distance in mm		
20	Magnetization curve of CT core		
21	Variation in ratio and phase angle error due to variation in		
21.1	Voltage by 1 volts		
21.2	Frequency by 1 Hz		
22	Current density in primary winding (A/sqmm)		
23	Weight of oil		
24	Total weight		
25	Mounting details		
26	Overall dimensions		
27	Terminal connector		

TECHNICAL SPECIFICATION FOR OUTDOOR CURRENT TRANSFORMER**ANNEXURE- C13 GUARANTEED TECHNICAL PARTICULARS (11KV, NCT 1200/0.578-0.578A)**

S No.	Description	Data By Purchaser		Data By Supplier	
1	Name of Manufacturer				
2	Address and contact details				
3	Type	Outdoor, Oil cooled, Hermetically sealed, Single phase, Dead tank NCT			
4	Rated nominal voltage	11kV			
5	Highest system voltage	12kV			
6	Rated frequency	50 Hz			
7	Rated primary current	1200A			
8	Rated secondary current	0.578A			
9	Number of core	2			
10.0		Core-1	Core-2		
10.1	Secondary current (A)	0.578	0.578		
10.2	Application	Protection (O/C & E/F)	Protection (Busbar)		
10.3	Rated Output (VA)	15			
10.4	Class of accuracy	5P	PS		
10.5	Instruments security factor	-	-		
10.6	Accuracy limit factor	20			
10.7	Knee point voltage and corresponding exciting current	-	$\geq 40(R_{ct}+8)$		
10.8	Magnetizing current at $V_k/4$ (mA)	-	$\leq 30\text{mA}$		
10.9	Resistance at secondary winding at 75 Deg. C (ohms)				
10.10	Secondary limiting voltage				
11	Short time thermal rating of primary				
11.1	One second				

TECHNICAL SPECIFICATION FOR OUTDOOR CURRENT TRANSFORMER

11.2	Three seconds	26.3 KA	
12	Rated dynamic current of primary		
13	Rated continuous thermal current		
14	Temperature rise at ambient temp 50 deg. C		
14.1	Winding		
14.2	Oil at top		
14.3	Exposed current carrying parts		
15	One minute power frequency dry withstand voltage		
16	One minute power frequency wet withstand voltage	28kV (rms)	
17	1.2/50 microsecond impulse withstand test voltage	75 KV (peak)	
18	Minimum creepage distance in mm	31KV / mm	
19	Protective creepage distance in mm		
20	Magnetization curve of CT core		
21	Variation in ratio and phase angle error due to variation in		
21.1	Voltage by 1 volts		
21.2	Frequency by 1 Hz		
22	Current density in primary winding (A/sqmm)		
23	Weight of oil		
24	Total weight		
25	Mounting details		
26	Overall dimensions		
27	Terminal connector		



SP-ODCT-47-R0

TECHNICAL SPECIFICATION FOR OUTDOOR CURRENT TRANSFORMER

ANNEXURE - D RECOMENDED 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			

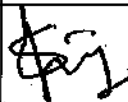
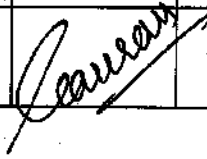
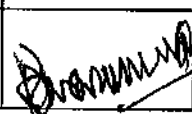
BSES

SP-MODS-44-R1

TECHNICAL SPECIFICATION FOR MOTORIZED OUTDOOR DISCONNECTING SWITCH

**TECHNICAL SPECIFICATION
FOR
MOTORIZED OUTDOOR DISCONNECTING SWITCH**

SPECIFICATION NO. – SP-MODS-44-R1

Prepared by		Reviewed by		Approved by		Rev	Date
Name	SG	Name	GS	Name	DS		
Sign		Sign		Sign		R1	21.06.2016

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Annexure-A: Guaranteed Technical Particulars of 66KV Isolator Unit

Annexure-B: Guaranteed Technical Particulars of 33KV Isolator Unit

TECHNICAL SPECIFICATION FOR MOTORIZED OUTDOOR DISCONNECTING SWITCH**Record of Revision**

Clause No.	Change in Specification	Approved by	Revision
4.2	Disconnect Switch Type updated	DS	1

TECHNICAL SPECIFICATION FOR MOTORIZED OUTDOOR DISCONNECTING SWITCH**1.0. SCOPE OF SUPPLY**

The scope of supply includes the following-

- 1.1 Design, Engineering, Manufacturing, Assembly, Inspection, Testing of motorized isolator at manufacturer's works, Packing and Transportation, supervision of testing, erection and commissioning at site.
- 1.2 Supply of the following accessories with complete motorized isolator unit
 - a. Clamp and connectors
 - b. Stainless steel hardware like nut bolts, washers, etc. for fixing of all equipment/accessories in the scope of the bidder with supporting structure.
 - c. Any other item necessary for usual for efficient performance and satisfactory maintenance under the various operating and atmospheric conditions.
- 1.3 Civil foundation or works is excluded from supply unless otherwise specified in bid document.

2.0. STANDARDS & CODES

Materials, equipment and methods used in manufacturing of Isolator unit shall conform to the latest edition of following-

STANDARD CODE	STANDARD DESCRIPTION
Latest Edition	Indian Electricity Rules
Latest Edition	Indian Electricity Act
Latest Edition	CBIP Manual
IEC : 62271 - 102	High-Voltage Switchgear and Controlgear Alternating current Disconnectors and Earthing Switches
IS : 9921 - Part I to V	Specification for Alternating Current Disconnectors (Isolators) and Earthing Switches
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 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

TECHNICAL SPECIFICATION FOR MOTORIZED OUTDOOR DISCONNECTING SWITCH**3.0. SERVICE CONDITIONS**

Motorized isolator units to be supplied against this specification shall be suitable for satisfactory operation under the following conditions-

S No.	PARAMETERS	CONDITION
3.1	Average grade atmosphere	Heavily polluted, Dry
3.2	Maximum altitude above sea level	1000M
3.3	Ambient Air Temperature	Highest 50Deg C, Average 40Deg C
3.4	Minimum Ambient air Temperature	0 Deg C
3.5	Maximum Relative Humidity	100%
3.6	Rainfall	750mm concentrated in four months

4.0. DESIGN FEATURES

S No.	DESCRIPTION	BSES REQUIREMENT / RATING
4.1	Application	Outdoor type for installation and operation in horizontal plane with or without earth switches.
4.2	Disconnect Switch Type	Motor operated, central rotating double break with turn and twist mechanism, triple pole, outdoor type installation and operation in horizontal/vertical as per the site requirement.
4.3	Operating Motor	Universal type
4.4	Earth Switch Mechanism	Manually operated
4.5	Disconnect Control	
4.5.1	Remote electrical control	Required
4.5.2	Local Manual control	Required
4.5.3	Local electrical control	Required from integral Local Control Cabinet
4.6	Interlock with circuit breakers	Electrical interlock with solenoid
4.7	Interlock with Earth Switch	Mechanical & Electrical interlock
4.8	Padlock for Earth Switch	Padlock & keys arrangement for both positions i.e. when earth switch is grounded and when earth switch is un-grounded.
4.9	Main Contacts	
4.9.1	Type of contacts	High pressure self wiping type copper alloy silver plated or aluminum alloy spring less design. Fist and finger type design. Material and design of contact shall be supported by type test design.

TECHNICAL SPECIFICATION FOR MOTORIZED OUTDOOR DISCONNECTING SWITCH

4.9.2	Current carrying part	Silver plated copper alloy or aluminum alloy as per type tested design
4.10	Insulators	
4.10.1	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. * Bidder shall also provide alternate offer with polymeric post insulator.
4.10.2	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 galvanized.
4.11	Material of rotating blade	Electrolytic Tinned Copper with silver coating of 25 microns or aluminum alloy as per type tested design.
4.12	Earth Switch contacts	
4.12.1	Type of contact	Copper or aluminum alloy contact, high pressure fixed and finger.
4.12.2	Material of blade	Electrolytic Tinned Copper silver plated (25 microns) or aluminum alloy
4.13	Corona Effect	Shall be free from visible corona discharge in both open & close positions at visible discharge test voltages.
4.14	Control cabinet	
4.14.1	Enclosure	Weather-proof, water-shedding, corrosion-proof IP-55 made out of aluminum alloy sheet.
4.14.2	Cabinet Door	Neoprene Gasketed, hinged access double door shall have a mechanical indicator fitted to clearly indicate fully opened and fully closed positions of the disconnection switch.

TECHNICAL SPECIFICATION FOR MOTORIZED OUTDOOR DISCONNECTING SWITCH

4.14.3	Wiring	Control wiring shall be done using 1.1KV grade 2.5 sq.mm stranded copper conductor, PVC insulated, cables laid in GI conduits.
4.14.4	Locking arrangement	Padlocking arrangement to be provided.
4.14.5	Incomer	A local TPN MCB to be provided in cabinet at power supply incoming point.
4.14.6	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.
4.14.7	Aux. Contacts	All auxiliary contacts of the disconnection switch and earthing switches shall be wired up to the terminal blocks.
4.14.8	Terminals	Screw driver operated Stud type terminals suitable for minimum 6sqmm cable should be provided. At least ten (10) percent terminals shall be spare in each terminal block.
4.14.9	Painting	As per manufacturer standard
4.14.10	Local Controls	A local/ remote changeover switch shall be fitted inside the cabinet together with open/ close push buttons for local control.
4.14.11	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.
4.15	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 meter above the finished ground level of the substation.

TECHNICAL SPECIFICATION FOR MOTORIZED OUTDOOR DISCONNECTING SWITCH

4.16	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 blades. 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.
4.17	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.
4.18	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.
4.19	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. 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.

TECHNICAL SPECIFICATION FOR MOTORIZED OUTDOOR DISCONNECTING SWITCH

4.20	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.
4.21	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.
4.22	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 approval.

5.0. MAKE OF COMPONENTS

S No.	Components	Approved Make
5.1	Motors	Agni / ABB / Siemens / Crompton/ Remi / Elcen / Grosshopp
5.2	Insulators	JSI / WSI / Modern / Saravana / BHEL/ABIL
5.3	Switch	Kaycee / L&T (Salzer)
5.4	HRC Fuse Links	Alstom / Siemens / L&T
5.5	AC Contactors & O/L Relay	L&T / Siemens / Schneider
5.6	Terminals	Connectwell / Elmex
5.7	Push buttons / Actuator	L&T / Teknic / Siemens
5.8	MCB	Merlin Gerin / Siemens / Schneider/ ABB

6.0. RATING PLATE AND MARKING

6.1	Rating Plate Material	Anodized aluminum 16SWG
6.1.1	Background	SATIN SILVER

TECHNICAL SPECIFICATION FOR MOTORIZED OUTDOOR DISCONNECTING SWITCH

6.1.2	Letters, diagram & border	Black
6.1.3	Process	Etching
6.1.4	Method of fixing	Riveted at corners
6.2	Main Rating plate details	a. Property of BSES b. Supplier's Name c. Sr. No. of Isolator Unit d. P.O. No. with Date e. Month & Year of Manufacturing f. Relevant IS g. Gross Weight / Net Weight h. Guarantee Period i. Basic Insulation Level j. Short Time Current Rating k. Operating Mechanism l. Standard connection diagram (if any) m. Warranty period
6.3	MOM Box Rating Plate Details	a. Property of BSES b. Gear Ratio c. Degree of Protection d. Auxiliary Control Voltage e. No. of Auxiliary Switch f. PO No. with date g. Month & Year of Manufacturing h. Warranty period

7.0. QUALITY ASSURANCE, INSPECTION & TESTING

7.1	Vendor Quality Plan	To be submitted for purchaser approval for outline of production, inspection, testing, inspection, packing, dispatch, documentation program
7.2	Inspection points	To be mutually identified & agreed in quality plan
7.3	Type Test	a. Disconnecter Switch with all its accessories shall be type tested as per relevant standards. b. 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. c. Type test reports from CPRI/ERDA shall be treated valid. d. Type tests should not pertain to period earlier than five years.
7.4	Routine & Acceptance Test	a. Manufacturer shall carry out comprehensive inspection and testing during manufacture of the equipment. b. All the acceptance tests as per relevant standards shall be conducted during the inspection. c. Temperature rise test shall be carried out during inspection of each lot. d. During inspection, all the tests shall be carried out in presence of representative of purchaser. e. The raw material test certificates, routine test/internal test reports and calibration certificates of the equipments used

TECHNICAL SPECIFICATION FOR MOTORIZED OUTDOOR DISCONNECTING SWITCH

		shall be submitted during inspection. f. Tests on fittings and accessories shall be carried out as per relevant standards.
7.5	Physical Tests	a. Visual & Dimensional Verification. b. Checks of all mounting plates / fasteners. c. Checking of components as per drawing. d. Electrical circuits' fasteners tightness / Surface area contacts. e. Labels / Identification / Nameplates. f. All doors checks – Safety and Accessibility. g. Material surface finish / Smoothness.
7.6	Inspection	a. The Buyer reserves the right to witness all tests specified on completed product as specified above in acceptance and physical tests. b. The Buyer reserves the right to inspect the product at the Sellers works at any stage, to verify compliance with the specifications. c. In-process and final inspection call intimation shall be given atleast 15 days in advance.

8.0. SHIPPING, HANDLING & SITE SUPPORT

8.1	Packing Protection	Against any damage, corrosion & heavy rains.
8.2	Packing for accessories and spares	Robust non returnable packing case with all the above protection & identification label.
8.3	Packing Identification Label	Following details to be provided on the packing identification label:- 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 quality 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

TECHNICAL SPECIFICATION FOR MOTORIZED OUTDOOR DISCONNECTING SWITCH

8.4	Shipping	The bidder shall ascertain at an early date and definitely before the commencement of manufacture, any transport limitations such as weights, dimensions, road culverts, overhead lines, free access etc. from the manufacturing plant to the project site. Bidder shall furnish the confirmation that the proposed Packages can be safely transported, as normal or oversize packages, up to the site. Any modifications required in the infrastructure and cost thereof in this connection shall be brought to the notice of the Purchaser. The seller shall be responsible for all transit damage due to improper packing.
8.5	Handling and Storage	Manufacturer instruction shall be followed. Detail handling & storage instruction sheet / manual needs to be furnished before commencement of supply.

9.0. DEVIATIONS

List of deviations shall be stated in writing with the tender by reference to the Specification clause / GTP/ Drawing. In absence of such a statement, requirements of the Specification shall be assumed to be met without exception by the vendor.

10.0. DOCUMENT SUBMISSION

10.1	The seller has to submit the following documents along with bid
10.1.1	GA / cross sectional drawing of Disconnecting Switch with all its accessories showing all the views / sections / parts
10.1.2	Detailed reference list of customers using the offered product during the last 5 years with similar design and rating
10.1.3	Completely filled GTP
10.1.4	Manufacturer's quality assurance plan and certification for quality standards
10.1.5	Type test reports for the offered disconnecting switch and other accessories
10.1.6	Complete product catalogue and Manual
10.1.7	Bill of material with make, model & quantity of items.
10.2	After award of contract, seller has to submit the following documents for buyer's Approval {A} / Reference {R}.
10.2.1	Program for production and testing (A)
10.2.2	Guaranteed Technical Particulars (A)
10.2.3	Calculations to substantiate choice of electrical, structural & mechanical component size/ratings (A)
10.2.4	Detailed dimensional drawing of components (A) GA drawing of major components (R) Rating and Diagram plate (R)
10.2.5	Detailed loading drawing to enable the buyer to design and construct foundations (as applicable) (R)
10.2.6	Detailed installation & commissioning instructions
10.2.7	Quality Assurance Plan (A)
10.2.8	Operation Manual ®
10.2.9	Inspection and routine test reports, carried out in manufacturer's works

TECHNICAL SPECIFICATION FOR MOTORIZED OUTDOOR DISCONNECTING SWITCH

10.2.10	Test certificates of all bought out items
10.2.11	Detailed bill of material for all fittings & accessories with their make & model
10.2.12	Drawing and document sizes
10.2.13	Number of Documents required at different stages shall be as per scope of supply.
10.2.14	Duly signed & stamped copies of the drawings / documentation are required to be submitted to BSES for approval.

TECHNICAL SPECIFICATION FOR MOTORIZED OUTDOOR DISCONNECTING SWITCH**Annexure – A: Guaranteed Technical Particulars of 66KV Disconnecter Unit**

Note: This GTP is to be filled by the supplier in accordance with the given specification. Any deviation from the same shall be clearly highlighted and shall be supported with relevant documents.

S No.	Description	Data by Purchaser	Data by Supplier
1	Name of manufacturer		
2	Type	Motor operated, central rotating horizontal double break(HDB) with turn and twist mechanism, triple pole, outdoor type installation	
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 \pm 5%	
iii)	System Neutral	Solidly earthed	
7	Rated Insulation Data		
7.1	1.2/50 μ s 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	1600 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)	-	
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	

TECHNICAL SPECIFICATION FOR MOTORIZED OUTDOOR DISCONNECTING SWITCH

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	
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	Hard drawn electrolytic tinned copper or aluminum alloy	
iii)	Material of contact	Hard drawn silver plated electrolytic copper or aluminum alloy	
15	Earth Switch Contacts		
i)	Type of Contact of Earth switch	High pressure banging type	
ii)	Material for earth switch blade	Hard drawn electrolytic tinned copper or aluminum alloy	
iii)	Material of earth switch contact	Hard drawn Silver plated electrolytic copper or aluminum alloy	
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 / 50 V DC	
22	AC Aux. Supply (4 wire)	415 V \pm 10%	
23	Inter Locking arrangement	Electrical and mechanical	

TECHNICAL SPECIFICATION FOR MOTORIZED OUTDOOR DISCONNECTING SWITCH

24	Terminal connectors	Universal type, Made of Al A-6 alloy Suitable for twin ACSR Zebra conductor	
25	Minimum creepage distance of insulator	31mm/KV	
26	Type of control for		
i)	Disconnection switch	Motorized 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	As per IS/IEC	
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)	Torsional 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)	Frame size		
iv)	Rated Voltage	415 V AC	
v)	Degree of Protection	IP-55	
vi)	Insulation Class	B/F	
vii)	Duty		

TECHNICAL SPECIFICATION FOR MOTORIZED OUTDOOR DISCONNECTING SWITCH**Annexure – B: Guaranteed Technical Particulars of 33KV Disconnecter Unit**

Note: This GTP is to be filled by the supplier in accordance with the given specification. Any deviation from the same shall be clearly highlighted and shall be supported with relevant documents.

S No.	Description	Data by Purchaser	Data by Supplier
1	Name & Place of manufacturer		
2	Type	Motor operated, central rotating double break with turn and twist mechanism, triple pole, outdoor type installation and operation in horizontal/vertical as per the site requirement.	
3	Model		
4	No. of units		
5	Installation	Outdoor vertical	
6	System Particulars		
i)	Highest System Voltage	36 KV	
ii)	Rated frequency	50 Hz \pm 5%	
iii)	System Neutral	Solidly Earthed	
7	Rated Insulation Data		
7.1	1.2/50 μ s 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)	-	
9	Earthing switch current capacity		

TECHNICAL SPECIFICATION FOR MOTORIZED OUTDOOR DISCONNECTING SWITCH

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	
10	Minimum clearances		
i)	In air between live parts and earth	320 mm	
ii)	In air between Phase to phase	320 mm	
iii)	Minimum ground clearance	3700 mm	
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 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 or aluminum alloy	
iii)	Material of contact	Silver plated electrolytic copper or aluminum alloy	
15	Earth Switch Contacts		
i)	Type of Contact of Earth switch	High pressure banging type	
ii)	Material for earth switch blade	Electrolytic tinned copper or aluminum alloy	
iii)	Material of earth switch contact	Silver plated electrolytic copper or aluminum alloy	
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	

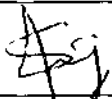
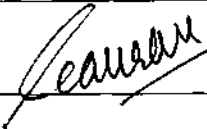
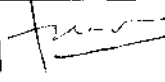
TECHNICAL SPECIFICATION FOR MOTORIZED OUTDOOR DISCONNECTING SWITCH

20	Temperature rise	As per IS 9921	
21	Control supply voltage	220 V/ 50 V DC	
22	AC Aux. Supply (4 wire)	415 V \pm 10%	
23	Inter Locking arrangement	Electrical and mechanical	
24	Terminal connectors	Universal type, Suitable for twin ACSR Zebra conductor	
25	Minimum creepage distance of insulator	31mm/KV	
26	Type of control for		
i)	Disconnection switch	Motorized 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)	Torsional 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)	Frame size		

TECHNICAL SPECIFICATION FOR MOTORIZED OUTDOOR DISCONNECTING SWITCH

iv)	Rated Voltage	415 V AC	
v)	Degree of Protection	IP-55	
vi)	Insulation Class	B/F	
vii)	Duty		

**TECHNICAL SPECIFICATION
FOR
OUTDOOR POTENTIAL TRANSFORMER
(33 KV & 66 KV)**

PREPARED BY	REVIEWED BY	APPROVED BY	REV	01
SG	GS	AA	DATE	24/05/2019
			PAGE	1 OF 21

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RECORD OF REVISION

Clause No.	Change in Specification	Approved by	Rev
3.17.0	Additional details of CVT	AA	1

TECHNICAL SPECIFICATION FOR OUTDOOR POTENTIAL TRANSFORMER**1.0 SCOPE OF SUPPLY**

Design, manufacture, assembly, testing at stages of manufacture as per this specification, final testing at manufacturer works on completely assembled Potential Transformer (PT) / CVT before dispatch, packing and delivery of PT/CVT Transformer as per the tender requirement.

2.0 CODES & STANDARDS

Materials, equipment and methods used in the manufacture of Potential Transformer (PT)/ CVT shall conform to the latest edition of following

IS-3156 (Part I to IV)	Specification for Voltage transformer
IS-4146	Application guide for voltage transformer.
IS-2099	High voltage porcelain bushings
IS-731	Insulator for O/H power line
IS-335	New insulating oil for transformer and switchgear.
IS-9676	Reference ambient temperature of electrical equipment
IS-5561	Specification of electric power connectors
IS-5621	Hollow insulator for use in electrical equipments
	Indian Electricity Rules
	Indian electricity act
	CBIP manual

3.0 MAJOR DESIGN CRITERIA & PARAMETERS

3.1.0	System	66KV	33KV
3.1.1	Voltage	66KV \pm 10%	33KV \pm 10%
3.1.2	Frequency	50HZ \pm 5%	50HZ \pm 5%
3.1.3	Fault level	31.5KA for 3secs.	26.3KA for 3secs.
3.1.4	Earthing	Solidly grounded	Solidly grounded
3.2.0	Type	Single phase, dead tank, oil immersed, self-cooled outdoor type.	
3.3.0	Construction feature	Oil immersed PT/CVT shall be hermetically sealed to eliminate breathing and to prevent ingress of air and moisture.	
3.3.1	Tank		

TECHNICAL SPECIFICATION FOR OUTDOOR POTENTIAL TRANSFORMER

3.3.2	Material of Construction	Tank shall be of MS with polyurethane paint or shall be Galvanised Steel.
3.3.3	Tank Feature	The tank shall be provided with oil draining plug, Oil level gauge glass.
3.3.4	Oil Expansion	Stainless steel bellow or diaphragm shall be provided to take care of oil expansion
3.3.5	Core	High grade, non ageing, low loss, high permeability, cold rolled grain oriented silicon steel lamination.
3.4.0	Winding	
3.4.1	Material	Electrolytic Copper
3.4.2	Winding Insulating material	Class A, non catalytic, inert to transformer oil, free from compounds liable to ooze out, shrink or collapse.
3.4.3	Winding Insulation	Uniform
3.4.4	Design features	Winding shall be capable of desired output as per specified limits without exceeding permissible temperature rise.
3.5.0	Insulating oil	
3.5.1	Type	Class 1 new mineral insulating oil as per IS 335, shall be certified not to contain PCBs. Anti oxidant inhibitor if recommended shall be subject to Purchaser's approval.
3.6.0	Terminals	
3.6.1	Primary terminals	The HV Terminal shall be of copper. Single Zebra ACSR conductor. Termination shall be by bimetallic Aluminum alloy grade A6 suitable for
3.6.2	Primary Terminal connector	Universal type, Suitable for termination of Single Zebra ACSR conductor. Connector should be of Aluminium alloy A6. Bimetallic sleeve of 1mm thickness should be provided for primary connection.
3.6.3	Secondary terminals	The secondary terminals shall be provided in IP55 Box with Brass/copper stud type terminals

TECHNICAL SPECIFICATION FOR OUTDOOR POTENTIAL TRANSFORMER

		accessible from front with removable cover.
3.6.4	Earth terminal of primary winding	The earth terminal of HV winding shall be brought out in secondary Terminal box by bushing. This shall be connected with body earth terminal with flexible copper lead through a link.
3.6.5	Terminal marking	Terminals shall be marked as per IS 3156
3.7.0	Bushing	
3.7.1	Type	Porcelain bushing
3.7.2	Minimum creepage distance of bushing	31 mm/KV
3.7.3	Protected creepage distance	At least 50 % of total creepage distance
3.8.0	Over Voltage factor	1.2 times for continuous rating and 1.5 times for 30 seconds.
3.9.0	Atmospheric protection for clamp and fitting of iron and steel	Hot dip galvanizing as per IS 2633. The Minimum thickness of galvanization should be 610 g/ sq mm.
3.10.0	Gland Plate	Min. 3 mm thick detachable with three knockout holes of 3/4 inch.
3.11.0	Cable entry	Bottom for all cables
3.12.0	Earthing	The PT/CVT assembly comprising of the chasis, frame work and fixed parts of metal casing shall be provided with two separate body earthing terminals.
3.13.0	Drain Plug on tank Base	Required
3.14.0	Painting surface preparation	Shot blasting or chemical 7 tank process.
3.15.0	Painting external finish	692 as per IS 5
3.16.0	Fixing bolts	Fixing bolts and other accessories as per this specification.
3.17.0	Additional details of CVT	<ul style="list-style-type: none">i) Shall comprise a capacitor divider unit and an electromagnetic unit such that secondary voltage of electromagnetic unit is substantially proportional to and in phase with the primary voltage applied to capacitor divider units.ii) Capacitors shall be oil impregnated type enclosed in inert gas atmosphere, hermetically

TECHNICAL SPECIFICATION FOR OUTDOOR POTENTIAL TRANSFORMER

		<p>sealed.</p> <p>iii) The material and construction and assembly of CVT shall be such that the capacitance does not change with time and the effect of temperature is minimum.</p> <p>iv) Provided with an over voltage suppressor</p> <p>v) No radio interference when operated at maximum service voltage</p> <p>vi) Reactance to be provided to minimize draining of carrier signal in electromagnetic unit</p> <p>vii) No radio interference when operated at maximum service voltage</p> <p>viii) The CVT shall be designed to cover its rated output range without any adjustment of its electromagnetic unit.</p> <p>ix) Material used in insulation and assembly of the winding shall be insoluble, non catalytic and chemically inactive in hot transformer oil and shall not be subjected to a shrinking and seasoning process</p> <p>x) CVT shall provide designed transient response requirement as per IEC / IS i.e. during transient oscillations following a short circuit on primary side, the secondary side output voltage shall not fall to a value less than 10% of peak value before short circuit within 20 milliseconds</p> <p>xi) The secondary terminal box shall include necessary HRC fuses for protection of secondary circuits and both the sides of fuse shall be terminated on terminal block for fuse supervision.</p>
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4.0 RATING PLATE

4.1.0	Material	Anodized aluminum 16SWG
4.1.1	Background	SATIN SILVER
4.1.2	Letters, diagram & border	Black
4.1.3	Process	Etching
4.2.0	Rating plate details	As per IS3156
4.2.1	Other details required on rating plate	BSES PO No. and Date
		Warranty Period
		Connection Diagram

5.0 APPROVED MAKE OF COMPONENTS

5.1	Insulator	ABIL, WSI, Modern, Saravana, BHEL, CJI
5.2	Primary Terminal Connector	Exalt, Tyco, Rashtraudyog

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5.3	Note	Any other make of component to be approved by Owner
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6.0 DRAWING, DATA & MANUALS

6.1.0	To be submitted along with bid	<p>Seller has to submit:</p> <ul style="list-style-type: none">i) Tentative GA / cross sectional drawing of product showing all the views / sectionsii) Detailed reference list of customers already using the offered product during the last 5 years with particular emphasis on units of similar design and ratingiii) Completely filled GTPiv) Deviations from this specification. Only deviations approved in writing before award of contract shall be acceptedv) Details of manufacturer's quality assurance standards and programme and ISO 9000 series or equivalent national certificationvi) 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
6.2.0	After award of contract, seller has to submit mentioned drawings for buyer's Approval (A) / Reference (R)	<ul style="list-style-type: none">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) Detailed dimensional drawing for all components, general arrangement drawing showing detailed component

TECHNICAL SPECIFICATION FOR OUTDOOR POTENTIAL TRANSFORMER

		layout and detailed schematic and wiring drawings for all components (like marshalling box) v) Terminal arrangement & cable box details etc (as applicable) (A) vi) Drawing of major components (A) vii) Rating and diagram plate (A) viii) Detailed loading drawing to enable the buyer to design and construct foundations (as applicable) (R) ix) Transport / Shipping dimensions with weights, wheel base details, untanking height etc (As applicable) (R) x) List of makes of all fittings and accessories (A) xi) detailed installation and commissioning instructions (R) xii) quality plan
6.3.0	Submittals required prior to dispatch	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
6.4.0	Drawing and document sizes	Standard size paper A0, A1, A2, A3, A4
6.5.0	Drgs/Documents required at different stages	Both hard copy and Soft copy in Pendrive

7.0 QUALITY ASSURANCE, TESTING & INSPECTION

7.1.0	Vendor Quality Plan	To be submitted for purchaser approval
7.2.0	Inspection points	To be mutually identified & agreed in quality plan
7.3.0	Type Tests	i) On one CVT/PT of each rating and type (In Govt. recognized independent test laboratory), all the test as per IS 3156 ii) In case 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,

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		before commencement of supply.
		iii) If the manufacturer's lab is accredited by govt. / authorized body then it shall be acceptable for type testing.
7.4.0	Inspection and testing during manufacture	
7.4.1	Tank	i) Checking of dimensions as per approved drawing. ii) Checking for leakage by pressure testing. iii) Thickness of Paint or Galvanisation, as applicable
7.4.2	Porcelain	i) Check dimension. ii) Check finish of sealing surface. iii) Check creepage distance. iv) Check for routine electrical test. v) Check for porosity and temperature cycle test.
7.4.3	Insulating Materials	i) Sample check for physical properties of materials. ii) Check for dielectric strength. iii) Visual and dimensional checks.
7.4.4	Copper conductor	i) Check for dimension. ii) Check for elongation. iii) Check for unidirectional scrap. iv) Heat shock.
7.4.5	Oil	i) Check for break down voltage. ii) Check for density. iii) Check for flash point. iv) Check for moisture content. v) Check for neutralization value. vi) Check for inter facial tension at 27 Deg c. vii) Check for sludge content. viii) Check for specific resistance. ix) Check for pour point.
7.4.6	Secondary terminals	i) Check for one min AC Test
7.5.0	Routine tests	Tests shall be carried out in accordance with IS 3156

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7.6.0	Acceptance test	To be performed in presence of Owner's representative at manufacturer works:- i) Routine tests as per IS ii) Physical inspection of dimensions and BOM. iii) Pressure test on tank iv) IP55 test on secondary compartment v) Creepage distance of bushing vi) Test on accessories as per manufacturer's standard
7.7.0	Inspection and Testing	i) The buyer reserves the right to witness all tests specified on completed product ii) 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. iii) In-process and final inspection call intimation shall be given atleast 15 days in advance.

8.0 PACKING , SHIPPING, HANDLING AND STORAGE

8.1.0	Packing	
8.1.1	Packing protection	Against corrosion, dampness, heavy rains, breakage and vibration
8.1.2	Packing for accessories and spares	Robust wooden non returnable packing case with all the above protection and identification labels.
8.1.3	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's / its agent

TECHNICAL SPECIFICATION FOR OUTDOOR POTENTIAL TRANSFORMER

		viii) Description and quantity ix) Country of origin x) Month and year of manufacturing xi) Case measurements xii) Gross and net weights in kilograms xiii) All necessary slinging and stacking instructions.
8.1.4	Shipping	i) The bidder shall ascertain at an early date and definitely before the commencement of manufacture, any transport limitations such as weights, dimensions, road culverts, overhead lines, free access etc. from the manufacturing plant to the project site; and furnish to the Purchaser confirmation that the proposed packages can be safely transported, as normal or oversize packages, upto the plant site. Any modifications required in the infrastructure and cost thereof in this connection shall be brought to the notice of the Purchaser. ii) the seller shall be responsible for all transit damage due to improper packing.
8.1.5	Handling and Storage	Manufacturer instruction shall be followed. Detail handling & storage instruction sheet / manual needs to be furnished before commencement of supply.

9.0 DEVIATIONS

	Deviation from this specification, if any, shall be clearly brought out in the offer. Unless owner explicitly accepts such deviations, it shall be constructed that the offer fully complies with the specification.
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ANNEXURE - A SERVICE CONDITIONS

S No.	ENVIRONMENTAL CONDITION	REQUIREMENT
1	Average grade atmosphere	Heavily polluted, dry
2	Maximum altitude above sea Level	1000 M
3	Ambient air temperature	Highest 50Deg C Average 40Deg C
4	Minimum ambient air temperature	0 Deg C
5	Relative Humidity	100%
6	Seismic Zone	4
7	Rainfall	750 mm concentrated in four months

TECHNICAL SPECIFICATION FOR OUTDOOR POTENTIAL TRANSFORMER**ANNEXURE - B GUARANTEED TECHNICAL PARTICULARS 66KV PT/VT**

S No.	Description	Data by purchaser	Data by Supplier
1.0	Location of equipment	Project specific to be filled up	
2.0	Name of manufacturer		
3.0	Address & contact details		
4.0	Type	Single phase outdoor, dead tank type oil immersed, self cooled	
5.0	Manufacturer model no.		
6.0	Reference design ambient temperature	50 Deg. C	
7.0	Reference standard	IS:3156	
8.0	Nominal system voltage	66 KV	
9.0	Highest system voltage	72.5KV	
10.0	Basic insulation level	325KVp	
11.0	Power frequency voltage	140 KV	
12.0	Type of cooling	ONAN	
13.0	Rated frequency	50 Hz	
14.0	Insulation class	A	
15.0	Rated primary voltage	$66kV/\sqrt{3}$	
16.0	Rated secondary voltage	$110V / \sqrt{3}$	
17.0	Number of secondary cores	Two	
18.0	Core specifications		
18.1	Core -1		
18.1.1	Purpose	Metering	
18.1.2	Rated output	50 VA	
18.1.3	class of accuracy	0.2	
18.1.4	Ratio error	As per IS	
18.1.5	Phase angle error	As per IS	

TECHNICAL SPECIFICATION FOR OUTDOOR POTENTIAL TRANSFORMER

S No.	Description	Data by purchaser	Data by Supplier
18.2	Core -2		
18.2.1	Purpose	Protection	
18.2.2	Rated output	50 VA	
18.2.3	class of accuracy	3P	
18.2.4	Ratio error	As per IS	
18.2.5	Phase angle error	As per IS	
19.0	Rated over voltage factor		
19.1	Continuous	1.2 times	
19.2	30 seconds	1.5 times	
20.0	For CVT, Capacitor Divider		
20.1	High voltage Capacitor	C1 (pf)	
201.2	Intermediate Voltage Capacitor	C2 (pf)	
20.3	Total Equivalent Capacitance	Pf	
20.4	Rated temperature at which above values are indicated.	Deg C	
20.5	Capacitance emperature coefficient		
20.6	Tan delta value of capacitance		
20.7	Carrier frequency coupling	Pf	
20.8	Rated Intermediate Voltage		
20.9	Natural frequency of coupling	KHZ	
20.10	Band Width	KHZ	
20.11	Series reactance/choke rated Voltage & power frequency withstand voltage		
21	Temperature rise above the ambient 50 deg.C at 1.2 times voltage factor for continues rating		
21.1	For winding	50 Deg. C	

TECHNICAL SPECIFICATION FOR OUTDOOR POTENTIAL TRANSFORMER

S No.	Description	Data by purchaser	Data by Supplier
21.2	For Oil	40 Deg C	
22.0	Temperature rise above the ambient 50 deg.C at 1.5 times voltage factor for 30 seconds rating		
22.1	For winding	50 Deg. C	
22.2	For Oil	40 Deg C	
23.0	One minute power frequency dry withstand voltage for 66 KV (KV rms)		
24.0	One minute power frequency wet withstand voltage for 66 KV (KV rms)		
25.0	1.2/50 micro seconds impulse withstand test voltage KV peak for 66KV PT/ CVT	325 KVp	
26.0	One minute power frequency withstand voltage for secondary winding	3 KV	
27.0	Minimum creepage distance in mm	2250 mm	
28.0	Protective creepage distance in mm	50 % of creepage	
29.0	Partial discharge test, whether will be carried out Yes / No		
30.0	Weight of core		
31.0	Weight of oil		
32.0	Total weight		



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TECHNICAL SPECIFICATION FOR OUTDOOR POTENTIAL TRANSFORMER

S No.	Description	Data by purchaser	Data by Supplier
33.0	Mounting details		
34.0	Overall dimensions		
35.0	Terminal connector	ACSR single Zebra conductor	

TECHNICAL SPECIFICATION FOR OUTDOOR POTENTIAL TRANSFORMER**ANNEXURE - C GUARANTEED TECHNICAL PARTICULARS 33KV PT/CVT**

S No.	Description	Data by purchaser	Data by Supplier
1.0	Location of equipment	Project specific to be filled up	
2.0	Name of manufacturer		
3.0	Address & contact details		
4.0	Type	Single phase outdoor, dead tank type oil immersed, self cooled	
5.0	Manufacturer model no.		
6.0	Reference design ambient temperature	50 Deg. C	
7.0	Reference standard	IS:3156	
8.0	Nominal system voltage	33 KV	
9.0	Highest system voltage	36 KV	
10.0	Basic insulation level	170 KVp	
11.0	Power frequency voltage	70 KV	
12.0	Type of cooling	ONAN	
13.0	Rated frequency	50 Hz	
14.0	Insulation class	A	
15.0	Rated primary voltage	$33\text{kV}/\sqrt{3}$	
16.0	Rated secondary voltage	$110\text{V} / \sqrt{3}$	
17.0	Number of secondary cores	Two	
18.0	Core specifications		
18.1	Core -1		
18.1.1	Purpose	Metering	
18.1.2	Rated output	50 VA	
18.1.3	class of accuracy	0.2	
18.1.4	Ratio error	As per IS	
18.1.5	Phase angle error	As per IS	
18.2	Core -2		
18.2.1	Purpose	Protection	
18.2.2	Rated output	50 VA	
18.2.3	class of accuracy	3P	
18.2.4	Ratio error	As per IS	
18.2.5	Phase angle error	As per IS	

TECHNICAL SPECIFICATION FOR OUTDOOR POTENTIAL TRANSFORMER

S No.	Description	Data by purchaser	Data by Supplier
19.0	Rated over voltage factor		
19.1	Continuous	1.2 times	
19.2	30 seconds	1.5 times	
20.0	For CVT, Capacitor Divider		
20.1	High voltage Capacitor	C1 (pf)	
201.2	Intermediate Voltage Capacitor	C2 (pf)	
20.3	Total Equivalent Capacitance	Pf	
20.4	Rated temperature at which above values are indicated.	Deg C	
20.5	Capacitance temperature coefficient		
20.6	Tan delta value of capacitance		
20.7	Carrier frequency coupling	Pf	
20.8	Rated Intermediate Voltage		
20.9	Natural frequency of coupling	KHZ	
20.10	Band Width	KHZ	
21	Temperature rise above the ambient 50 deg.C at 1.2 times voltage factor for continuous rating		
21.1	For winding	50 Deg. C	
21.2	For Oil	40 Deg C	
22.0	Temperature rise above the ambient 50 deg.C at 1.5 times voltage factor for 30 seconds rating		
22.1	For winding	50 Deg. C	
22.2	For Oil	40 Deg C	
23.0	One minute power frequency dry withstand voltage for 33 KV		
24.0	One minute power frequency wet withstand		

TECHNICAL SPECIFICATION FOR OUTDOOR POTENTIAL TRANSFORMER

S No.	Description	Data by purchaser	Data by Supplier
	voltage for 33 KV		
25.0	1.2/50 micro seconds impulse withstand test voltage KV peak for 33KV PT/CVT	170 KVp	
26.0	One minute power frequency withstand voltage for secondary winding	3 KV	
27.0	Minimum creepage distance in mm	1116	
28.0	Protective creepage distance in mm	50 % of creepage	
29.0	Partial discharge test, whether will be carried out Yes / No		
30.0	Weight of core		
31.0	Weight of oil		
32.0	Total weight		
33.0	Mounting details		
33.0	Overall dimensions		
34.0	Terminal connector	ACSR single Zebra conductor	

ANNEXURE - D RECOMENDED SPARES (DATA BY SUPPLIER)

List of recommended spares as following –

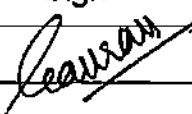
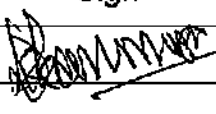
Sr No	Description of spare part	Unit	Quantity
1		No	
2		No	
3			
4			
5			

BSES

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TECHNICAL SPECIFICATION FOR 66/33KV CONTROL AND RELAY PANEL

TECHNICAL SPECIFICATION**FOR****66/33KV CONTROL & RELAY PANEL**

Prepared by		Approved by		Rev	03
Name	Sign	Name	Sign	Date	29 th July 2016
GS		DS		Page	1 of 35

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1.0 SCOPE

- 1.1 This specification covers design, manufacture, testing at manufacturer's works, packing and delivery of control and relay panel (CRP) for 66kV and 33kV substations. For detailed scope of supply refer Annexure-A.
- 1.2 The control and relay panel shall be complete with all components and accessories, which are necessary or usual for their efficient performance and trouble free operation under the various operating and atmospheric conditions. Such parts that may have not been specifically included, but otherwise form part of the CRP as per standard trade and/or professional practice and/or are necessary for proper operation of control and relay panel, will be deemed to be included in this specification.

2.0 CODES AND STANDARDS

Control and Relay panel should be designed and manufactured in accordance with the following standards.

2.1	IS-1248, Part 1- 1993	Direct acting indicating analogue electrical measuring instruments and their accessories.
2.2	IS-3231, Part 1- 1986 Part 2 &3 -1987	Electrical relays for power system protection
2.3	IS-9000 Part 1 -1988	Basic environmental testing procedures for electronics & electrical items
2.4	IS-13703 1993	Low voltage fuses for Voltages not exceeding 1000V AC or 1500 V DC
2.5	IS-13947 Part 1 - 1993	Low voltage switchgear & control gear
2.6	IEC-60255 - 1989	Specification for electrical relays
2.7	IEC 60688 1997	Electrical measuring transducers

3.0 PANEL CONSTRUCTION

3.1	Panel Type	Simplex panels with Width - 1000mm and Depth – 800 to 1000mm. Equipment shall be mounted on the front of the panel and doors for wiring access shall be at the back of panels.
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3.2	Enclosure type	Completely metal enclosed and dust, moisture and vermin proof. Degree of protection not less than IP4X in accordance with IS 13947
3.3	Enclosure material	Pre-galvanized, cold-rolled sheet steel of thickness not less than 2.0 mm. Stiffeners shall be provided wherever necessary.
3.4	Doors	Double leaf doors shall be provided at the rear. Doors shall have handles with built-in locking facility.
3.5	Gland Plate	At least two separate gland plates of removable type with gasket shall be provided for each panel. They shall be of sheet steel of thickness not less than 3.0 mm.
3.6	Cable Entry	Shall be from the bottom
3.7	Gaskets	All doors, removable covers and panels shall be gasketed all around with neoprene gaskets.
3.8	Ventilating louvers	Ventilating louvers, if required,, shall have screens and filters. The screens shall be made of either brass or GI wires mesh.
3.9	Foundation	The panels shall be fixed on the embedded foundation channels with intervening layers anti vibration strips made of shock absorbing materials.
3.10	Base Frame	Base frames shall be supplied along with panels. 100mm channel painted black.
3.11	Mounting	Equipment on front of panel shall be flush mounted. No equipment shall be mounted on the doors.
3.12	Working level	The center lines of switches, push buttons and indicating lamps shall not be less than 750mm and higher than 1600mm from panel base. Height of relays, meters and recorders shall not be less than 450 mm from the bottom of the panel.
3.13	Appearance	The center lines of switches, push buttons and indicating lamps shall be matched to give a neat and uniform appearance. Likewise the top lines of all meters, relays and recorders etc, shall be matched.

4.0 WIRING

4.1	Internal wiring	1100V grade, FRLS type, single core, stranded copper conductor wires with PVC insulation.
4.2	Size	2.5 sqmm for CT circuits, 2.5 sqmm for PT and control circuits.

4.3	Colour Code	
4.3.1	CT & PT	R Ph – Red Y Ph – Yellow B Ph – Blue Neutral – Black
4.3.2	Others	DC– grey, AC-black, Earth – green
4.4	Ferrules	Ferrules marked to correspond with panel wiring diagram shall be fitted at both ends of each wire. Ferrules shall fit tightly on the wire. Wires directly connected to trip circuit shall be distinguished by the addition of red colored unlettered ferrule.
4.5	Termination	Fork type, pin type and ring type (as applicable) tinned copper lugs to be used. Only ring type lugs should be used in CT circuits. Insulated sleeves shall be provided at all the wire terminations.
4.6	Wiring Enclosure	Plastic channels to be used as enclosures. PVC sleeves to be used for interpanel wiring.
4.7	Spare Contacts	Spare contacts of relays and contactors etc. should be wired upto the terminal block.
4.8	Inter-panel wiring	When panels are arranged to be located adjacent to each other inter panel wiring of common bus wires between the panels should be supplied with one end terminated and the other end bunched and coiled. Inter panel wiring shall be clearly indicated in the wiring tables.
4.9	Auxiliary supply	Auxiliary bus wiring for AC and DC supplies, voltage transformer circuits, annunciation circuits and other common services shall be provided on the same set of terminals in all the panels with proper segregation.

5.0 TERMINAL BLOCKS

5.1	Rating and Type	1100 V grade, molded piece, stud type screw driver operated terminals complete with insulated barriers, washers, nuts and lock nuts.
5.2	Suitability	Unless otherwise specified, terminal blocks shall be suitable for connecting the following conductors of cable on each side- a. All circuits including current / voltage transformer circuits: 6mm ² flexible copper. b. AC / DC power supply circuits: one no of 10 mm ² Al./ 6 mm ² flexible Cu.
5.3	Marking and covers	White fibre markings strip with clear plastic, slip-on / clip-on terminal covers to be provided.

5.4	Disconnecting Facility	To be provided in CT and PT terminals
5.5	Shorting & Earthing Facility	To be provided in CT Terminals
5.6	Spare Terminals	20% in each TB row
5.7	Vertical clearance with gland plate	Minimum 250mm
5.8	Clearance between two rows of TBs	Minimum 150mm
5.9	Test Terminal Blocks	Srew driver operated stud type for metering circuits.
5.10	Arrangement	Arrangement of the terminal block assemblies and the wiring channel within the enclosure shall be such that a row of terminal block runs in parallel and close proximity to each side of the wiring duct. The side of the terminal block opposite the wiring duct shall be reserved for the external cable connection.
5.11	Categorization	For ease of external connections, terminal blocks shall be categorized based on their usage i.e all terminals for wiring of particular equipment like circuit breaker should form one terminal block.

6.0 PAINT

6.1	Paint Type	Powder coated. Pure Polyester base grade-A, structure finish.
6.2	Paint Shade	RAL7032 'Siemens Grey'
6.3	Paint Thickness	Minimum 50 microns

7.0 MIMIC DIAGRAM

7.1	System Representation	Colored mimic diagram and symbols showing the exact representation of the system shall be provided in the front of control panels
7.2	Material	Mimic diagram shall be made preferably of painted aluminum or plastic (approved material), which shall be screwed on to the panel and can be easily cleaned. Painted overlaid mimic is also acceptable. The mimic bus shall be 2-3 mm thick. The width of the mimic bus shall be 12mm for bus bars and 10 mm for other connections.

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7.3	Mimic Indications	LED indications are to be used for breaker and isolator position and semaphore indicators shall be used for earth switch position.
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8.0 NAMEPLATES AND MARKINGS

8.1	Nameplates	To be provided as per the following description
8.1.1	Equipment Nameplates	a. All equipment mounted on front side as well as equipment mounted inside the panels shall be provided with individual name plates with equipment designation engraved. b. All front mounted equipment shall be also provided at the rear with individual name plates engraved with tag numbers corresponding to the one shown in the panel internal wiring to facilitate easy tracing of the wiring.
8.1.2	Feeder Nameplates	a. Large and bold name plate carrying the feeder identification numbers shall be provided for circuit / feeder designation on the top of each panel on front as well as rear side. b. Rear bottom of each panel shall have a nameplate clearly indicating the following: Customer Name – BSES, PO No. & date; Drawing Reference No., Year of Manufacture etc.
8.1.3	Material	Non-rusting metal or 3 ply lamicaid. Nameplates shall be black with white engraving lettering. Stickers are not allowed.
8.1.4	Fixing	All nameplates/rating plates shall be riveted to the panels at all four corners. Bolting/screwing is not acceptable.
8.2	Markings	Each switch shall bear clear inscription identifying its function. Similar inscription shall also be provided on each device whose function is not otherwise identified. If any switch or device does not bear this inscription separate nameplate giving its function shall be provided for it. Switch shall also have clear inscription for each position indicating e.g. Trip-Neutral close, ON-OFF etc.

9.0 EARTHING

9.1	Panel Earthing	All panels shall be equipped with an earth bus securely fixed.
9.2	Material	The material and the sizes of the bus bar shall be 25 x 6 mm copper flat unless specified otherwise.
9.3	Earth Bus joints	All bolted joints in the bus should be effected by connection of two bolts.

9.4	Hinged Doors	Earthed through flexible copper braid.
9.5	Instrument and Relay Earthing	All metallic cases of relays, instruments and other panel mounted equipment including gland plate, shall be connected to the earth bus by copper wires of size not less than 2.5 mm ² . The color code of earthing wires shall be green.
9.6	CT and PT circuit earthing	PT and CT secondary neutral shall be earthed at one place only at the terminal blocks through links.

10.0 INSTRUMENTS

10.0	Mounting	Flush mounted
10.1	Ammeter	Digital type with programmable ratio
10.1.1	Size	96x96 mm
10.1.2	Panels where to be provided	All panels
10.1.3	Ammeter selector switch	Required
10.1.4	Accuracy Class	1.0
10.1.5	Auxiliary Supply	48 – 240VDC and AC i.e universal type.
10.2	Voltmeter	Digital type with programmable ratio
10.2.1	Size	96x96 mm
10.2.2	Panels where to be provided	Incomer and Buscoupler
10.2.3	Voltmeter selector switch	Required
10.2.4	Accuracy Class	1.0
10.2.5	Auxiliary Supply	48 – 240VDC and AC i.e universal type.
10.3	Multifunction Meter	Digital type with programmable ratio
10.3.1	Model	Rish Delta Energy,
10.3.2	Make	Rishabh
10.3.3	SCADA Interfacing	RS485 rear port suitable for integration on Modbus Protocol
10.3.4	Size	96x96 mm

10.3.5	Panels where to be provided	All panels
10.3.6	Accuracy Class	1.0
10.3.7	Auxiliary Supply	48 – 240VDC and AC i.e universal type.
10.4	Energy meter provision	Energy meter is not in supplier's scope. Only space and CT/PT wiring is to be provided in all panels except bus coupler and bus PT.

11.0 RELAYS

11.1	General features of Protection Relays	
11.1.1	Technology and Functionality	Numerical, microprocessor based with provision for multifunction protection, control, metering and monitoring
11.1.2	Mounting	Flush Mounting, IP5X
11.1.3	Architecture	Hardware and software architecture shall be modular and dis-connectable to adapt the protection and control unit to the required level of complexity as per the application.
11.1.4	Programming and configuration	Relay shall utilize a user friendly setting and operating multi-lingual software in windows environment with menus and icons for fast access to the data required. Programming software and communication cord for offered relays should be included in scope of supply.
11.1.5	SCADA Interface port	RS485 rear port. If relays have any other rear port, hardware/software required to achieve the above said compatibility will be in supplier's scope.
11.1.6	Communication Protocol	Relays shall be compatible for interfacing with SCADA on both IEC61850 and IEC103 protocol. Communication protocol shall be selectable at site.
11.1.7	PC Interface port	Front port (preferably serial) for configuration/data download using PC.
11.1.8	User Interface	An alphanumeric key pad and graphical LCD display with backlight indicating measurement values and operating messages. It should be possible to access and change all settings and parameters without the use of PC.
11.1.9	Relay Characteristics	Relay shall integrate all necessary protections for different applications in accordance with IS and IEC. Relay shall provide wide setting ranges and choice of all IEC, IEEE and other tripping curves through a minimum of two setting groups.
11.1.10	Event and Fault records	Relay shall have the facility of recording of various parameters during event/fault with option to set the duration of record through settable pre fault and post fault time. Relay shall store records for last 10 events and 10 faults (minimum). It should be possible to download records locally

		to PC and to remote SCADA.
11.1.11	Measurement	Relays shall be capable of transmitting current, voltage, power and other measured parameters to SCADA.
11.1.12	Self diagnosis	Relay shall be able to detect internal failures. A watchdog relay with changeover contact shall provide information about the failure.
11.1.13	Time synchronization	All relays shall be capable of being synchronized with the system clock through SCADA and PC.
11.1.14	Operation Indicators	LEDs with push button for resetting.
11.1.15	Test Facility	Inbuilt
11.2	Protection Relay Requirement for Line CRP (66kV/33kV)	
11.2.1	Relay 1 (If Distance protection is considered as primary protection)	Distance Protection
		Sync check function
		PT supervision
		Power swing blocking
	Relay 1 (If Line differential protection is considered as primary protection)	Combined Line differential and distance protection
		Software based CT ratio correction
	Selection of Relay 1	Dedicated port for communication with remote end relay through optical fibre. This port should be in addition to PC interface and SCADA interface ports.
11.2.2	Relay 2	Selection of Relay-1 (primary protection) will depend on site requirements. Price bid shall mandatorily contain rate of Line panel - a. With Distance protection as primary protection b. With combined Line differential and distance protection as primary protection.
		3-phase Directional Overcurrent and Earthfault protection with IDMT, Definite time and instantaneous characteristics.
		Sync check function, if not provided in relay 1.
		PT supervision, if not provided in relay 1
11.2.3	User Configurable DIs and DOs	Circuit Breaker failure protection (CBFP)
		Relay-1 and Relay-2 should have a total of 32DIs and 16DOs exclusively for SCADA interfacing. Dis and Dos for tripping and interlocking shall be additional as per scheme requirement. However, Dis and Dos for tripping and interlocking may be integrated with Dis and Dos meant for SCADA to optimize DI/DO configuration of relays. In any case, atleast 2Dis and 2Dos should be spare in each relay

		for future use.
11.2.4	Note	Combining functions of Relay-1 and Relay-2 in single relay is not acceptable.
11.2.5	SLD	Refer annexure E1 and E5 for SLD of 66kV and 33kV line bays respectively
11.3	Protection Relay Requirement for Transformer CRP (66kV/33kV)	
11.3.1	Relay-1	Biased Differential Protection
		High Impedance REF protection
		Software based ratio and vector correction feature (without ICT)
		H2 and H5 harmonic restraint
11.3.2	Relay-2	3-phase Overcurrent and earthfault protection with IDMT, Definite time and instantaneous characteristics.
		Circuit breaker failure protection (CBFP)
11.3.3	User Configurable DIs and DOs	Relay-1 and Relay-2 should have a total of 32DIs and 16DOs exclusively for SCADA interfacing. Dis and Dos for tripping and interlocking shall be additional as per scheme requirement. However, Dis and Dos for tripping and interlocking may be integrated with Dis and Dos meant for SCADA to optimize DI/DO configuration of relays. In any case, atleast 2Dis and 2Dos should be spare in each relay for future use.
11.3.4	Note	Combining the functions of Relay-1 and Relay-2 in a single relay is not acceptable.
11.3.5	SLD	Refer annexure E2 and E6 for SLD of 66kV and 33kV transformer bays respectively
11.4	Protection Relay Requirement for Bus Coupler CRP (66kV/33kV)	
11.4.1	Relay-1	3-phase Overcurrent and earthfault protection with IDMT, Definite time and instantaneous characteristics.
		Sync check function
		Circuit breaker failure protection (CBFP)
		PT supervision (fuse failure monitoring) for Bus PT-1
11.4.2	Relay-2	PT supervision (fuse failure monitoring) for Bus PT-2 if not provided as part of relay-1
11.4.3	User Configurable DIs and DOs	Relay-1 should have a total of 32DIs and 16DOs exclusively for SCADA interfacing. Dis and Dos for tripping and interlocking shall be additional as per scheme requirement. However, Dis and Dos for tripping and interlocking may be integrated with Dis and Dos meant for SCADA to optimize DI/DO configuration of relays. In any case, atleast 2Dis and 2Dos should be spare in each relay for future use.

11.4.4	SLD	Refer annexure E3 and E7 for SLD of 66kV and 33kV bus coupler bays respectively
11.5	Protection Relay Requirement for Capacitor CRP (66kV/33kV)	
11.5.1	Relay-1	3-phase Overcurrent and earthfault protection with IDMT, DMT and instantaneous characteristic.
		Overvoltage and Undervoltage protection
		Circuit breaker failure protection (CBFP)
		Timer for ON time delay (600 seconds minimum)
11.5.2	Relay-2	Neutral unbalance relay (current based)
11.5.3	User Configurable DIs and DOs	Relay-1 and Relay-2 should have a total of 32DIs and 16DOs exclusively for SCADA interfacing. Dis and Dos for tripping and interlocking shall be additional as per scheme requirement. However, Dis and Dos for tripping and interlocking may be integrated with Dis and Dos meant for SCADA to optimize DI/DO configuration of relays. In any case, atleast 2Dis and 2Dos should be spare in each relay for future use.
11.5.4	Note	Combining the functions of Relay-1 and Relay-2 in a single relay is not acceptable
11.5.5	SLD	Refer annexure E4 and E8 for SLD of 66kV and 33kV capacitor bays respectively
11.6	SCADA Interfacing of Protection Relays	
11.6.1	Configuration and wiring of DIs of protection relays for routing status signals to SCADA	DI-1 – CB Open DI-2 – CB Close DI-3 – Earth switch 1 close DI-4 – Earth switch 2 close DI-5 – Line Isolator Open (For Bus Coupler Panel - Earth switch 3 close) DI-6 – Line Isolator Close (For Bus coupler panel - Earth switch 4 close) DI-7 – Bus 1 Isolator Open DI-8 – Bus 1 Isolator Close DI-9 – Bus 2 Isolator Open DI-10 – Bus 2 Isolator Close DI-11 – TC Unhealthy DI-12 – CB Spring Charged DI-13 – SF6 Low/ SF6 Lockout DI-14 – Local/Remote switch in Local DI-15 – CB Autotrip DI-16 – Protection/Trip relay faulty DI-17 – DC fail/DC MCB trip from adjacent panel (DC -1/2 fail for bus coupler panel) DI-18 – PT MCB trip (wherever relevant) Sequence of DIs should be strictly as mentioned above.

		Change in sequence of DIs will not be acceptable.
11.6.2	Configuration and wiring of DOs of protection relays for executing SCADA commands through SCADA interface port (refer clause 11.1.5).	DO-1 – CB Open DO-2 – CB Close DO-3 – Line Isolator Open DO-4 – Line Isolator Close DO-5 – Bus 1 Isolator Open DO-6 – Bus 1 Isolator Close DO-7 – Bus 2 Isolator Open DO-8 – Bus 2 Isolator Close Sequence of DOs should be strictly as mentioned above. Change in sequence of DOs will not be acceptable.
11.6.3	Looping	All relays should be looped to form a common bus for interfacing with SCADA.
11.7	Transformer Monitoring Cum AVR Relay	
11.7.1	Functions	As per annexure –B
11.7.2	Requirement	To be provided in Transformer CRP (Take off price to be mentioned in price bid)
11.8	General Features of Auxiliary Relays	
11.8.1	Type	Static or electromechanical.
11.8.2	Reset Characteristic	Self reset contacts except for lockout relays.
11.8.3	Operation Indicators	Hand reset operation indicators or LEDs with pushbutton for resetting.
11.8.4	Lockout relay	Manual reset type
11.8.5	Operational Data	Bidder shall provide the reference list of the type of relays offered
11.8.6	Spare Contacts	Minimum 1NO and 1NC
11.9	Auxiliary relays – Panel wise requirement	
11.9.1	Antipumping relay	To be provided in all panels
11.9.2	Lockout relay	
11.9.3	DC fail relay	
11.9.4	AC fail relay	
11.9.5	Trip circuit supervision relay	To be provided in all panels for supervision of two trip coils.
11.9.6	Bistable Relays	To be provided in all panels for multiplication of auxiliary contact of breakers, isolators and earth switches. Multiplied contacts to be used for interlocks, indications and numerical relay input. 2NO + 2NC contacts shall be spare after multiplication in each case.

11.9.7	PT selection relays	To be provided in all panels as per scheme requirement.
11.9.8	Transformer Trouble Relays	Auxiliary relays with indicating flags (contactors will not be accepted) should be provided in transformer panel for the following trip and alarm commands – <ul style="list-style-type: none">a. Buchholz tripb. OSR tripc. PRV tripd. SPR tripe. WTI Tripf. OTI Tripg. Buchholz Alarmh. Low oil level alarmi. OTI Alarmj. WTI Alarm.
11.9.9	SF6 low and SF6 lockout relay	To be provided in all 66kV control and relay panels
11.9.10	DC selection scheme	Fed by two DC incoming sources in Bus coupler panel with auto changeover facility
11.10	General Requirements for all relays/contactors	
11.10.1	Auxiliary supply	50 or 220VDC. All relays/contactors shall be suitable for continuous operation at 15% overvoltage.
11.10.2	Spare contacts	Shall be wired upto the terminal block

12.0 ANNUNCIATION

12.1	Type	Static type alongwith alarm. Annunciations shall be repetitive type and shall be capable of registering the fleeting signal. Fascia test facility should also be provided.
12.2	Mounting	Flush mounted
12.3	Fascia	16 window
12.4	Signals to provided on Fascia	Window 1 – Main Protection Operated (Distance /Differential) Window 2 – Backup O/C & E/F Protection Operated Window 3 – CBFP operated Window 4 – CB Autotrip Window 5 – SF6 Low/SF6 Lockout (For 66kV CRP only) Window 6 – Trip Circuit Unhealthy Window 7 – DC Fail Window 8 – AC Fail Window 9 – VT Fuse Fail Window 10 – Protection Relay/Trip relay Faulty Window 11 – Tarfo Trouble trip (For trafo panel only) Window 12 – Trafo Trouble alarm (For trafo panel only)

12.5	Push Buttons	For test, accept and reset
12.6	Potential Free Contacts	To be provided for event logger
12.7	Alarm	For all signals wired to the annunciator

Sequence of operation of the annunciator shall be as follows-

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

13.0 INDICATIONS

13.1	Indicating Lamps	Flush mounted Clustered LED type with rear terminal connections. Lamp Cover to be screwed type and moulded from heat resistant material
13.1.1	Breaker On	Red
13.1.2	Breaker Off	Green
13.1.3	Isolator Close	Red
13.1.4	Isolator Open	Green
13.1.5	Spring Charged	Blue
13.1.6	DC control supply healthy	Amber
13.1.7	Heater circuit healthy	Yellow
13.1.8	Trip circuit healthy	White
13.1.9	PT supply	R, Y, B
13.2	Semaphores	To be provided for all earth switches.

14.0 SELECTOR SWITCHES AND PUSH BUTTONS

14.1	Switches	Flush Mounted with shrouded terminals
14.1.1	TNC Switch	Pistol Grip type with spring return to normal position

14.1.2	Local/SCADA selector switch	2 pole
14.1.3	Rotary On/Off Switches	For heater/illumination circuit
14.1.4	Rating of switches	16 A
14.2	Push buttons	Flush Mounted with shrouded terminals
14.2.1	Accept Push Button	Black Color- Trip alarm/DC fail alarm
14.2.2	Reset Push Button	Yellow Color- Trip alarm/DC fail alarm
14.2.3	Test Push Button	Blue Color
14.2.4	Rating	10A

15.0 ACCESSORIES

15.1	Space heaters	Thermostat controlled with switch for isolation
15.2	Socket and switch	240V, 5/15A universal type socket to be provided in each panel with on-off switch
15.3	MCBs and Fuses	Provision for receiving, distribution, isolation and fusing of DC and AC supplies to various control circuits should be made using MCBs and Fuses of appropriate ratings.
15.4	Panel illumination	240V AC illumination lamp controlled by panel door switch to be provided in each panel

16.0 APPROVED MAKES OF COMPONENTS

16.1	Numerical Relays	R series of ABB, Siprotec series of Siemens, Micom series of Schneider/Alstom. All numerical relays in a panel should be of same make. Use of two different makes of relays in a panel is not acceptable.
16.2	Transformer Monitoring Cum AVR relay	Easun MR/ A-Eberle
16.3	Auxiliary Relays & Contact Multiplication Relays	Alstom/Schneider/ABB/Siemens/ER
16.4	Miniature Relays	ABB/Jyoti / OMRAN
16.5	Contactors	ABB/Siemens/Schneider
16.6	MCBs	Siemens/Schneider/Legrand/ABB

16.7	Control switches	Switron/Kaycee
16.8	Annunciator	Minilec/Alan
16.9	Test terminal block	IMP/DAV
16.10	Terminal blocks	Elmex/Connectwell
16.11	Indicating lamps	Siemens/ Teknic/ Binay
16.12	Meters	Rishabh/Conzerv

17.0 INSPECTION AND TESTING

17.1	Type tests	Product must be type tested as per Indian Standards or IEC
17.1.1	Type test report validity	Last five years from the date of bid submission
17.2	Acceptance and Routine tests	As per specifications and relevant standards. Charges of these tests shall be deemed to be included in the equipment price. Purchaser reserves the right to witness all the tests.
17.3	Notice to Purchaser for conducting tests	Atleast three weeks in advance
17.4	Test reports of acceptance and routine test before dispatch	Six copies to be submitted.

18.0 DRAWINGS AND DATA SUBMISSION

18.1	Submissions along with the bid	
18.1.1	Duly filled GTP and copy of specification	2 copies + 1 soft copy
18.1.2	GA drawing and Cross sectional drawings	2 copies + 1 soft copy
18.1.3	Panel wise Bill of Material	2 copies + 1 soft copy
18.1.4	Catalogues and Manuals for all major equipments	1 copy
18.1.5	Type test report for type, size and rating of equipment offered.	2 copies + 1 soft copy

18.1.6	Deviations from this specification	To be provided in writing. In absence of deviation sheet it will be assumed that bidder complies completely with this specification.
18.1.7	Reference List of customers	For last five years with units of similar design and rating
18.1.8	Recommended spares and consumables	For five years of operation alongwith price list
18.1.9	Manufacturer's quality assurance plan	To be provided
18.2	Submissions after award of contract	
18.2.1	Duly filled GTP	1 copy + soft copy
18.2.2	Panel wise Bill of Material	1 copy + soft copy
18.2.3	GA and Cross sectional drawings	1 copy + soft copy
18.2.4	Single line diagrams	1 copy + soft copy
18.2.5	Schematic drawings	1 copy + soft copy
18.2.6	Calculations for sizing of various equipment	1 copy + soft copy
18.2.7	Catalogues and Manuals for all equipments	1 copy + soft copy
18.2.8	Foundation Plan	1 copy + soft copy
18.2.9	Calculations for sizing of various components	1 copy + soft copy
18.2.10	Type test report for type, size and rating of equipment offered.	1 copy + soft copy
18.1.11	Manufacturer's quality assurance plan	1 copy + soft copy
18.2.12	Deviations from this specification	Approved in writing before award of contract.
18.3	Submissions prior to dispatch	
18.3.1	Inspection and test reports/ compliance report by manufacturer	1 copy + 1 soft copy
18.3.2	Test certificates for all bought out items	1 copy + 1 soft copy
18.3.3	GTP and As Built drawings consisting of GA, Cross sectional, SLD and schematic drawings	3 copies + 1 soft copy
18.3.4	Catalogues and Manuals for all equipments	3 copies + 1 soft copy

18.4	Drawing and document sizes	Standard size paper A3 and A4
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ANNEXURE – A – SCOPE OF SUPPLY

Scope of supply includes the following -

- 1.1 Design, manufacture, assembly, testing at manufacturer's works, properly packed for transport, supply and FOR delivery at site of 66kV / 33kV Control and Relay panels as per specification.
- 1.2 Licensed programming software and communication cord for offered numerical relays.
- 1.3 Refer clause 11.2.1 of specification. Primary protection of 66kV/33kV Line CRP will be finalized based on site requirement. Hence, unit rate of 66kV/33kV Line CRP should be mentioned in the price bid for the following configurations–
 - a. Considering Relay-1 as distance protection.
 - b. Considering Relay-1 as Combined line differential and distance protection.
- 1.4 One set of special tools and tackles (if any) required for maintenance of CRP and its components.
- 1.5 Spares as per Annexure D.
- 1.6 All relevant drawings, data and instruction manuals.

ANNEXURE – B – TRANSFORMER MONITORING CUM AVR RELAY

1	General features	
1.1	Technology and Functionality	Microprocessor based with provision for multifunction control and monitoring.
1.2	Mounting	Flush Mounting
1.3	Architecture	Hardware and software architecture shall be modular and disconnectable to adapt the control unit to the required level of complexity as per the application.
1.4	Programming and configuration	AVR shall utilize a user friendly setting and operating multi-lingual software in windows environment with menus and icons for fast access to the data required.
1.5	User Machine Interface	UMI with an alphanumeric key pad and graphical LCD display with backlight indicating measurement values and operating messages. Capability to access and change all settings and parameters.
1.6	PC Interface port	Front port (preferably serial) for configuration using PC. Cost of licensed software and communication cord, required for programming of offered protection relays using PC, shall be mentioned separately in the bid.

1.7	SCADA Interface port	RS485 rear port. If relays have any other rear port, hardware/software required to achieve the above said compatibility will be in supplier's scope.
1.8	Communication protocol	Relays shall be compatible for interfacing with SCADA on both IEC61850 and IEC103 protocol. Communication protocol shall be selectable at site.
1.8	Self diagnosis	Shall be able to detect internal failures. A watchdog relay with changeover contact shall provide information about the failure.
1.9	Auxiliary supply	220VDC or 48VDC
2	Inputs and Outputs	
2.1	CT Input	1/5A selectable through programming
2.2	PT Input	110VAC
2.3	Binary Inputs	Sixteen programmable binary inputs should be provided
2.4	Analog Inputs (4-20mA)	One input to be provided
2.5	PT-100 direct input	Two inputs to be provided
2.6	Direct Resistance Input	For tap position indication (18 steps)
2.7	Binary Outputs	Ten programmable binary outputs should be provided
3	Control	
3.1	Control Tasks	Ability to implement control functions through programmable logics
3.2	Voltage setting	Programmable Voltage set point
3.3	Voltage Regulation	Raise/Lower tap position to maintain the preset value of voltage.
3.4	Voltage Regulation modes	Automatic and Manual
3.5	Operation Modes	Local and Remote
3.6	Fan and Pump control	To be provided
3.7	Transformer Paralleling	Capability to parallel transformers whose AVR's are interconnected via a communication network.
4	SCADA Interfacing	

4.1	Configuration of DIs for routing alarm/trip signals to SCADA.	DI-1 – Buchholz trip DI-2 – OSR Trip DI-3 – PRV trip DI-4 – SPR trip DI-5 – OTI trip DI-6 – WTI trip DI-7 – Buchholz alarm DI-8 – Oil Level low larm (MOG alarm) DI-9 – WTI alarm DI-10 – OTI alarm DI-11 – Tap changer trouble/stuck/out of step DI-12 – Tap changer motor supply fail DI-13 – Tap changer in local control All signals from DI-1 to DI-10 are to be wired up from transformer trouble auxiliary relays.
4.2	Configuration of DOs for executing commands from SCADA through interface port/CRP	DO-1 – Tap raise DO-2 – Tap lower DO-3 – Fan group 1 control DO-4 – Fan group 2 control
4.3	Spare DIs and DOs	To be wired upto the terminal block.
5	Measurement, Event Recording and Monitoring	
5.1	Measured Quantities (optional)	Voltage, Current, Active Power, Reactive Power, Apparent Power, Power factor, frequency
5.2	Event Recording	Facility for recording parameters during various events such as tap change, change in binary input status etc.
5.3	Monitoring	Capability to monitor important transformer parameters such as Oil temperature, Winding Temperature etc and give indication/alarm when the value of a particular parameter exceeds the preset value.

ANNEXURE- C – GUARANTEED TECHNICAL PARTICULARS

	Parameter	Technical Particulars
1	CONTROL PANEL	
1.1	Make	
1.2	Type	
1.3	Reference Standard	
1.4	Construction	
1.4.1	Degree of protection	

	Parameter	Technical Particulars
1.4.2	Sheet metal thickness mm	
1.4.3	Floor channel sills, vibration damping pads and kick plate furnished ?	
1.5	Painting	
1.5.1	Type of finish	
1.5.2	Colour Shade – Inside/Outside	
1.5.3	Details of painting procedure	
2	BREAKER CONTROL SWITCH	
2.1	Make	
2.2	Type	
2.3	Reference Standard	
2.4	Contact Rating	
2.4.1	Make & Continuous (A)	
2.4.2	Break (inductive) (A)	
3	ISOLATOR CONTROL SWITCH	
3.1	Make	
3.2	Type	
3.3	Reference Standard	
3.4	Contact Rating	
3.4.1	Make & Continuous (A)	
3.4.2	Break (inductive) (A)	
4	PUSH BUTTON	
4.1	Make	
4.2	Type	
4.3	Reference Standard	
4.4	Contact Rating	
4.4.1	Make & Continuous (A)	
4.4.2	Break (inductive) (A)	
4.5	Nos. & type of Contacts provided per button	
5	LAMPS	
5.1	Make	
5.2	Type	
5.3	Reference Standard	
5.4	Rating	
5.4.1	Volt	
5.4.2	Watt	
5.4.3	Series Resistance	
5.5	10% Extra lamps furnished?	
5.6	Size of lens	

	Parameter	Technical Particulars
6	SEMAPHORE INDICATORS	
6.1	Make	
6.2	Type	
6.3	Diameter of the Disc	
6.4	Operating voltage	
6.5	Burden (Watt DC)	
6.6	Whether latch in type or supply Failure type	
7	AMMETER	
7.1	Make	
7.2	Type/Model	
7.3	Reference Standard	
7.4	Accuracy Class	
7.5	VA Burden	
8	VOLTMETER	
8.1	Make	
8.2	Type/Model	
8.3	Reference Standard	
8.4	Accuracy Class	
8.5	VA Burden	
9	ANNUNCIATOR	
9.1	Make	
9.2	Type	
9.3	Reference Standard	
9.4	No. of Annunciator groups	
9.5	No. of Windows per group	
9.6	Overall Dimension of a group (mm)	
10	PROTECTION RELAYS	
10.1	Reference Standard	
10.2	Communication Protocol	
10.3	Programming software offered	
10.4	Line Panel	
10.4.1	Distance Relay/ Line Differential Relay	
a	Make	
b	Model	
c	Protection functions offered	
d	Measurement functions offered	
e	Control functions offered, if any	
f	Front communication port	

	Parameter	Technical Particulars
g	Rear communication port	
h	No. of DIs and DOs	
10.4.2	Directional O/C & E/F Relay	
a	Make	
b	Model	
c	Protection functions offered	
d	Measurement functions offered	
e	Control functions offered, if any	
f	Front communication port	
g	Rear communication port	
h	No. of DIs and DOs	
10.5	Transformer Panel	
10.5.1	Differential Relay	
a	Make	
b	Model	
c	Protection functions offered	
d	Measurement functions offered	
e	Control functions offered, if any	
f	Front communication port	
g	Rear communication port	
h	No. of DIs and DOs	
10.5.2	Backup O/C & E/F	
a	Make	
b	Model	
c	Protection functions offered	
d	Measurement functions offered	
e	Control functions offered, if any	
f	Front communication port	
g	Rear communication port	
h	No. of DIs and DOs	
10.6	Bus coupler Panel	
10.6.1	O/C & E/F Relay	
a	Make	
b	Model	
c	Protection functions offered	
d	Measurement functions offered	
e	Control functions offered, if any	
f	Front communication port	

	Parameter	Technical Particulars
g	Rear communication port	
h	No. of DIs and DOs	
11	AUXILIARY RELAYS	
11.1	Lockout relay	
a	Make	
b	Model	
11.2	Contact Multiplication relays	
a	Make	
b	Model	
11.3	Transformer trouble relays	
a	Make	
b	Model	
11.4	DC fail relay	
a	Make	
b	Model	
11.5	AC fail relay	
a	Make	
b	Model	
11.6	TC supervision relay	
a	Make	
b	Model	
12	PANEL NAMEPLATE	
12.1	Material	
12.2	Thickness	
12.3	Size for equipment	
12.4	Size for panel	
13	MIMIC	
13.1	Material	
13.2	Width	
14	INTERNAL ILLUMINATION	
14.1	Volt	
14.2	Watt	
14.3	Door switch controlled (yes/no)	
14.4	Provided with individual switch fuse unit (yes/no)	
15	SPACE HEATER	
15.1	Volt	
15.2	Watt	
15.3	Thermostat range	

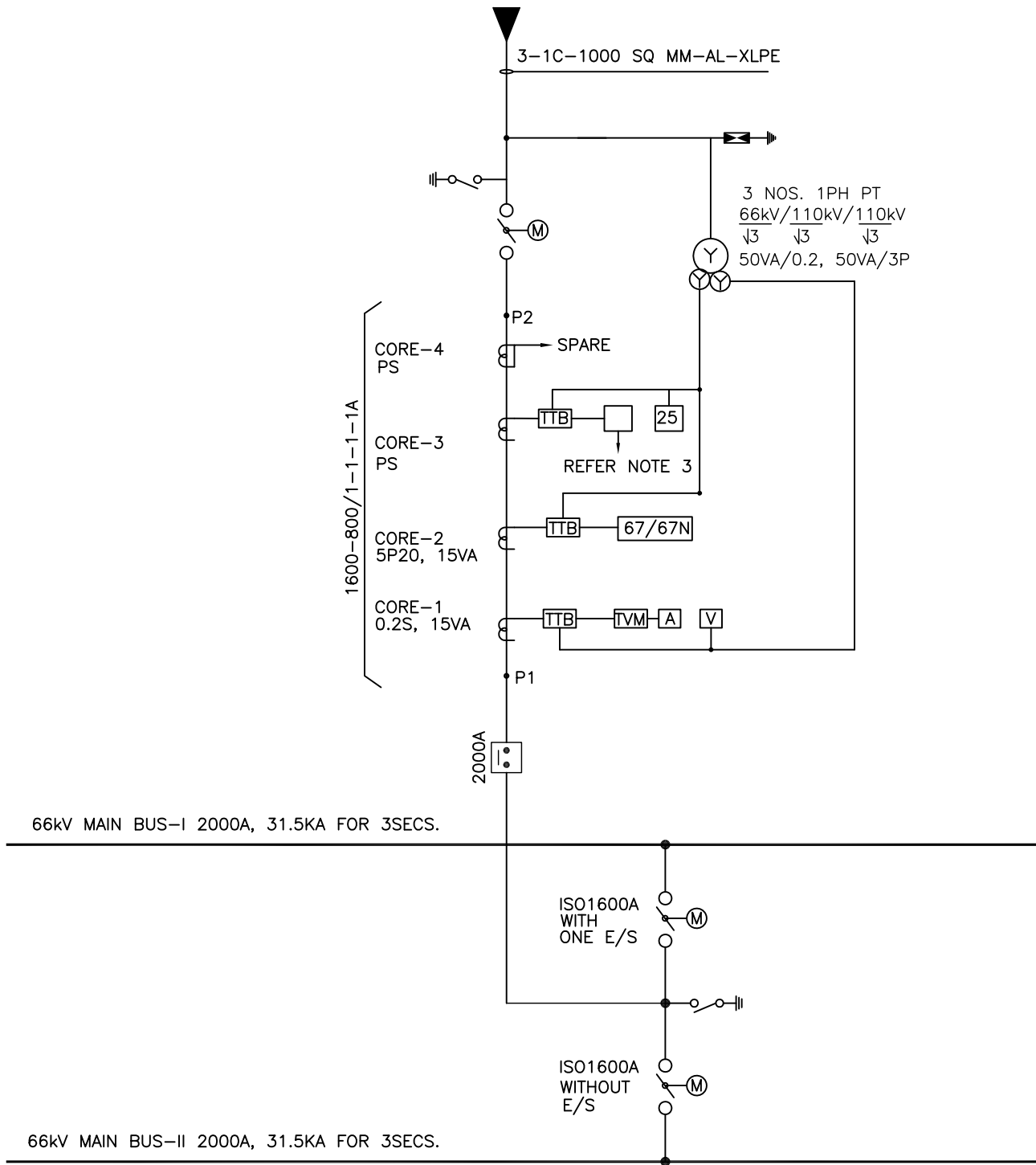
	Parameter	Technical Particulars
15.4	Provided with individual switch fuse unit (yes/no)	
16	SOCKET	
16.1	Universal type	
16.2	Rating	
16.3	Provided with individual switch fuse unit (yes/no)	
17	MCB TYPE & RATING	
17.1	Incoming A.C. supply	
17.2	Incoming D.C. supply	
17.3	PT circuits	
18	INTERNAL WIRING	
18.1	Wire type	
18.2	Voltage grade	
18.3	Conductor material	
18.4	Conductor size for current circuit	
18.5	Conductor size for voltage circuit	
18.6	Conductor size for control circuit	
18.7	Wires identified at both ends with ferrules	
19	TERMINAL BLOCK	
19.1	Make	
19.2	TBs for CT/PT circuits	
19.2.1	Type	
19.2.2	Size	
19.2.3	Rating	
19.3	TBs for other circuits	
19.3.1	Type	
19.3.2	Size	
19.3.3	Rating	
19.4	20% spare terminals furnished ?	:
20	GROUND BUS	
20.1	Material	
20.2	Size (mm)	

ANNEXURE- D – SPARES REQUIREMENT

S No.	Description	Unit Rate
1	Numerical relay of each type	1 nos.
2	Auxiliary relay of each type	1 nos.
3	Contact multiplication relays (Bistable type for CB, isolator	6 nos.

	and earth switch auxiliary contact multiplication)	
4	Contactor of each rating	2 nos.
5	Ammeter	1 nos.
6	Voltmeter	1 nos.
7	Local/Remote Selector switch	1 nos.
8	TNC switch for CB	2 nos.
9	TNC switch for Isolators	3 nos.
10	Semaphore indicators	4 nos.
11	MCB of each rating	1 nos.

ANNEXURE-E1



LEGEND

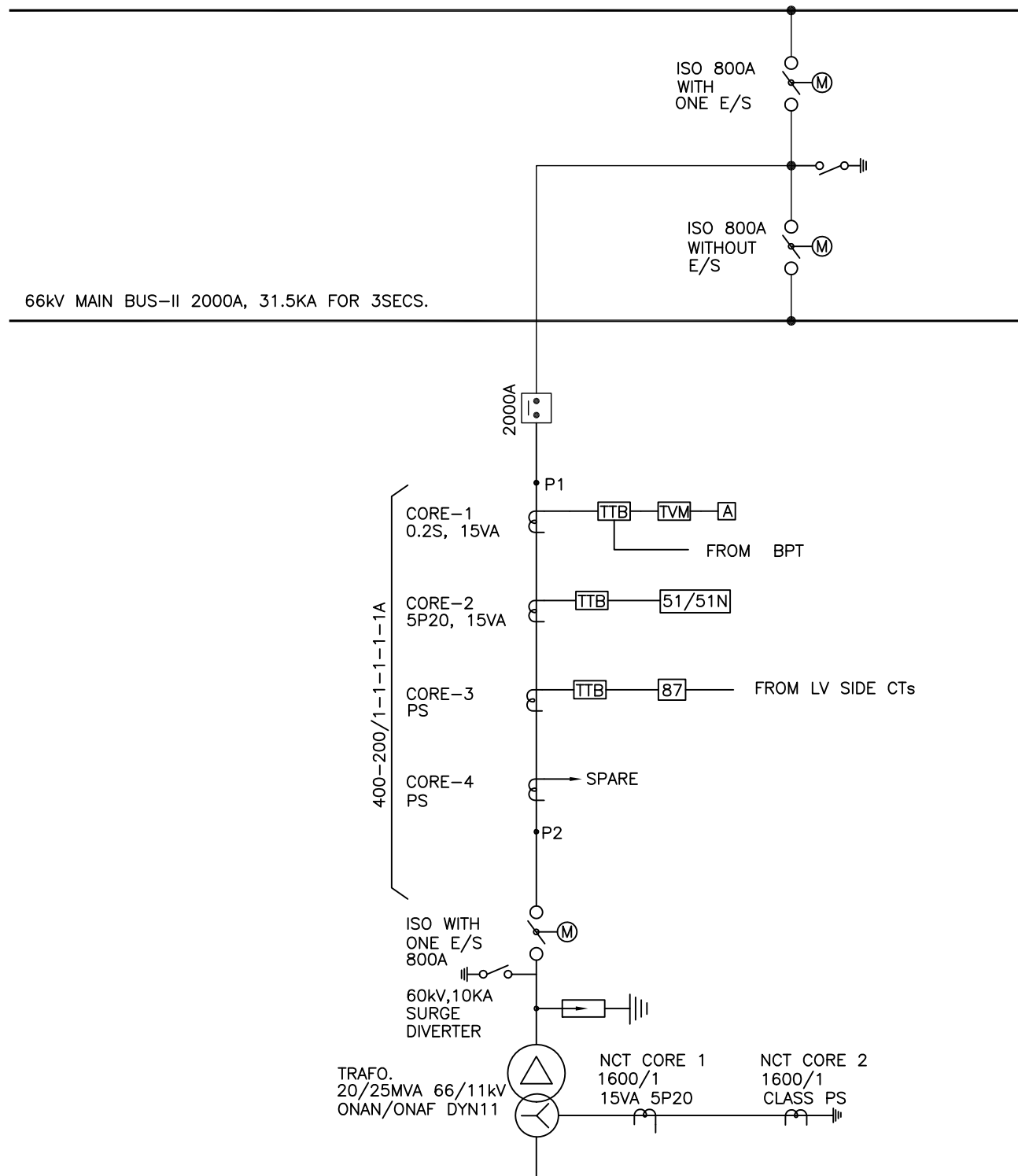
SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	MOTORISED ISOLATOR WITH ONE E/S		TEST TERMINAL BLOCK
	MOTORISED ISOLATOR WITH DOUBLE E/S		O/C & E/F RELAY
	SURGE DIVERTER		DISTANCE RELAY
	CURRENT TRANSFORMER		U/V & O/V RELAY
	POTENTIAL TRANSFORMER		DIRECTIONAL O/C & E/F RELAY
	CIRCUIT BREAKER		DIFFERENTIAL RELAY
	VOLTMETER		NEUTRAL UNBALANCE RELAY
	AMMETER		SYNC CHECK
	TRIVECTOR METER		

- NOTE; 1. REFER SPECIFICATION CLAUSE 11.0 FOR FUNCTIONAL DETAILS OF PROTECTION RELAYS.
2. TVM IS NOT IN SUPPLIER'S SCOPE.
3. LINE DIFFERENTIAL OR DISTANCE RELAY AS PER CLAUSE 11.2.1 OF SPECIFICATION


















DRAWN	RAJESH	TITLE:-	TYPICAL 66KV LINE SLD	BSES
CHECKED	GS			
APPD.	DS			
DATE	29.07.16			
SCALE	NTS			SPECIFICATION NO. SP-CRP-01-R3
				DWG No.:- SLD-CRP-66KV-01

ANNEXURE-E2


66kV MAIN BUS-I 2000A, 31.5KA FOR 3SECS.



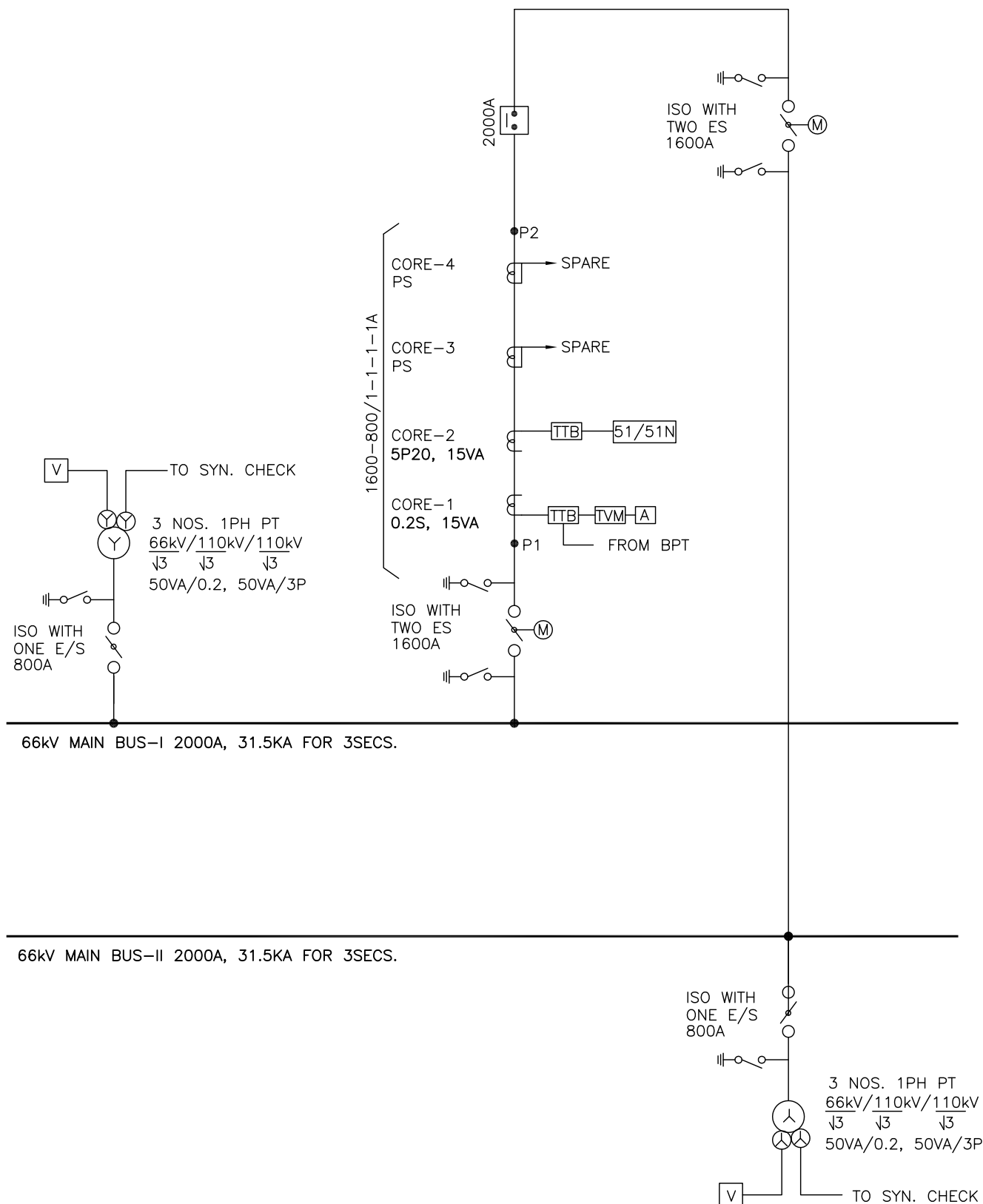
LEGEND

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	MOTORISED ISOLATOR WITH ONE E/S		TEST TERMINAL BLOCK
	MOTORISED ISOLATOR WITH DOUBLE E/S		O/C & E/F RELAY
	SURGE DIVERTER		DISTANCE RELAY
	CURRENT TRANSFORMER		U/V & O/V RELAY
	POTENTIAL TRANSFORMER		DIRECTIONAL O/C & E/F RELAY
	CIRCUIT BREAKER		DIFFERENTIAL RELAY
	VOLTMETER		NEUTRAL UNBALANCE RELAY
	AMMETER		SYNC CHECK
	TRIVECTOR METER		










NOTE; 1. REFER SPECIFICATION CLAUSE 11.0 FOR
FUNCTIONAL DETAILS OF PROTECTION RELAYS.
2. TVM IS NOT IN SUPPLIER'S SCOPE.

DRAWN	RAJESH	TITLE:-- TYPICAL 66/11KV TRANSFORMER FEEDER SLD	 SPECIFICATION NO. SP-CRP-01-R3 DWG No.:-- SLD-CRP-66KV-02
CHECKED	GS		
APPD.	DS		
DATE	29.07.16		
SCALE	NTS		


ANNEXURE-E3



LEGEND

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	MOTORISED ISOLATOR WITH ONE E/S		MOTORISED ISOLATOR WITH DOUBLE E/S
	SURGE DIVERTER		CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER		CIRCUIT BREAKER
	VOLTMETER		AMMETER
	TRIVECTOR METER		

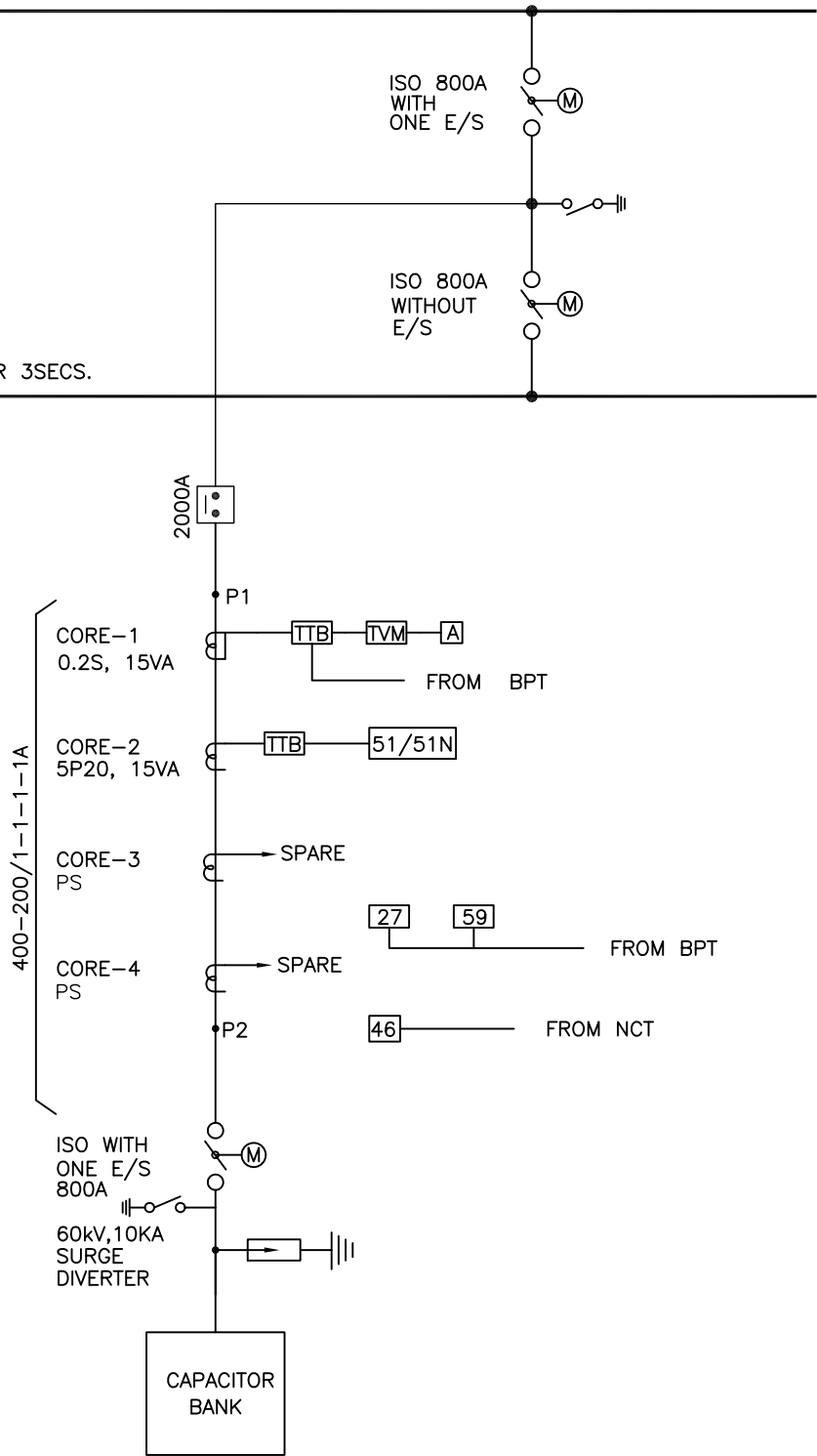
NOTE; 1. REFER SPECIFICATION CLAUSE 11.0 FOR
FUNCTIONAL DETAILS OF PROTECTION RELAYS.
2. TVM IS NOT IN SUPPLIER'S SCOPE.

DRAWN	RAJESH	TITLE:- TYPICAL 66KV BUSCOUPLER SLD	
CHECKED	GS		
APPD.	DS		
DATE	29.07.16		
SCALE	NTS		
			SPECIFICATION NO. SP-CRP-01-R3
			DWG No.:- SLD-CRP-66KV-03

ANNEXURE-E4

66kV MAIN BUS-I 2000A, 31.5KA FOR 3SECS.

66kV MAIN BUS-II 2000A, 31.5KA FOR 3SECS.



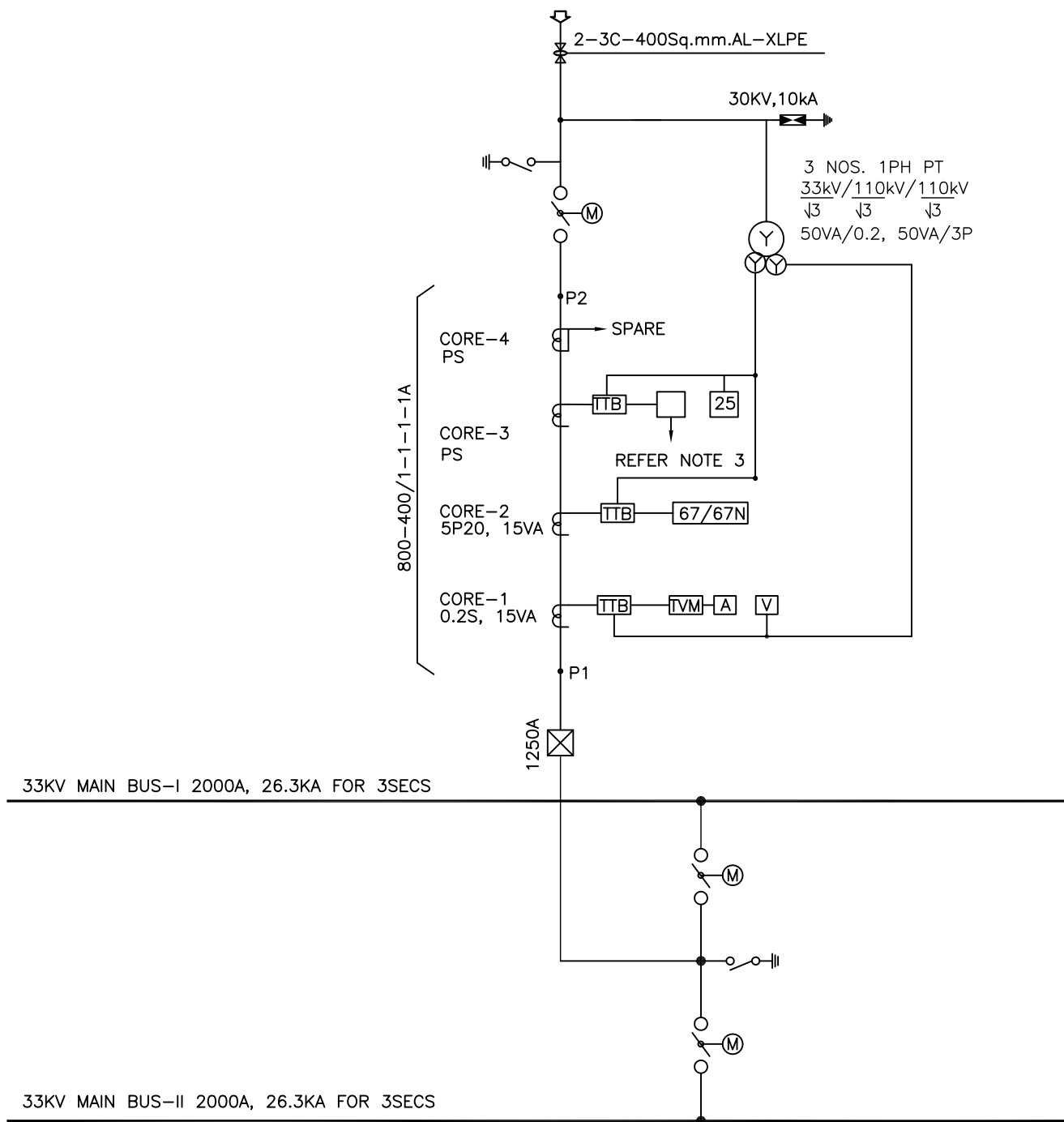
LEGEND

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	MOTORISED ISOLATOR WITH ONE E/S		TEST TERMINAL BLOCK
	MOTORISED ISOLATOR WITH DOUBLE E/S		O/C & E/F RELAY
	SURGE DIVERTER		DISTANCE RELAY
	CURRENT TRANSFORMER		U/V & O/V RELAY
	POTENTIAL TRANSFORMER		DIRECTIONAL O/C & E/F RELAY
	CIRCUIT BREAKER		DIFFERENTIAL RELAY
	VOLTMETER		NEUTRAL UNBALANCE RELAY
	AMMETER		SYNC CHECK
	TRIVECTOR METER		


















NOTE; 1. REFER SPECIFICATION CLAUSE 11.0 FOR FUNCTIONAL DETAILS OF PROTECTION RELAYS.
2. TVM IS NOT IN SUPPLIER'S SCOPE.

DRAWN	RAJESH	TITLE:-	
CHECKED	GS	TYPICAL 66KV	
APPD.	DS	CAPACITOR BANK FEEDER	
DATE	29.07.16	SLD	
SCALE	NTS		
			SPECIFICATION NO. SP-CRP-01-R3
			DWG No.: SLD-CRP-66KV-04


ANNEXURE-E5



LEGEND

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	MOTORISED ISOLATOR WITH ONE E/S		TEST TERMINAL BLOCK
	MOTORISED ISOLATOR WITH DOUBLE E/S		O/C & E/F RELAY
	SURGE DIVERTER		DISTANCE RELAY
	CURRENT TRANSFORMER		U/V & O/V RELAY
	POTENTIAL TRANSFORMER		DIRECTIONAL O/C & E/F RELAY
	CIRCUIT BREAKER		DIFFERENTIAL RELAY
	VOLTMETER		NEUTRAL UNBALANCE RELAY
	AMMETER		SYNC CHECK
	TRIVECTOR METER		

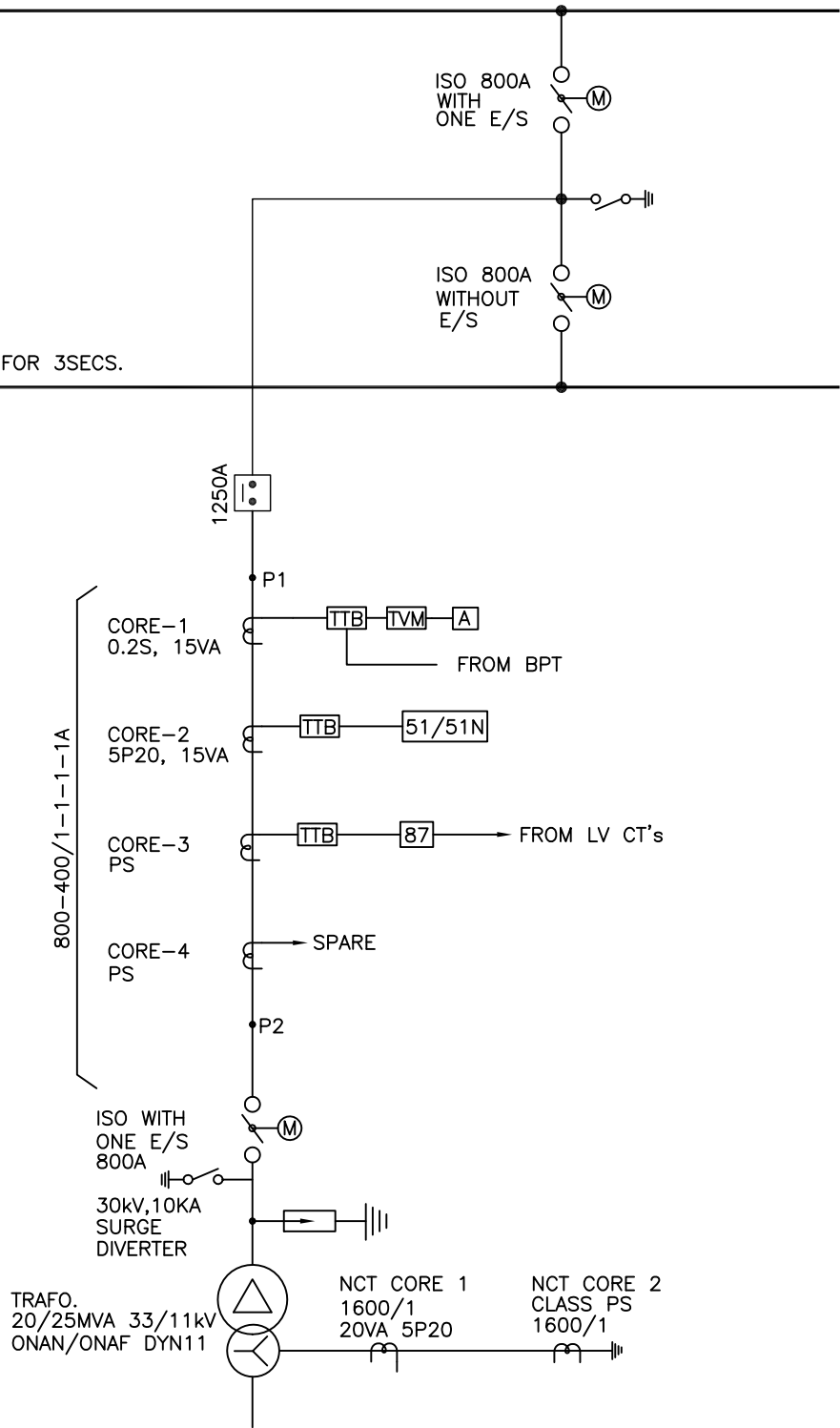
NOTE; 1. REFER SPECIFICATION CLAUSE 11.0 FOR FUNCTIONAL DETAILS OF PROTECTION RELAYS.
2. TVM IS NOT IN SUPPLIER'S SCOPE.
3. LINE DIFFERENTIAL OR DISTANCE RELAY AS PER CLAUSE 11.2.1 OF SPECIFICATION.

DRAWN	RAJESH	TITLE:-- TYPICAL SLD FOR 33KV INCOMER/OUTGOING	
CHECKED	DS		
APPD.	DS		
DATE	29.07.16		
SCALE	NTS		
			SPECIFICATION NO. SP-CRP-01-R3
			DWG No.:--SLD-CRP-33KV-01

ANNEXURE-E6

33kV MAIN BUS-I 2000A, 26.3KA FOR 3SECS.

33kV MAIN BUS-II 2000A, 26.3KA FOR 3SECS.



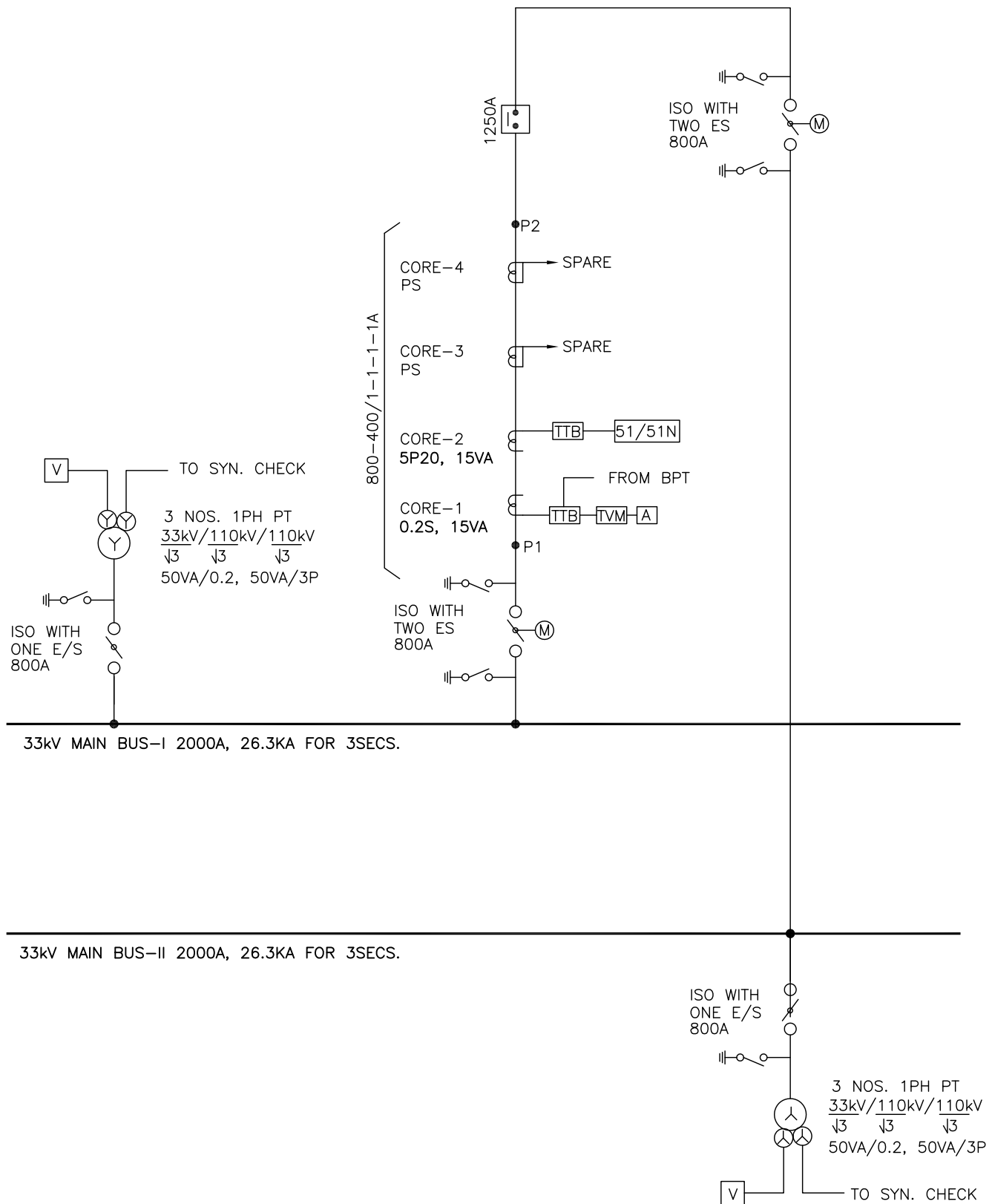
LEGEND

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	MOTORISED ISOLATOR WITH ONE E/S		TEST TERMINAL BLOCK
	MOTORISED ISOLATOR WITH DOUBLE E/S		O/C & E/F RELAY
	SURGE DIVERTER		DISTANCE RELAY
	CURRENT TRANSFORMER		U/V & O/V RELAY
	POTENTIAL TRANSFORMER		DIRECTIONAL O/C & E/F RELAY
	CIRCUIT BREAKER		DIFFERENTIAL RELAY
	VOLTMETER		NEUTRAL UNBALANCE RELAY
	AMMETER		SYNC CHECK
	TRIVECTOR METER		

NOTE; 1. REFER SPECIFICATION CLAUSE 11.0 FOR FUNCTIONAL DETAILS OF PROTECTION RELAYS.
2. TVM IS NOT IN SUPPLIER'S SCOPE.

DRAWN	RAJESH	TITLE:-	
CHECKED	GS	TYPICAL 33/11KV TRANSFORMER FEEDER SLD	
APPD.	DS		
DATE	29.07.16		
SCALE	NTS		SPECIFICATION NO. SP-CRP-01-R3
			DWG No.: -SLD-CRP-33KV-02

ANNEXURE-E7



LEGEND

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	MOTORISED ISOLATOR WITH ONE E/S		TEST TERMINAL BLOCK
	MOTORISED ISOLATOR WITH DOUBLE E/S		O/C & E/F RELAY
	SURGE DIVERTER		DISTANCE RELAY
	CURRENT TRANSFORMER		U/V & O/V RELAY
	POTENTIAL TRANSFORMER		DIRECTIONAL O/C & E/F RELAY
	CIRCUIT BREAKER		DIFFERENTIAL RELAY
	VOLTMETER		NEUTRAL UNBALANCE RELAY
	AMMETER		SYNC CHECK
	TRIVECTOR METER		

NOTE; 1. REFER SPECIFICATION CLAUSE 11.0 FOR FUNCTIONAL DETAILS OF PROTECTION RELAYS.
2. TVM IS NOT IN SUPPLIER'S SCOPE.

DRAWN	RAJESH
CHECKED	GS
APPD.	DS
DATE	29.07.16
SCALE	NTS

TITLE:-
TYPICAL 33KV
BUSCOUPLER SLD

BSES

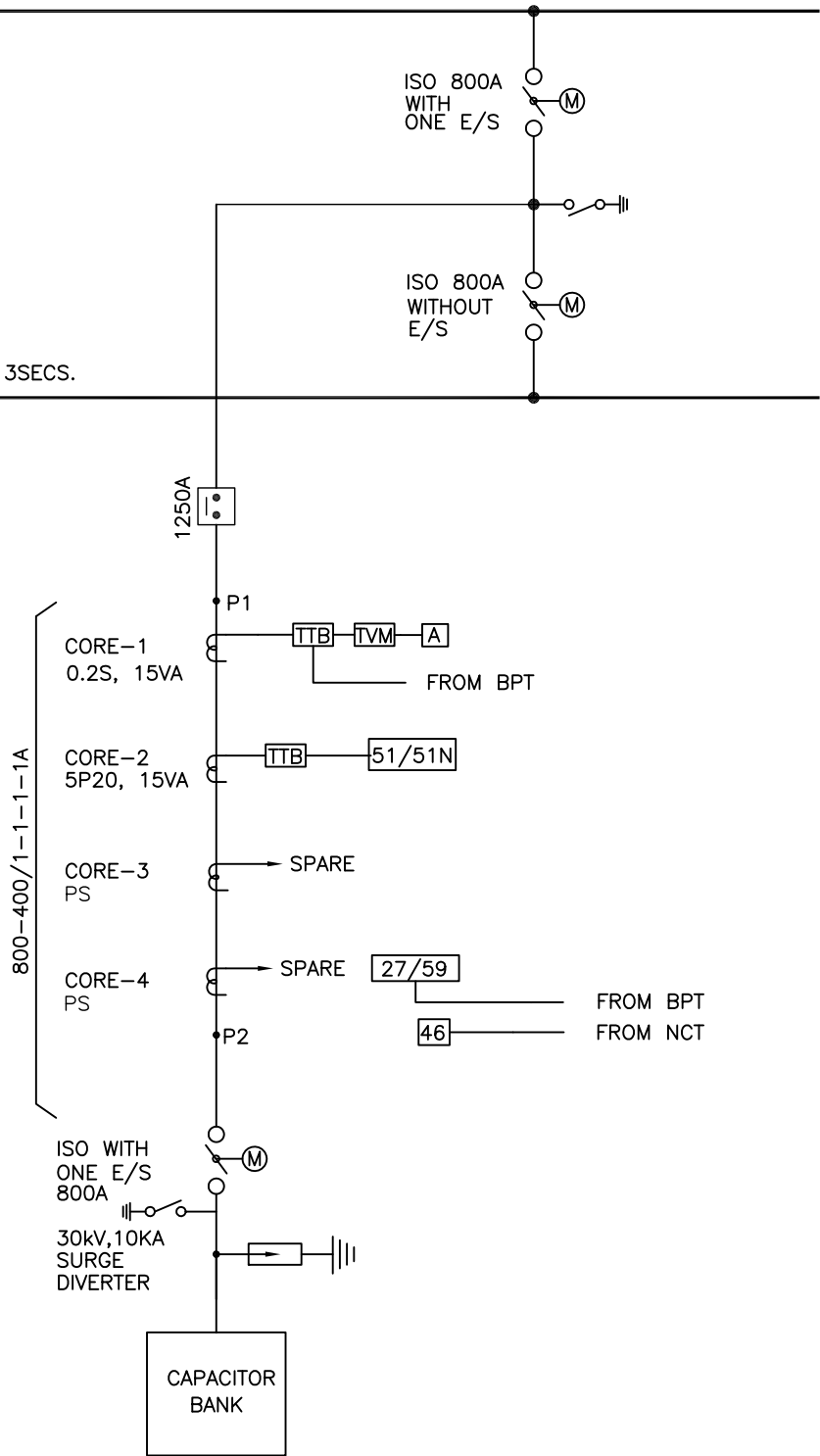
SPECIFICATION NO. SP-CRP-01-R3

DWG No.: SLD-CRP-33KV-03

ANNEXURE-E8

33kV MAIN BUS-I 2000A, 26.3KA FOR 3SECS.

33kV MAIN BUS-II 2000A, 26.3KA FOR 3SECS.



LEGEND

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	MOTORISED ISOLATOR WITH ONE E/S		TEST TERMINAL BLOCK
	MOTORISED ISOLATOR WITH DOUBLE E/S		O/C & E/F RELAY
	SURGE DIVERTER		DISTANCE RELAY
	CURRENT TRANSFORMER		U/V & O/V RELAY
	POTENTIAL TRANSFORMER		DIRECTIONAL O/C & E/F RELAY
	CIRCUIT BREAKER		DIFFERENTIAL RELAY
	VOLTMETER		NEUTRAL UNBALANCE RELAY
	AMMETER		SYNC CHECK
	TRIVECTOR METER		

NOTE; 1. REFER SPECIFICATION CLAUSE 11.0 FOR FUNCTIONAL DETAILS OF PROTECTION RELAYS.
2. TVM IS NOT IN SUPPLIER'S SCOPE.

DRAWN	RAJESH	TITLE:-	
CHECKED	GS	TYPICAL 33/11KV	
APPD.	DS	CAPACITOR BANK FEEDER	
DATE	29.07.16	SLD	
SCALE	NTS		SPECIFICATION NO. SP-CRP-01-R3
			DWG No.: SLD-CRP-33KV-04