BSES RAJDHANI POWER LTD (BRPL)

Notice Inviting Tender (NIT)

for

INSTALLATION, TESTING AND COMMISSIONING OF 33 KV AIS (INCLUDING 7 NOS. 33/0.433KV PSS) WITH SUPPLY OF MISCELLANEOUS MATERIALS AT KUSHAK NALLAH DEPOT, BRPL, NEW DELHI.

NIT NO CMC/BR/22-23/RB/CR/AG/1050 DT 06.08.2022

Due Date for Submission of Tender: 29.08.2022, 15:00 HRS

Date and Time of opening: 29.08.2022, 15:45 HRS

BSES RAJDHANI POWER LTD (BRPL)
BSES Bhawan, Nehru Place, New Delhi-110019
Corporate Identification Number: U40109DL2001PLC111527
Telephone Number: +91 011-4910 7235,
Website : www.bsesdelhi.com

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SECTION – I: REQUEST FOR QUOTATION

1. GENERAL

BSES RAJDHANI Power Limited invites sealed tenders on a "Single Stage: Two Envelope" bidding basis (Envelope –I, Techno-Commercial Bid & Envelope-II, Price Bid) from eligible Bidders for Installation, Testing and Commissioning of 33 KV AIS (including 7 nos. 33/0.433kv PSS) with supply of miscellaneous materials at Kushak Nallah depot, BRPL, New Delhi.

1.01 The bidder must qualify the requirements as specified in heading "Qualifying Requirements" of this RFQ. **The sealed envelopes shall be duly superscribed as-**

"Installation, Testing and Commissioning of 33 KV AIS (including 7 nos. 33/0.433kv PSS) with supply of miscellaneous materials at Kushak Nallah depot, BRPL, New Delhi." NIT NO CMC/BR/22-23/RB/CR/AG/1050 DT 06.08.2022".

1.02 Schedule of the tendering process is given below. Detailed Specification, Scope of Work, Terms & Conditions, etc are mentioned in the Tender documents, which is available on our website.
BRPL invites sealed tenders from eligible tenderers for the above-mentioned work (clause 1.01).

ESTIMATED COST OF WORK	Rs. 2.51 Crores
EARNEST MONEY DEPOSIT	Rs. 5.02 Lakhs
COST OF TENDER FORM (NON- REFUNDABLE)	Rs.1180/- (Including GST)
TENDER DOCUMENTS ON SALE	06/08/2022 (working days)
DATE & TIME OF SUBMISSION OF TENDER	29/08/2022 15:30 HRS
DATE & TIME OF OPENING OF TECHNICAL BID (PART-A)	29/08/2022 16:00 HRS

The tender document can be obtained from address given below against submission of nonrefundable demand draft/Pay Order of Rs.1180/- (including GST) drawn in favour of BSES RAJDHANI Power Ltd, payable at Delhi, per below:

Beneficiary Name : BSES Rajdhani Power Limited
Bank Name : Bank of Baroda
A/c No. : 10590200001560
IFSC Code : BARB0NEHRUP

1.03 The tender documents will be issued on all working days up to the date mentioned in clause 1.02. The tender documents & detail terms and conditions can also be downloaded from the website www.bsesdelhi.com. In case tender documents are downloaded from the above website, then the bidder has to enclose a separate demand draft covering the cost of bid documents.

2. POINTS TO BE NOTED

I. Works envisaged under this contract are required to be executed in all respects up to the period of completion/ duration of work mentioned above.

II. Only those agencies, who fulfil the qualifying criteria as mentioned in clause 4 should submit the tender documents.

III. BSES RAJDHANI Power Ltd reserves the right to accept/reject any or all bids without assigning any reason thereof and alter/amend/modify/add/reduce the amount and quantity mentioned in the tender documents at the time of placing Order

IV. The bid will be summarily rejected if:

(a) **Earnest Money Deposit (EMD)**and **Tender Fee** of requisite amount is not deposited as per tender conditions

(b) Bid received after due date and time.

3. EMD

BSES Rajdhani Power Ltd reserves the right to accept/reject any or all Tenders without assigning any reason thereof and alter the quantity of materials mentioned in the Tender documents at the time of placing purchase/ work orders. Tender will be summarily rejected if:

(i) If Earnest Money Deposit (EMD) of requisite amount is not deposited in shape of Bank Draft/Pay Order/BG drawn in favour of BSES Rajdhani Power Ltd, payable at Delhi as per below:

Please note that bank details as below have been provided only for the purpose of making BG for EMD.

Beneficiary Name: BSES Rajdhani Power Limited
Bank Name : State Bank of India, New Delhi
A/c No. : 40214783615
IFSC Code : SBIN0009601

(ii) If Tender is received after due date and time

I. The EMD of the bidders who are not technically qualified shall be returned after the price bid opening.

II. Earnest money given by all the bidders who are techno commercially qualified except the lower bidder shall be returned within 8 (Eight) weeks after award of the work.

III. The EMD of the successful bidder shall be returned on submission of CPBG as per tender terms.

IV. The EMD may be forfeited in case of:

(a) The Bidder withdraws its bid during the period of bid validity specified by the Bidder in the Bid Form or

(b) The successful Bidder does not

(i) Accept the Purchase Order/Work Order, or

(ii) Furnish the required CPBG as per tender terms

(c)The bidder is found to have submitted false or forged, any of the documents/certificates/information.

4. **QUALIFYING REQUIREMENTS (QR)**

The prospective bidder must qualify all of the following requirements to be eligible to participate in the bidding. Bidders who meet the following requirements will be considered as the successful bidder and bidder who does not meet these requirements shall be disqualified.

(A.1) TECHNICAL CRITERIA:

a) The bidder must have successfully installed, tested and commissioned Grid AIS/GIS substations of 33 KV or higher rating in the last Five (5) financial years from date of Bid opening. The list of such experiences shall be furnished as per format attached in Schedule-I (List of Installations) of Technical Specification.

b) Bidder should have at least one performance Certificate for the similar works executed in the last Five (5) financial years from reputed Electricity Board(s)/ reputed company(ies) in India /Abroad, transmission and distribution utilities of successful installation, testing & commissioning of similar above works.

c) Bidders shall submit the list of tools & tackles, with Sl No, Make & Calibration certificates suitable for carrying out the specified job tendered for.

d) The bidder must possess valid ISO 9001:2015 certification.

(A.2) COMMERCIAL CRITERIA:

a) The average annual turnover of the Bidder, in the preceding three (3) financial years (i.e., FY22, FY21 & FY20) should not be less than Rs 3 (Three) Crore. The bidder shall submit the Annual Turnover Report of the last 3 FYs duly certified by a Chartered Accountant. The Turnover certificate must have UDIN Number.

b) The bidder must provide proof of having solvency of an amount equal to Rs 0.50 Crore from any nationalized/ scheduled commercial bank. It should not be older than 01.01.2022.

c) The bidder should possess valid Electrical Contractor License issued by competent statutory agency to undertake work in NCT Delhi. In case the bidder is not having this license, they have 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 with the approval of BRPL where copy of valid license shall be submitted to BRPL before the start of the work.

d) The bidder must have valid Registration of GST & PAN, 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 statuary compliances as per the laws/rules etc. before the start of the supply/work.

e) Entities that have been currently debarred/blacklisted by any Private/central/state government institution including electricity boards in India, any of the DISCOM in India, lacks qualifying pre-requisites to participate in this tender will not be considered. Accordingly, an undertaking by the Authorized Person along with other documents to be provided by the bidder on its letterhead in this regard, confirming in clear terms, that the contractor has not been debarred/blacklisted as on the date of submission of the bid. Bidders who is currently debarred/ blacklisted/ suspended by BRPL will not be considered in this tender.

f) The bidder should give an undertaking on their letterhead that all the documents/certificates/information submitted by them against the tender are genuine/true/correct and the copies of documents have been made from the original document/s. Further, in case any of the documents/certificates/information submitted by the bidder is found to be false or, BRPL at its sole discretion shall be free to take all actions as permitted under law, including forfeiture of EMD and disqualification from participation in the future tenders of BRPL & Its group companies for an indefinite period or period as may be decided by BRPL.

g) The bidder should submit an undertaking for "No Litigation" / no legal case is pending with BRPL or its Group Companies. Bidders having any litigation/ legal case pending with BRPL shall not be considered qualified for this tender.

(A.3) OTHER REQUIREMENTS:

(a) Company reserves the right to carry out technical capability/ infrastructure assessment of the Bidders by factory/office/site inspection or by any other means and company's decision shall be final in this regard.
(b) No Joint ventures / consortiums are allowed.
(c) The bidder shall submit all necessary documentary evidence to establish that the Bidder meets the above qualifying requirements including but not limited to the following:

i. Last three Financial Years (FY 19-20, FY 20-21& FY 21-22) audited financial statement.
ii. Bidder to submit UDIN based CA Certificate showing NIL dues towards Statutory Liabilities, including GST, Taxation, PF, ESI, or any other dues Statutory in nature for the period upto 31.03.2022, herein collectively called as "Statutory dues" and there is no liability over the bidder relating to deposition of such statutory dues.
iii. Detail of Banks and Fund & Non fund based Credit limit
iv. Details of formation/registration of the firm (Proprietary/ Partnership) or Company along with all relevant details)

v. Memorandum & Articles of Association of the Company/ Partnership Deed of the Firm /other registration documents, as applicable
vi. Organization Chart of the Bidders Company/organization
vii. Organization chart for execution of the contract
viii. Experience details with credentials
ix. Number of Employees & necessary details
x. Details of office/s in Delhi, Details of Registered and Corporate offices and details of other offices/establishments in India.
xi. Work order / Agreement copies along with performance certificates in support of relevant experience.
xii. Turnover certificate issued by CA (along with UDIN no.) for the last three Financial Years.
xiii. Net worth certificate as elaborated in financial QR
xiv. List of pending litigation with government/other institution on account of executing any order.
xv. Copy of ESI/PF Registration certificate
xvi. Copy of PAN/GST no.
xvii. Copy of GST Return of last Financial Year.
xviii. Copy of valid Electrical License
xix. Non-Disclosure Agreement (NDA) as per format attached
xx. Bidder's details as per format attached
xxi. Solvency Certificate
xxii. An undertaking to provide all Tools & Plants , PPEs as per tender scope

(d) The bidder should enclose performance certificates in support of relevant experience.

(e) For Existing vendors of BRPL, the evaluation will also include the performance in the existing contracts via-a-vis performance in terms of HR issues, all statutory Compliance parameters and wages disbursement by Vendors. BRPL reserves the right to qualify or disqualify their bid based on the contract performance despite them meeting the above-mentioned qualification requirements. In case of bidder has a previous association with BRPL/BYPL for similar product and service, the performance feedback for that bidder by BRPL/BYPL shall only be considered irrespective of performance certificate issued by any third organization.

(f) BRPL may ask for such other documents as it deems fit for substantiating/ justifying the submissions made by the bidder.

5 Bidding and Award Process

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

5.01 BID SUBMISSION

The bidders are required to submit the bids in 2(two) parts to the following address

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

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

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

PART B: FINANCIAL **BID** comprising of (1 original only)

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

5.02 TIME SCHEDULE

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

S. No.	Steps	Date
1	Date of sale of bid documents	05.08.2022
2	Pre-Bid meeting	18.08.2022 14:30 HRS
3	Pre-Bid meeting ink	https://bsesbrpl.webex.com/bsesbrpl/j.php?MTID=m6d1fc90b5f902fb98a08558d2fa76d4a Meeting number: 2515 345 9697 Password: 123456

S. No.	Steps	Date
4	Last date of Queries, if any	17.08.2022
5	Last date of receipt of bid documents	25.08.2022 15:00HRS
6	Date & time of opening of tender – Part A	25.08.2022 15:45HRS

This is a two part bid process. Bidders are to submit the bids in 2(two) parts
Both these parts should be furnished in separate sealed covers super scribing NIT no. DUE DATE OF SUBMISSION, with particulars as **PART-A TECHNICAL BID & COMMERCIAL TERMS & CONDITIONS** and **Part-B FINANCIAL BID** and these sealed envelopes should again be placed in another sealed cover which shall be submitted before the due date & time specified.

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

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

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

Notwithstanding anything stated above, the Purchaser reserves the right to assess bidder's capability to perform the contract, should the circumstances warrant such assessment in the overall interest of the purchaser. In this regard the decision of the purchaser is final.

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

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

6.0 Award Decision

6 .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.

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

6.03 In the event of your bid being selected by purchaser (and / or its affiliates) and you subsequent DEFAULT on your bid; you will be required to pay purchaser (and / or its affiliates) an amount equal to the difference in your bid and the next lowest bid on the quantity declared in NIT/RFQ.

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

6.05 Qty Variation: The purchaser reserves the rights to vary the quantity by (+/-) 30% of the tender quantity.

7.0 Market Integrity

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

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

8.0 Confidentiality

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

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

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

9.0 Contact Information

Technical or Commercial clarifications, if any, as regards this RFQ shall be sought in writing and sent by mail to following address. The same shall not be communicated through phone.

	Technical	Commercial
Contact Person	Mr. Sheshadri Krishnapura (HOD-TSG)	Mr. Ananda Raj (Head Contracts)
Address	BSES Rajdhani Power Ltd , 2nd Floor, B Block, BSES Bhawan, Nehru Place, New Delhi 110019	BSES Rajdhani Power Ltd , 1st Floor, D Block, BSES Bhawan, Nehru Place, New Delhi 110019
Email	abhinav.r.srivastava@relianceada.com uttam.shukla@relianceada.com	**amitava.nandi@relianceada.com** anima.gaur@relianceada.com

SECTION – II: INSTRUCTION TO BIDDERS

1.00 GENERAL

BSES Rajdhani Power Ltd, hereinafter referred to as "The Company "are desirous of awarding work for " Installation, Testing and Commissioning of 33 KV AIS (including 7 nos. 33/0.433kv PSS) with supply of miscellaneous materials at Kushak Nallah depot, BRPL, New Delhi".

2.00 SCOPE OF WORK

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

3.00 DISCLAIMER

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

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

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

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

4.00 COST OF BIDDING

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

5.00 BIDDING DOCUMENTS

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

Request for Quotation (RFQ) - Section - I
Instructions to Bidders (ITB) - Section - II
Special Terms & Conditions of Contract (SCC) - Section –III
General Terms and Condition Supply (GCC-Supply) - Section –IV
Price Format Supply- Section V
General Terms and Condition Erection, Testing & Commissioning (GCC-ETC) - Section – VI
Price Format Erection, Testing & Commissioning - Section VII
Grand Summary of the Quoted Price Part A + Part B – Section X
Vendor Code of Conduct - Section XI
Technical Specifications - Annexure I

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

6.00 AMENDMENT OF BIDDING DOCUMENTS

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

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

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

Purchaser shall reserve the rights to following

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

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

7.00 LANGUAGE OF BID

The Bid prepared by the Bidder, and all correspondence and documents relating to the Bid exchanged by the Bidder and the Purchaser shall be written in the English Language. Any printed literature furnished by the Bidder may be written in another Language, provided that

this literature is accompanied by English translation, in which case, for purposes of interpretation of the Bid, the English translation shall govern.

8.00 DOCUMENTS COMPRISING THE BID

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

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

9.00 BID FORM

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

9.02 EMD

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

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

(a) Banker's Cheque / Demand Draft/Pay Order drawn in favour of BSES Rajdhani Power Ltd, payable at Delhi.

(b) Bank Guarantee valid for One hundred Twenty (120) days after due date of submission or amended due date of submission drawn in favour of BSES Rajdhani Power Ltd, BSES Bhawan, Nehru Place, New Delhi 110019

The EMD may be forfeited in case of:

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

OR

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

(i) Accept the Purchase Order/ Work Order, or

(ii) Furnish the required performance security BG.

10.00 **BID PRICES**

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

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

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

11.00 **BID CURRENCIES**

Prices shall be quoted in Indian Rupees Only.

12.00 **PERIOD OF VALIDITY OF BIDS**

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

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

13.00 **ALTERNATIVE BIDS**

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

14.00 **FORMAT AND SIGNING OF BID**

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

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

14.03 The Bid shall contain no interlineations, erasures or overwriting except as necessary to correct errors made by the Bidder, in which case such corrections shall be initialed by the person or persons signing the Bid.

15.00 **SEALING AND MARKING OF BIDS**

15.01 Bid submission: One original & one Copy (hard copies) of all the Bid Documents shall be sealed and submitted to the Purchaser before the closing time for submission of the bid.

15.02 The Technical Documents and the EMD shall be enclosed in a sealed envelope and the said envelope shall be super scribed with —"Technical & EMD". The price bid shall be inside another sealed envelope with super scribed "Financial Bid ". Both these envelopes shall be sealed inside another big envelope. All the envelopes should bear the Name and Address of the Bidder and marking for the Original and Copy. The envelopes should be super scribed with — "Tender Notice No. & Due date of opening".

15.03 The Bidder has the option of sending the Bids in person. Bids submitted by Email/Telex/Telegram /Fax will be rejected. No request from any Bidder to the Purchaser to collect the proposals from Courier/Airlines/Cargo Agents etc shall be entertained by the Purchaser.

16.00 **DEADLINE FOR SUBMISSION OF BIDS**

16.01 The original Bid, together with the required copies, must be received by the Purchaser at the address specified earlier.

16.02 The Purchaser may, at its discretion, extend the deadline for the submission of Bids by amending the Bidding Documents, in which case all rights and obligations of the Purchaser and Bidders previously subject to the deadline will thereafter be subject to the deadline as extended.

17.00 **ONE BID PER BIDDER**

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

18.00 **LATE BIDS**

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

19.00 **MODIFICATIONS AND WITHDRAWAL OF BIDS**

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

20.00 **PROCESS TO BE CONFIDENTIAL**

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

21.00 **CLARIFICATION OF BIDS**

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

22.0 **PRELIMINARY EXAMINATION OF BIDS / RESPONSIVENESS**

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

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

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

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

23.00 **EVALUATION AND COMPARISON OF BIDS**

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

23.01 The evaluation of the Bids shall be a stage-wise procedure. The following stages are identified for

Evaluation purposes: In the first stage, the Bids would be subjected to a responsiveness check. The Technical Proposals and the Conditional ties of the Bidders would be evaluated.

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

23.03 The Purchaser's evaluation of a Bid will take into account, in addition to the Bid price, the following factors, in the manner and to the extent indicated in this Clause:

- Delivery Schedule
- Conformance to Qualifying Criteria
- Deviations from Bidding Documents

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

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

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

24.00 **CONTACTING THE PURCHASER**

24.01 If any Bidder wishes to contact the Purchaser on any matter related to the Bid, from the time of Bid opening to the time of contract award, the same shall be done in writing only.

24.02 Any effort by a Bidder to influence the Purchaser and/or in the Purchaser‘s decisions in respect of Bid evaluation, Bid comparison or Contract Award, will result in the rejection of the Bidder‘s Bid.

25.00 **THE PURCHASER ’S RIGHT TO ACCEPT ANY BID AND TO REJECT ANY OR A LL BIDS**

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

26.00 **AWARD OF CONTRACT**

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

26.02 The Purchaser intends to issue separate Purchase/Work Orders viz

a) Purchase Order for Supply
b) Work Order for Installation, Testing & Commissioning

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

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

28.00 **LETTER OF INTENT/ NOTIFICATION OF AWARD**

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

29.00 **CONTRACT PERFORMANCE BANK GAURANTEE**

Within 15 days of the receipt of Notification of Award/ Letter of Intent/PO from the Purchaser, the successful Bidder shall furnish the Performance Bank Guarantee towards faithful performance of Contract for an amount of 10% (Ten percent) of the Contract Price. The Performance Bond shall be valid up to completion period/handing over, whichever is earlier plus 3 months claim period. Upon submission of the performance security, the EMD shall be released. 2 (two) nos. separate CPBG's shall be submitted against Supply, ETC.

30.00 **CORRUPT OR FRADULENT PRACTICES**

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

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

"Corrupt practice" means behavior on the part of officials in the public or private sectors by which they improperly and unlawfully enrich themselves and/or those close to them, or induce others to do so, by misusing the position in which they are placed, and it includes the offering, giving, receiving, or soliciting of anything of value to influence the action of any such official in the procurement process or in contract execution; and "Fraudulent practice" means a misrepresentation of facts in order to influence a award process or the execution of a contract to the detriment of the Company, and includes collusive practice among Bidders (prior to or after Bid submission) designed to establish Bid prices at artificial non -competitive levels and to deprive the Company of the benefits of free and open competition.

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

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

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

31.00 **COMPLETION PERIOD**

8 Months from the date of PO

2 months: Engineering - Drawing submission & approval of Supply of Miscellaneous materials.

4 months: Complete Supply of Miscellaneous materials on Site.

3 months: Erection, Testing and Commissioning of electrical equipment and related accessories and handing over.

Section III

SPECIAL TERMS AND CONDITIONS OF CONTRACT

1.1. Bidders are requested to visit the site to understand the scope of work, site conditions and requirements prior to Bidding. Hence, no price/time escalation shall be admissible on these accounts.

1.2. The scope of this tender includes supply , survey , design , engineering , manufacturer , shop testing ,inspection , packing , dispatch , loading , unloading and storage at site, storage and construction insurance , assembly , erection ,structural , complete pre-commissioning checks , testing and commissioning at site , obtaining statutory clearance & certification from state electrical inspector and handing over of Grid to owner on single point responsibility basis.

1.3. The scope includes supply of all barricading, free issued materials (including installation, transportation, loading & unloading), dewatering, watch and ward and transportation of scrap (generated at Site), balance free-issued material, dismantled material from site to BRPL store including loading & unloading and no additional charges shall be paid against these activities. Used barricading material will be taken back by bidder soon after job is handed over or as directed by BRPL Engineer-In-Charge (E-I-C). No additional cost for these items will be paid to the Bidder. Any leakage, pilferage and damage of the material shall be in vendor's scope.

1.4. Joints & Terminations installation shall only be done by OEM. No additional cost for this item will be paid to the Bidder. Contractor to provide all support to the Jointers for doing Joints & Terminations of Joint Kits.

1.5. Prices for all the activities shall be FIRM till the actual completion of the job. Statutory variation will be allowed for direct supplies only wherever breakup of Taxes & Duties are available in Price Bid. In case bidder has not submitted any price breakup, no variation on account of statuary variation shall be paid extra by BRPL.

1.6. There will be no price escalation given to bidder even if there is delay in the project due to ROW permission.

1.7. Permission from road owning agencies & statutory clearance for road cutting shall be taken by Bidder. The Bidder shall follow-up with local authorities and other connected persons that may require carrying out the job under this work order.

1.8. Electrical Inspector Clearance fees shall be in Bidder's scope. The related fees, payments and pursuance work shall be in scope of Bidder only.

1.9. Bidder has to submit the technical parameters with details of Spares for each rating with catalogue, reference codes etc.

1.10. Wherever BRPL specifications are not available relevant IS/IEC to be followed. All Drawings mentioned in the Tender Specification and other required for the completeness of the tender shall be submitted. Drawing submission process shall not be deemed complete if all the requirements are not complied during the submission of the same.

1.11. The bidder should have own testing equipment's/they have to provide like IR Tester, Hi Pot Test Kit, Earth Tester, etc with Calibration Certificates for testing.

1.12. The Bidder should have own Safety equipment like Neon Tester, Portable Earth, Earthing discharge rod etc. along with Calibration Certificates of all the equipment.

1.13. The Bidder should have all major tools and tackles required for installation, testing & commissioning works.

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

1.15. Any other material not specifically mentioned above but required for successful commissioning and operation is in the scope of bidder. Prior approval shall be taken from central engineering department before execution. Commercial approval shall be taken from C&M Department before execution.

1.16. Successful bidder has to adhere to the statutory compliance.

1.17. Successful Bidder has to depute the safety officer and quality officer separately at site for whole duration and they have to submit the safety report and quality report to BRPL E-I-C on weekly basis.

1.18. Successful bidder has to send the weekly progress report to BRPL EIC.

1.19. In case of any major deviation, deletion or addition which bidder may feel is relevant to this project & for its safe operation and completion of works; Bidder may clearly highlight and communicate the same to the purchaser with his bid.

1.20. Necessary Statutory Clearances from CEI of Delhi & any other authority for energizing shall be in the scope of this tender.

1.21. After commissioning of the complete system and final approval of Electrical Inspector & Compliance to punch points observed to the satisfaction of Projects as per statutory requirements, system shall be handed over to BRPL.

1.22. **Guarantee period/Defect Liability period:**

The Guarantee Period will be equipment/service/work specific and shall be as specified in the Technical Specifications for the equipment/material/service/work and where Technical

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

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

1.23. **Failure during Guarantee Period:**

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

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

a) Service Engineer Availability to Attend, Identify & Restore Defects (Minor) of materials/Equipment's under Guarantee Period within 48 Working Hours (Exclusion of Material Support Cases)

b) Spare Material Delivery for rectification of defect (Major) Under Guarantee Period within Two Weeks. Bidder must keep Requisite Inventory of Critical Spares & Other Equipments Covered in Guarantee Period to Restore Equipment within Two Weeks.

c) In Case Of Complete Replacement of material, within a Period of 4 Weeks.

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

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

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

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

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

1.25. PROJECT INFORMATION & COMPLETION

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

1.26. PROJECT IMPLEMETATION & EXECUTION CONTROL

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

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

SECTION IV
GENERAL TERMS AND CONDITIONS - SUPPLY

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

1.02 Bidder shall bear all costs associated with the preparation and delivery of its Bid, and the Purchaser will in no case shall be responsible or liable for these costs.

1.03 The Bid should be submitted by the Bidder in whose name the bid document has been issued and under no circumstances it shall be transferred /sold to the other party.

1.04 The Purchaser reserves the right to request for any additional information and also reserves the right to reject the proposal of any Bidder, if in the opinion of the Purchaser, the data in support of RFQ requirement is incomplete.

1.05 The Bidder is expected to examine all instructions, forms, terms & conditions and specifications in the Bid Documents. Failure to furnish all information required in the Bid Documents or submission of a Bid not substantially responsive to the Bid Documents in every respect may result in rejection of the Bid. However, the Purchaser's decision in regard to the responsiveness and rejection of bids shall be final and binding without any obligation, financial or otherwise, on the Purchaser.

1.06 Bidder shall procure all equipments from the approved vendor list of BRPL as per technical specifications.

2.0 Definition of Terms

2.01 "Purchaser" shall mean BSES Rajdhani Power Limited, on whose behalf this bid enquiry is issued by its authorized representative / officers.

2.02 "Bidder" shall mean the firm who quotes against this bid enquiry issued by the Purchaser. "Supplier" or "Supplier" shall mean the successful Bidder and/or Bidders whose bid has been accepted by the Purchaser and on whom the "Letter of Acceptance" is placed by the Purchaser and shall include his heirs, legal representatives, successors and permitted assigns wherever the context so admits.

2.03 "Supply" shall mean the Scope of Contract as described.

2.04 "Specification" shall mean collectively all the terms and stipulations contained in those portions of this bid document known as RFQ, Commercial Terms & Condition, Instructions to Bidders, Technical Specifications and the Amendments, Revisions, Deletions or Additions, as may be made by the Purchaser from time to time.

2.05 "Letter of Acceptance" shall mean the official notice issued by the Purchaser notifying the Supplier that his proposal has been accepted and it shall include amendments thereto, if any, issued by the Purchaser. The "Letter of Acceptance" issued by the Purchaser shall be binding on the "Supplier" The date of Letter of Acceptance shall be taken as the effective date of the commencement of contract.

2.06 "Month" shall mean the calendar month and "Day" shall mean the calendar day.

2.07 "Codes and Standards" shall mean all the applicable codes and standards as indicated in the Specification.

2.08 "Offer Sheet" shall mean Bidder's firm offer submitted to BRPL in accordance with the specification.

2.09 "Contract" shall mean the "Letter of Acceptance/Purchase Order" issued by the Purchaser.

2.10 "Contract Price" shall mean the price referred to in the "Letter of Acceptance/Purchase Order".

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

2.12 "Acceptance" shall mean and deemed to include one or more of the following as will be stipulated in the specification:

a) The written acceptance of material by the inspector at suppliers works to ship the materials.
b) Acceptance of material at Purchaser site stores after its receipt and due inspection/ testing and release of material acceptance voucher.
c) Where the scope of the contract includes supplying, acceptance shall mean issue of necessary equipment / material takeover receipt after installation & commissioning and final acceptance.

3.0 Contract Documents & Priority

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

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

4.0 Scope of Supply -General

4.01 The "Scope of Supply" shall be on the basis of Bidder's responsibility, completely covering the obligations, responsibility and supplies provided in this Bid enquiry whether implicit or explicit.

4.02 Bidder shall have to quote for the Bill of quantities as listed herewith.

4.03 All relevant drawings, data and instruction manuals of supply of miscellaneous material shall be scope of bidder.

4.04 Qty Variation: The Bidder/purchaser reserves the rights to vary the quantity by (+/-) 30% of the supply of miscellaneous item quantity as listed below.

Supply of miscellaneous items - Scope of Work			
33 KV AIS Substation, DTC Kushak Nallah			
S. No.	**Item Description**	**UoM**	**Quantity**
1	MS Steel Structure	Lot	1
	MS Channel 100x50x6mm	MT	0.5
	MS Angle 65x65x5mm	MT	0.5
	MS Angle 50x50x5mm	MT	0.5
	MS Flat 50x6mm	MT	0.25
2	Fire Alarm System	Lot	1
	Copper Tubing for Fire Alarm System	M	25
	Nitrogen Gas Cylinder	EA	3
	Temperature Sensors	EA	15
	Fire Alarm Control System	EA	1
3	Earthing System	Lot	1
	MS Rod 40 MM Dia	MT	6
	Treated Earth pit with Pipe Earthing	EA	4
	GI Flat 50x6 mm Riser	MT	0.3
4	DSLP System	Lot	1
	GI Flat 50x6 mm	MT	0.3
	40 mm Dia MS Rod for spikes	MT	0.2
	Treated Earth pit with Pipe Earthing	EA	4
5	Cable Sealing Solution	Lot	1
	Roxtex Cable Sealing solution suitable for 33 kv 3x400 Sq.mm Cable	EA	12
	Roxtex Cable Sealing solution suitable for Control Cable	EA	3
6	Fire Extinguishers, Safety Mat Etc.	Lot	1
	Fire Extnguisher 22.5 KG CO2 with Trolley	EA	2
	Fire Extnguisher 4.5 KG CO2 with Wall mounting arrangement	EA	6

	Safety Mat Suitable for 33 kV Insulation, 2.5Mx1M	EA	10
7	Cable Tray	Lot	1
	Cable Tray 450 mm Ladder Type	M	50
	Cable Tray 300 mm Perforated Type	M	50
	Cable Tray 100 mm Perforated Type	M	50
8	Supply of Gland Lugs etc for cable termination	Lot	1
	Double Compression Gland for Control Cable 10x2.5 Sq.mm	EA	100
	Double Compression Gland for Control Cable 6x2.5 Sq.mm	EA	100
	Cable Cleat suitable for 33 kV 3x400 Sq.mm Cables	EA	12
9	Lighting of Outdoor Area	Lot	1
	Steel Tubular Pole single overhang	EA	10
	LED Light 40 W for outdoor Street Lighting	EA	10
10	Lighting of inside Substation building including Emergency Lighting	Lot	1
	LED Light Panels 36W 2x2 Ceilling Mounting Type	EA	75
	DC Lights 10W Wall Mounting	EA	20
11	Air Conditioning System	Lot	1
	Air Conditioners 1.6 Tons Split type 5 star rating including all accessories	EA	6
12	Video Monitoring System of entire Substation	Lot	1
	360 Deg Camera Outdoor Type with all accessories	EA	8
	360 Deg Camera indoor Type with all accessories	EA	6
	Data Storage syatem with communication at 61850 protocol	EA	1

4.05 Other petty and miscellaneous material required to execute the work at site shall be in the scope of bidder.

2.

Supply of miscellaneous items of PSS- Scope of Work			
7 Nos. 33/.433 KV Package Substation, Kushak Nallah			
S NO.	DESCRIPTION	UOM	QTY
1	STRUCTURAL STEEL (CHNL,STRCTL,ISMC100;100MM;50MM;7.7MM)	MT	1
2	3M LONG PERFORATED GI PIPE ELECTRODE ALONG WITH TREATING AGENT(PI,EARTHING;2.5MTR;GS;40NB)	EA	14
3	GI STRIP 75MM*10MM FOR EARTHING (STRIP,MTLC,EARTHNG;75X10MM;MS GALVANIZED)	KG	15000

5.0 Quality Assurance and Inspection

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

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

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

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

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

5.06 Purchaser reserves the right to send any material being supplied to any recognized laboratory for testing, wherever necessary and the cost of testing shall be borne by the Bidder. In case the material is found not in order with the technical requirement / specification, the charges along with any other penalty which may be levied is to be borne by the bidder. To avoid any complaint the supplier is advised to send his representative to the stores to see that the material sent for testing is being sealed in the presence of bidder's representative.

6.0 Packing, Packing List & Marking

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

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

7.01 Price basis for supply of materials

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

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

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

Transit insurance will be arranged by bidder.

8.0 Terms of payment and billing – SUPPLY

a) 85 % against R/A bills for supply of equipment and materials within 30 days against receipt of material at site and submission of following documents duly certified by BRPL Project-in-charge:
   i. Consignee copy of LR
   ii. Detailed invoice showing commodity description, qty, unit & total price,
   iii. Original certificate issued by BRPL confirming receipt of material at site & acceptance
   iv. Dispatch clearance & inspection report issued by the inspection authority
   v. Packing List, Test Reports
   vi. Guarantee Certificate.

b) 10% pro-rata after installation/erection of equipment duly certified by BRPL Project-in-charge.

c) 5% pro-rata after completion of successful acceptance testing, commissioning and handing over of the entire Installation and duly certified by BRPL Project-in-charge.

9.0 Price Validity

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

10.0 CONTRACT PERFORMANCE BANK GUARANTEE:

10.1 CONTRACTOR shall furnish the Contract Performance Bank Guarantee in the prescribed format (Appendix I) within 15 days from the date of issue of Order for due performance of the provisions of purchase Order.

10.2 The contract Performance Bank Guarantee shall be of 10% of the total value of order and shall be valid till the completion of defect liability period, plus three (3) months towards claim period.

10.3 The Contract Performance Bank Guarantee shall be issued from any Scheduled /nationalized bank as per company format.

10.4 The Company shall reserve the right to invoke the bank guarantee unconditionally and without recourse to the Contractor, if there is failure to perform any part of the Contract for whatsoever reason. This clause is pertaining to performance of contractual obligations and the decision of Company shall be final in this regard.

10.5 In the event, in Company sole judgment, the Contractor has fulfilled all its obligations under this Contract, Company shall release the Contract performance bank guarantee without interest, within seven (7) days from the last date up to which the performance bank guarantee is to be kept valid or if it is assessed by the Company that Contractor has not fulfilled its obligation then the performance bank guarantee shall be extended by the Contractor till that period as requested by the Company.

11.0 Forfeiture

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

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

12.0 Release

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

13.0 Guarantee of Performance

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

equipment/material is new and unused except for the usage required for the tests and checks required as part of quality assurance.

14.0 Guarantee Period/Defects Liability Period

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

If during the defects liability period any materials / items are found to be defective, these shall be replaced or rectified by the bidder at his own cost within 30 days from the date of receipt of intimation.
Cost of repairs on failure in Guarantee Period:
The cost of repairs/rectification /replacement, apart from the actual cost of repairs/rectification/replacement is also inclusive of all bidder costs of required transportation, site inspection /mobilization/dismantling and re-installation costs as applicable, to be borne by the bidder. The bidder has to ensure that the interruption in the usage of intended purpose of the equipment is minimized to the maximum extent In lieu of the time taken for repairs/rectification/replacement.

15.0 Latent Defect:

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

16.0 Support beyond the Guarantee Period

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

17.0 Return, Replacement or Substitution

BRPL shall give Supplier notice of any defective Commodity promptly after becoming aware thereof. BRPL may at its discretion elect to return defective Commodities to Supplier for replacement, free of charge to BRPL, or may reject such Commodities and purchase the same or similar Commodities from any third party. In the latter case BRPL shall furnish proof to Supplier of the cost of such substitute purchase. In either case, all costs of any replacement,

substitution, shipping, labour and other related expenses incurred in connection with the return and replacement or for the substitute purchase of a Commodity hereunder should be for the account of Supplier. BRPL may set off such costs against any amounts payable by BRPL to Supplier. Supplier shall reimburse BRPL for the amount, if any, by which the price of a substitute Commodity exceeds the price for such Commodity as quoted in the Bid.

18.0 Effective Date of Commencement of Contract:

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

19.0 Time – The Essence of Contract

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

20.0 The Laws and Jurisdiction of Contract:

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

21.0 Events of Default

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

(a) Supplier fails or refuses to pay any amounts due under the Contract;

(b) Supplier fails or refuses to deliver Commodities conforming to this RFQ/ specifications, or fails to deliver Commodities within the period specified in P.O. or any extension thereof

(c) Supplier becomes insolvent or unable to pay its debts when due, or commits any act of bankruptcy, such as filing any petition in any bankruptcy, winding-up or reorganization proceeding, or acknowledges in writing its insolvency or inability to pay its debts; or the Supplier's creditors file any petition relating to bankruptcy of Supplier;

(d) Supplier otherwise fails or refuses to perform or observe any term or condition of the Contract and such failure is not remediable or, if remediable, continues for a period of 30 days after receipt by the Supplier of notice of such failure from BRPL.

22.0 Consequences of Default

(a) If an Event of Default shall occur and be continuing, BRPL may forthwith terminate the Contract by written notice.

(b) In the event of an Event of Default, BRPL may, without prejudice to any other right granted to it by law, or the Contract, take any or all of the following actions;

(i) present to Bank for forfeiture to the relevant bank the Performance Bond;

(ii) Purchase the same or similar Commodities from any third party; and/or

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

23.0 Liquidated Damages

23.01 If supply of items / equipment is delayed beyond the supply schedule as stipulated in LOI/PO, then the Supplier shall be liable to pay the Purchaser for delay a sum of 0.5% (half percent) of the total price for every week of delay or part thereof for undelivered units.

23.02 The total amount for delay under the contract will be subject to a maximum of ten percent (10%) of the total contract value.

23.03 The Purchaser may, without prejudice to any method of recovery, deduct the amount for such damages from any amount due or which may become due to the Supplier or from the Performance Bond or file a claim against the supplier. The levy payment or deduction of such damages shall not relieve the Contractor from his obligation to complete the Supply on time or from any other part of his obligation and liabilities under the Contract. Once the maximum is reached, the Company reserves the right for termination of contract without any liabilities to the Company.

In the event of an extension of time being granted by the EIC, in writing for the Completion of the works, this clause shall be applicable after the expiry of such an extended period.

24.0 Statutory variation in Taxes and Duties

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

25.0 Force Majeure

25.01 General

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

(i) Such event or circumstance materially and adversely affects the ability of the affected Party to perform its obligations under this Contract, and the affected Party has taken all reasonable precautions, due care and reasonable alternative measures in order to prevent or avoid the effect of such event on the affected party's ability to perform its obligations under this Contract and to mitigate the consequences thereof.

(ii) For the avoidance of doubt, if such event or circumstance would not have materially and adversely affected the performance of the affected party had such affected party followed good industry practice, such event or circumstance shall not constitute force majeure.

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

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

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

(i) The following events and circumstances:

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

b) Explosions or fires.

(ii) War declared by the Government of India, provided that the ports at Mumbai are declared as a war zone.

(iii) Dangers of navigation, perils of the sea.

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

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

25.04 Mitigation of Events of Force Majeure Each Party shall:

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

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

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

25.07 The Purchaser may terminate the contract after giving 7(seven) days notice if any of following occurs:
a) Contractor fails to complete execution of works within the approved schedule of works, terms and conditions
b) In case the contractor commits any Act of Insolvency, or adjudged insolvent
c) Has abandoned the contract
d) Has failed to commence work or has suspended the progress of works

e) Has failed to proceed the works with due diligence and failed to make such due progress

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

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

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

26.0 Transfer and Sub-Letting

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

27.0 Recoveries

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

28.0 Waiver

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

29.0 Indemnification

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

30.0 Documentation:

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

compliance to the specifications and Field Quality Procedures issued by BRPL Engineer in-charge.

31.0 Commissioning Spares

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

32.0 Limitation on Liability

Notwithstanding anything to the contrary in the Purchase Order but subject to clause 33 Consequential Damages, the aggregate liability of either Party to the other Party in respect of all claims for Liabilities arising under the Purchase Order shall not exceed the aggregate value of the Purchase Order(s) under which the Liabilities arose except that such limitation shall not apply to the Contractor's indemnification obligations in accordance with clause 29 Indemnification herein.

33.0 Consequential Damages

Notwithstanding anything to the contrary in the Purchase Order, except for breach of obligations under Non-disclosure and except as expressly provided in a Purchase Order, in no event, as a result of breach of contract or breach of warranty or otherwise, shall either Party hereto or either Party's Affiliates or sub Contractors, be liable under the Purchase Order to the other Party for any consequential, special, indirect, exemplary or incidental damages, and/or for any lost profits, goodwill or revenues of such Party, howsoever arising, before or after Acceptance of the Goods and whether or not such damages are foreseeable.

SECTION VI

GENERAL TERMS & CONDITIONS - ERECTION, TESTING & COMMISSIONING

1. DEFINITIONS and INTERPRETATION

The following terms shall have the following meanings:

1.1 "Company": means BSES Rajdhani Power Ltd, a company incorporated under the Companies Act 1956 and having its office at BSES Bhawan, Nehru Place, New Delhi 110 019, which expression shall include its authorized representatives, agents, successors and assigns.
1.2 "Contractor": shall mean the successful Bidder / vendor to whom the contract has been awarded
1.3 "Rate": The unit rates for the work to be carried out at site shall be as per finalized unit rates through tender. The finalized rates shall be firm for the entire duration of work to be carried out by the Contractor under the work order and are not subject to escalation for any reason whatsoever.
1.4. Contract Specification: The terms "Contract Specification" shall mean the Technical specification of the work as agreed by you and description of work as detailed in Annexure-I enclosed herewith and all such particulars mentioned directly/referred to or implied as such in the contract.
1.5 SITE: The terms "Site" shall mean the working location in BRPL area. Under this tender, working location shall be as mentioned elsewhere.
1.6 ENGINEER IN CHARGE: "Engineer In-charge" means the Company's authorized representative for the purpose of carrying out the work.

2. EXAMINATION OF SITE AND LOCAL CONDITIONS:

The contractor is deemed to have visited the site of the work and ascertained therefore all site conditions and information pertaining to his work. The company shall not accept any claim whatsoever arising out of the difficult site/terrain/local conditions, if any.

3. LANGUAGE AND MEASUREMENT:

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

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

4. SCOPE OF WORK:

The scope includes survey, design, engineering, manufacture, shop testing, inspection, packing, dispatch, loading, unloading and storage at site, storage and construction insurance, assembly, erection, structural, complete pre-commissioning checks , testing and commissioning at site , obtaining statutory clearance & certification from state electrical inspector, Municipal Corporation department (if required), Fire Officer (if required), Horticulture department (if required), and

handing over to owner after successful testing & Commissioning of 3 Nos. 33 kV AIS Substation & 7 nos. Package substations at BRPL, New Delhi. Schedule of work shall be as per BOQ attached herewith.

After completion of E/T/C work of the scheme, Bidder has to obtain the Electrical Inspectorate's Clearance from the Electrical Inspector of Delhi Govt. Electrical Inspector Clearance fees shall be in Bidder's scope. The related fees, payments and pursuance work shall be in scope of Bidder only.

Bidder shall arrange any permission like road cutting clearance, if required, etc from the Delhi Civic authorities. The Bidder shall follow-up with local authorities and other connected persons that may be required to carry out the job under this work order.

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

The Bidder shall also make his own arrangement for the accommodation/conveyance requirements for its staff at site. Company will be provided at site the adequate open space for Bidder's site store for storing the materials, tools, tackles etc. The entire Bidder'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 Bidder, however company does not hold any responsibility for any loss or damage of Bidder's material etc.

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

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

Major materials like Switchgear panels along with C&R Panels, ACDB, DCDB, Battery charger & battery bank etc. will be issued by BRPL as free issue item. However transportation of all free issue materials from BRPL stores to BRPL S/S, handling, safe storage till handing over of the installations shall be in the scope of the contractor.

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 handing over of the completed installations 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 terms by Vendor and remain with Vendor until handing over of the

completed installations 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.

Special Instruction:-

a. All Erection tools and tackles and testing equipment shall be available with Bidder in event of order.

b. Penalty clause shall be incorporated in case any of workmen of Bidder is found violating safety protocol as per GCC-ETC LD Clause no 15.

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

5. RATES:

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

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

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

6. TAXES AND DUTIES:

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

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

1. As Per Notification No. 39/2021 – Central Tax dated 21st December, 2021 w.e.f 01/01/2022 registered person (ie, Recipent/Purchaser) can avail tax credit on those invoices only which have

been reflected in GSTR 2A or GSTR2B (it means 100% matching of invoice is required). Also, GST has to be deposited by Supplier/Contractor by filing of GSTR- 1 and GSTR-3B.

2. In view of above, if the same is not complied with by the supplier/contractor and the Recipient/Purchaser is not in position to avail / utilize Input Tax Credit due to non-compliance or non-filing of GSTR-1 and GSTR-3B for the month/quarter (as applicable) in which the supply was made, then Recipient/Purchaser has right to hold 100% GST amount from next payment due of the subsequent month till the time default is not cured.

3. For releasing of the payment kept on hold on account of GST supplier shall submit payment proof i.e GST Portal screenshot reflecting name of Recipient/Purchaser alongwith GSTR-1 and GSTR-3B for month/quarter (as applicable) in which the same has been discharged. Payment shall not be released, till the time proof of payment of GST as mentioned above is not submitted.

4. Further, the recipient/purchaser shall also be entitled to recover any financial loss incurred (including tax, interest and penalty) due to non-compliance or non-filing of GSTR-1 and GSTR-3B by the supplier.

5. In case where delivery of goods is being made on FOR site basis, the Supplier is responsible to comply with rules applicable for E-way bill. Any violation in provision of E-way Bill will attract penalty and seizure of Transit Material. Any Penalty and Pre-Deposit due to violation of rules/provision shall be paid and borne by Supplier. Also, Supplier is responsible for releasing of goods from Authority whether CGST/SGST. Delay in supply due to seizure of goods shall attract liquidated damages as per Order / Contract provisions. "

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

Payment shall be made as under:

i) 85% pro-rata of total installation value shall be payable against R/A bills payable within 45 days after installation / erection of material at site duly certified by Engineer in charge.

ii) 10% pro-rata of total installation value shall be payable against R/A bills payable within 30 days after testing & commissioning of material at site.

iii) 5% of contract value payable after completion of successful acceptance testing, commissioning and handing over of complete systems duly certified by Engineer in charge, submission of Electrical Inspector Clearance Certificate.

The contractor shall submit the invoice along with the checklist duly filled in Invoice shall be processed and payment shall be made to contractor on certification of Engineer-In Charge for compliance to check point's given in check list.

8 CONTRACT PERFORMANCE BANK GUARANTEE:

8.1 CONTRACTOR shall furnish the Contract Performance Bank Guarantee in the prescribed format (Appendix I) within 15 days from the date of issue of Order for due performance of the provisions of purchase Order.

8.2 The contract Performance Bank Guarantee shall be of 10% of the total value of order and shall be valid till the completion of defect liability period, plus three (3) months towards claim period.

8.3 The Contract Performance Bank Guarantee shall be issued from any Scheduled /nationalized bank as per company format.

8.4 The Company shall reserve the right to invoke the bank guarantee unconditionally and without recourse to the Contractor, if there is failure to perform any part of the Contract for whatsoever reason. This clause is pertaining to performance of contractual obligations and the decision of Company shall be final in this regard.

8.5 In the event, in Company sole judgment, the Contractor has fulfilled all its obligations under this Contract, Company shall release the Contract performance bank guarantee without interest, within seven (7) days from the last date up to which the performance bank guarantee is to be kept valid or if it is assessed by the Company that Contractor has not fulfilled its obligation then the performance bank guarantee shall be extended by the Contractor till that period as requested by the Company.
All the Bank guarantees shall be submitted as per Company's format (Appendix I) and from any scheduled Bank approved by Company.

9. Guarantee of Performance

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

10. Guarantee period/Defect Liability period:

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

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

11. COMPLETION PERIOD

You are required to mobilize your manpower and Tools & Tackles and furnish a list of equipments to be used for erection and commence the execution activity as per instructions of Engineer In-charge. The entire Erection, Testing & Commissioning work should be completed within 08 months from the date of issue of LOI/WO. The detailed schedule and milestone completion dates would be as per the contract schedules given from time to time by Engineer In-charge at site. You shall submit a weekly progress report to Engineer In charge.

12. CLEANLINESS

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

13. COMMISSIONING & ACCEPTANCE TEST:

After completion of the work, the Bidder 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 Bidder. If any rectification/modification required during this period the Bidder shall do all necessary measures.
On satisfactory completion of above, the system shall be deemed to have energized and placed in commercial operation. The Engineer-in-Charge will issue an acceptance certificate.

14. WORK COMPLETION CERTIFICATION, HANDING OVER.

The work carried out by the Bidder under this order has to be certified by Engineer In-charge for satisfactory completion of work allotted to the Bidder with respect to specifications / Field Quality Procedures as per applicable standards. In case of modification/correction to be carried out, Bidder shall carry out the said modifications/correction without additional cost. The Bidder 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 Bidder shall be solely responsible for any shortage or damage of materials issued to them handling of and / or in storage and erection at site and cost of the same will be recovered from the Bidder as certified by Engineer In-Charge. Bidder 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 Bidder shall maintain an accurate and exhaustive record detailing out the list of all items received by him for the purpose of erection and keep such record open for the inspection of the company.

15. PENALTY AND LIQUIDATED DAMAGES

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

15.2 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 Bidder, the Bidder shall pay to the Company liquidated damages.

If the Bidder failed perform the services within the time period specified in the order, the Company shall, without prejudice to its other remedies under the contract, deduct liquidated damages a sum equivalent to 0.5 % of the total order value for each week or part there of delay until the actual date of completion up to a maximum deduction of 10% of total order value. The levy payment or deduction of such damages shall not relieve the Bidder from his obligation to complete the Works on time or from any other part of his obligation and liabilities under the Contract. Once the maximum is reached, the Company reserves the right for termination of contract without any liabilities to the Company.

In the event of an extension of time being granted by the EIC, in writing for the Completion of the works, this clause shall be applicable after the expiry of such an extended period.

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

16. SAFETY REGULATIONS & SAFETY CODE:

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

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

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.

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

The cost so incurred by the Bidder 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 Bidder on this account.

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

The Bidder 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 Bidder shall not deploy any worker below the age of 18 years.

The Bidder 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 Bidder that all safety requirements are followed by the employees and staff of the sub-vendor.

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

17. STATUTORY OBLIGATIONS:

The Bidder 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) GST & PAN No.
f) Work Contract Tax Registration Number/ GSTN Registration.
g) Labour License under Contract Labour Act (R & A) Act 1970

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

The Bidder must follow:

a) Third party Insurance Policy before start of work.
b) To follow Minimum Wages Act prevailing in the state.
c) Salary / Wages to be distributed in presence of representative of Company's representative not later than 7th of each month.
d) To maintain Wage- cum - Attendance Register.
e) To maintain First Aid Box at Site.

f) Latest P.F. and E.S.I. challans pertaining to the period in which work was undertaken along with a certificate mentioning that P.F. and E.S.I. applicable to all the employees has been deducted and deposited with the Authorities within the time limits specified under the respective Acts.
g) Workman Compensation Policy. {If applicable}
h) Labour license before start of work. {If applicable}.

18. WORKMAN COMPENSATION:

The Contactor shall take insurance policy under the Workman Compensation Act to cover such workers who are not covered under ESI and PF by the Bidder 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 Bidder, the Bidder shall certify for the same.

The Bidder shall keep the company indemnified at all times, against all claims of compensation under the provision of Workmen Compensation Act 1923 and as amended from time to time or any compensation payable under any other law for the time being workman engaged by the Bidder/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 Bidder, moneys paid or payable by way of compensation as aforesaid or cost or expenses in connection with any claims thereto and the Bidder shall abide by the decision of the Company as to the sum payable by the Bidder under the provisions of this clause.

19. STAFF AND WORKMAN

It shall be responsibility of Bidder

(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) ReAISter of muster roll.
c) ReAISter of overtime.

d) ReAISter of wages.

e) Any other reAISter 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 Bidder 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 Bidder.

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

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

20. INSURANCE

a) THIRD PARTY INSURANCE

Before commencing the execution of the work the Bidder 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 Bidder shall be responsible for settlement of claims with the underwriters without any liability on the purchaser / owner and will arrange replacements / rectification expeditiously without awaiting settlement by insurance claim at Bidders own cost.

b) ACCIDENTAL INSURANCE POLICY FOR LIFE COVER:

Before commencing the execution of the work, the Bidder shall take Accidental insurance policy for the staff engaged by him for this work to insure against any loss of life which may occur during the contract for the work of the Company. The policy shall have coverage of Rs. 10 Lacs (Table C- Death + Permanent Total Disability + Partial permanent Disability due to external accidents). The Bidder shall be responsible for on the spot same day claim settlement with the

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

c) INSURANCE FOR MAN, MATERIAL & MACHINERY DEPLOYED AT SITE

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

21. SECURITY

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

22. ENVIRONMENTAL, HEALTH & SAFETY PLAN:

Bidder 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. Bidders 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 Bidders staffs are accountable for the following:

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

23. TEST CERTIFICATE & QUALITY ASSURANCE:

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

24. SUB-CONTRACTING / SUBLETTING:

BIDDER 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 Bidder assigns this work order, Bidder'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, Bidder shall remain wholly responsible for the carrying out, completion and satisfactory execution of Works in all respects in accordance with this Work Order, specification, approved drawings and data sheets.

25. INDEMNITY:

Bidder 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 Bidder or its employees or agents of any of the provisions of this Work Order.
B. Any act or omission of Bidder or its employees or agents.
C. Any negligence or breach of duty on the part of Bidder, its employees or agents including any wrongful use by it or them of any property or goods belonging to or by COMPANY or any other third party at site including adjoining neighbors.

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

26. EVENTS OF DEFAULTS:

COMPANY may, without prejudice to any of its other rights or remedies under the Work Order or in law, terminate the whole or any part of this Work Order by giving written notice to the Bidder, if in the opinion of COMPANY, Bidder 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 sub-vendor 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 tender, the contractor shall be liable to COMPANY for any additional costs that may be incurred by COMPANY for the execution of the Work.

27. RISK & COST:

If the Contractor of fails to execute the work as per specification / as per the direction of Engineer's In-change 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 Contractor.

28. ARBITRATION:

To the best of their ability, the parties hereto shall endeavor to resolve amicably between themselves all disputes arising in connection with the proposed Agreement. If the same remain unresolved, within fifteen (15) 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 a sole arbitrator to be appointed by the company. The decision of the arbitrator is final and binding upon both the parties. The arbitration proceeding shall be conducted in accordance with the provisions of the Indian Arbitration & Conciliation Act, 1996 and the venue of such arbitration shall be New Delhi only.

29. FORCE MAJEURE:

29.1 General:

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

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

(ii) Such event or circumstance materially and adversely affects the ability of the affected Party to perform its obligations under this Contract, and the affected Party has taken all reasonable precautions, due care and reasonable alternative measures in order to prevent or avoid the effect of

such event on the affected parties ability to perform its obligations under this Contract and to mitigate the consequences thereof. For the avoidance of doubt, if such event or circumstance would not have materially and adversely affected the performance of the affected party had such affected party followed good industry practice, such event or circumstance shall not constitute force majeure.

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

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

29.2 Specific Events of Force Majeure:

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

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

b) Explosions or fires

c) Declaration of the Site as war zone.

d) Any order, regulation, directive, requirement from any Governmental, leAISlative, executive or judicial authority.

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

(i) Immediately notify the other party in writing of the force majeure events within 2 working days of the occurrence of the force majeure event

(ii) Be entitled to suspend performance of the obligation under the Contract which is affected by force majeure event for the duration of the force majeure event

(iii) Use all reasonable efforts to resume full performance of the obligation as soon as practicable

(iv) Keep the other party informed of all such efforts to resume full performance of the obligation on a regular basis

(v) Provide prompt notice of the resumption of full performance or obligation to the other party.

29.4 Mitigation of events of force majeure:

The Bidder shall:

(i) Make all reasonable efforts to prevent and reduce to a minimum and mitigate the effect of any delay occasioned by an Event of Force Majeure, including applying other ways in which to perform the Contract;

(ii) Use its best efforts to ensure resumption of normal performance after the termination of any Event of Force Majeure and shall perform its obligations to the maximum extent practicable as agreed between the Parties; and Keep the Company informed at regular intervals of the circumstances concerning the event of Force Majeure, with best estimates as to its likely continuation and what measures or contingency planning it is taking to mitigate and or terminate the Event of Force Majeure.

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

29.6 Terminations for certain events of force majeure:

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

30. SECRECY CLAUSE:

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

This technical information, drawing and other related documents shall be returned to the Company with all approved copies and duplicates including drawing/plans as are prepared by the Bidder 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 Bidder shall indemnify the Company against any loss, cost or damage or claim by any party in respect of such breach.

31. TERMINATION

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

31. A) TERMINATION BY EMPLOYER FOR CONVENIENCE

The Employer shall, in addition to any other right enabling it to terminate the Contract, have the right to terminate the Contract at any time by giving a written notice to the Contractor. The Contract shall stand terminated on receipt of such notice but such termination shall be without prejudice to the rights of the Parties accrued on and before the date of termination.

32. QUALITY

Contractor shall ensure that strict quality is maintained in the Performa 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.
Contractor shall prepare the quality plan as per the specifications and shall strictly monitor compliance with the approved quality plan during the entire period of this Work Order.
Contractor shall submit duly approved Quality Check sheets along with final bill and the same shall be integral part of final Quality Clearance.

33. LIABILITY OF BIDDERS

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

a) For any indirect or consequential loss or damage; and
b) For any direct loss or damage that exceeds:

(i) The total payments made and expected to be made to the Bidder under the Contract including reimbursements, if any; or
(ii) The insurance claim proceeds which the Bidder may be entitled to receive from any insurance purchased by the Bidder to cover such a liability, whichever is higher.
This limitation of liability shall not affect the Bidder's liability, if any, for damage to any third party, caused by the Bidder or any Person or firm acting on behalf of the Bidder in executing the Works.
Notwithstanding anything contained in the Contract, the Bidder shall not be liable for any gross negligence or willful misconduct on the part of the Employer or any of its affiliates, any Bidder, or any party, other than Bidder and/or, its directors, officers, agents or representatives or its affiliates, or Sub-vendor, or the Bidder or any third party engaged by it.
Notwithstanding anything contained in the Contract, including but not limited to approval by the Employer of any drawings, documents, Bidder list, supply of information or data or the participation

of the Employer in any meeting and/or discussion or otherwise, shall not absolve the Bidder from any of its liabilities or responsibilities arising in relation to or under the Contract.

34. CLEANLINESS & PRECAUTIONS TO BE TAKEN WHILE DOING WORK 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.

1. No construction material/ debris shall be stored on metalled road.
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.
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.
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.
5. Over loading of vehicles shall be strictly prohibited.
6. The construction material at site shall be stored under wet and covered condition.
7. The dumping sites for temporarily storing the excavated earth shall be properly levelled, watered and rehabilitated by plantation to avoid flying of dust.
8. The worker at the site shall be sensitized to adopt / observe the dust controlled measures in true spirit.
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.
10. Wet jet in grinding and stone cutting is being permitted at site.
11. The necessary record for dust control is being maintained by the department on day to day basis and being monitored regularly.

GUIDELINES REGARDING INSPECTION & MAINTENANCE OF PITS/ DUG AREA WHILE DOING WORK AT SITE IN BRPL AREA

The contractor shall ensure strict compliance of the following directions:

a) The sites of all manholes, pits, holes, tanks or any other opening in the ground of any kinds shall be regularly inspected and maintained.

b) Schedule and protocols of inspections and maintenance shall be drawn up and notified to BRPL.

c) These sites shall be cordoned off to render them inaccessible to the public.

d) The existence of these sites shall be clearly & visibly marked by the display of signboards/signages.

e) If they are required to be covered, it shall be ensured that the covers are in place.

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 BRPL from all liabilities on this account.

SECTION V

PART-A- SUPPLY

PRICE FORMAT – SUPPLY								
33kV Grid Substation, DTC Depot, Kushak Nallah								
S No.	**Item Description**	**UOM**	**QTY**	**Basic (Rs)**	**Freight (Rs)**	**GST (Rs)**	**Unit Landed (Rs)**	**Total Landed Cost (Rs)**
1	MS Steel structure (As per tech. specification)	LOT	1					
2	Fire Alarm System(As per tech. specification)	LOT	1					
3	Earthing System(As per tech. specification)	LOT	1					
4	DSLP System(As per tech. specification)	LOT	1					
5	Cable Sealing Solution(As per tech. specification)	LOT	1					
6	Fire Extinguishers, Safety Mat etc. (As per tech. specification)	LOT	1					
7	Cable Tray(As per tech. specification)	LOT	1					
8	Supply of Gland, Lugs etc for cable termination(As per tech. specification)	LOT	1					
9	Lighting of Outdoor area (As per tech. specification)	LOT	1					
10	Lighting of inside substation building including Emergency Lighting (As per tech. specification)	LOT	1					
11	Air Conditioning System and Exhaust Fans (As per tech. specification)	LOT	1					
12	Video Monitoring system of entire substation (As per tech. specification)	LOT	1					
13	Spares (As per tech. specification)	LOT	1					
Grand Total Landed Cost in Rs.								

BOQ shall be read in conjunction with the Tender Document & General Design Criteria

Appendix- I

COMMERCIAL TERMS AND CONDITIONS - SUPPLY

Sl No	Item Description	AS PER BRPL	BIDDER'S CONFIRMATION
1	Validity	120 days from the due date of submission or amended due date of submission	
2	Price basis	a) **Firm**, FOR Delhi store basis. Prices shall be inclusive of all taxes & duties, freight up to Delhi stores. b)Unloading at stores - in vendor's scope c) Transit insurance in Bidder scope	
3	Payment terms	a. 85 % against R/A bills within 30 days against receipt of material at site. b. 10% pro-rata after installation/erection of equipment c. 5% pro-rata after completion of successful acceptance testing, commissioning and handing over of the entire Installation and duly certified by BRPL Project-in-charge.	
4	Completion time	6 months from date of LOI/Order	
5	Defect Liability period	24 months from the date of Handing over of entire Installation.	
6	Liquidated damages	0.5% of total price for every week delay subject to maximum of 10% of total contract value	
7	Contract Performance Bank Guarantee	10% (Ten percent) of the total Contract value valid up to Defect Liability Period plus 3 months towards claim period.	

SECTION VII

PART-A- ERECTION, TESTING & COMMISSIONING

PRICE FORMAT – ERECTION, TESTING & COMMISSIONING OF 33KV AIS GRID SUBSTATION						
33kV Grid Substation, DTC Depot, Kushak Nallah						
Sr.No.	**Service Code**	**Description**	**Units**	**Qty**	**Basic (Rs)**	**Total amount in Rs.**
1	4060425	Transportation of various electrical equipment / material from various BRPL / BYPL Store / any site to the site of work in the Union Territory of Delhi including loading and unloading at both ends manually / by using suitable T&P for safe loading/ unloading.The material transported at site should be placed inyard where ever required. by Using Crane.	TRP	16		
2		Making of GIS Joint Boxes	EA	6		
3	4060249	Fabrication MS structure for different equipment like isolator, C.T.'s, P.T.'s, CVT, LA's etc, cable supporting structure including supply of nuts and bolts, consumables , welding electrode, hacksaw blades etc. excluding supply of steel.	MT	1.5		
4	4060348	Erection of MS as well as galvanised structure for different equipment like isolator, C.T.'s, P.T.'s, CVT, LA's , ISO etc, cable supporting structure, 33kV/66 kV GI gantry structure , Tower Structure i/c consumables , welding electrode ,tack welding & hacksaw blades etc.	MT	1.5		
5	4060400	Painting of Fabrication MS	KG	1500		

		Structure for diff.equip.				
6	4060176	Erection of electrical equipment Including supply of T & P, all consumable items such as welding rods, hacksaw blades etc and minor modification in support structure for fixing as required.**For 33 kV Indoor switchgear, Line panel with single bus bar arrangement**	EA	5		
7	4060178	Erection of electrical equipment Including supply of T & P, all consumable items such as welding rods, hacksaw blades etc and minor modification in support structure for fixing as required.**For 33 kV Indoor switchgear, Bus coupler panel with single bus bar arrangement**	EA	1		
8	4060179	Erection of electrical equipment Including supply of T & P, all consumable items such as welding rods, hacksaw blades etc and minor modification in support structure for fixing as required.**For 33 kV Indoor switchgear, Bus PT panel with single bus bar arrangement**	EA	1		
9	4060180	Erection of electrical equipment Including supply of T & P, all consumable items such as welding rods, hacksaw blades etc and minor modification in support structure for fixing as required.**For 33 kV/11kv Indoor switchgear, Bus trunking panel with single bus bar arrangement**	EA	1		

10	4060187	Erection of electrical equipment Including supply of T & P, all consumable items such as welding rods, hacksaw blades etc and minor modification in support structure for fixing as required.**For DC Battery Bank 50 V, 100 AH/150 AH complete with accessories I.e. wooden structure, battery cells**	EA	1		
11	4060188	Erection of electrical equipment Including supply of T & P, all consumable items such as welding rods, hacksaw blades etc and minor modification in support structure for fixing as required.**For 50/220 V DC distribution Board**	EA	1		
12	4060189	Erection of electrical equipment Including supply of T & P, all consumable items such as welding rods, hacksaw blades etc and minor modification in support structure for fixing as required.**For 50/220 V Float cum boost battery charger**	EA	1		
13	4060219	Laying, dressing, megger and contnuity test of PVC, armoured control and auxilary power cables in excavated trench/cable trays .**For 10CX2.5 sqmm, Cu**	M	2000		
14	4060221	Laying, dressing, megger and contnuity test of PVC, armoured control and auxilary power cables in excavated trench/cable trays .**For 6/5CX2.5 sqmm, Cu**	M	2000		
15	4060235	Erection of double compression gland including termination **For 10CX2.5**	EA	250		

		sqmm, Cu				
16	4060237	Erection of double compression gland including termination **For 5CX2.5 sqmm, Cu**	EA	250		
17	4060412	Supply of Glands 10X2.5MM	EA	250		
18	4060413	Supply of Glands 5X 2.5MM	EA	250		
19	3003170	Laying of HT/LT cable of following size in S/ Stn. Trench. Above 70 sq mm upto 150 sqmm	M	500		
20	3003171	Laying of HT/LT cable of following size in S/ Stn. Trench. Up to 70 sqmm.	M	200		
21	4060208	Laying of MS flat in the excavatd trench including risers, equipment earthing, overlapping of MS flat at the joints by twice of its width and welding of over lapping and cross joints including supply of electrodes, red oxide/bitumin compound , paint etcand Laying of GI earth strip for equipment earthing, along the wall, trench, cable trays etc including fabrication of supports/cleats and fixing with wall bolts, welding works, painting of earth strip and riser with red oxide paint/bitumin compound and final. **For 50X6 sqmm**	M	2000		
22	4060205	Excavation of trench below the ultimate good earth level in following type of soil including refilling after laying of eath mat riser, fixing of earth electrodes welding etc. **For Soft soil**	CUM	30		

23	4060206	Excavation of trench below the ultimate good earth level in following type of soil including refilling after laying of eath mat riser, fixing of earth electrodes welding etc. **For Semi rocky/rocky soil with providing of good earth**	CUM	30		
24	4060405	Digging of earth pit upto depth of 10 ft. inrocky/ semi rocky as per feasibility at site of embedding 600 x600mm earth plate with M.S Flate 50 x8 mm running the same through 3/4 " dia G.I. grouting pipe. Earth Plate to be covered by charcoal 200kg. And 100 Kg. Sodium chloride in the earth pit and refilling etc. NOTE: Charcoal, commonsalt, earth plate, G.I. Pipe, MS flat, Badarpur, Cement and bricks to be supplied by the contractor	EA	10		
25	4060409	Making of civil goomitties around GI earthpipe as per standard design of BSES. Supply of necessary bricks, cement, badarpur, sand, C1 cover of size 1'x1' and providing the same at the top of goomitties.	EA	10		
26		ETC of Fire Extinguisher and mat	LOT	1		
27		ETC of Fire Detection and alarmSystem	LOT	1		
28		ETC of ACDB	EA	1		
29		ETC of Building and Outdoor Lightning	LOT	1		
30		ETC of Cable Trays	LOT	1		

31		ETC of Cable Seal	LOT	1		
32		ETC of cabling b/w RTU	LOT	1		
33		ETC of GIS panels alongwith CRP	NOS	3		
34		ETC of Exhaust/ Ventillation/ Air conditioning system	LOT	1		
35		ETC of Grounding & Earthing of entire substation	LOT	1		
36		Indoor LE Lighting system including emergency lighting	LOT	1		
37		CCTV camera/ Video survillience/ Access control/ Grid monitoring system	LOT	1		
		Total Labour Cost: Grid Substation in Rs.				
		GST@18%				
		Grand Total Grid substation cost in Rs.				

Appendix-II

COMMERCIAL TERMS AND CONDITIONS – E/T/C

Sl No	Item Description	AS PER BRPL	BIDDER'S CONFIRMATION
1	Validity	120 days from the due date of submission or amended due date of submission	
2	Price basis	**Firm**. Prices shall be inclusive of all taxes & duties.	
3	Payment terms	a) 85% pro-rata of total installation value shall be payable against R/A bills payable within 45 days after installation/erection of material at site duly certified by Engineer in charge. c) 10% pro-rata of total installation value shall be payable against R/A bills payable within 30 days after testing & commissioning of material at site duly certified by Engineer in charge. d) 5% of contract value payable after completion of successful acceptance testing, commissioning and handing over of complete systems duly certified by Engineer in charge, submission of Electrical Inspector Clearance Certificate.	
4	Completion time	08 months from date of LOI/Order	
5	Defect Liability period	24 months from the date of Handing over of entire Installation.	
6	Liquidated damages	0.5 % of the order value for each week or part there of delay until the actual date of completion up to a maximum deduction of 10% of total order value	
7	Contract Performance Bank Guarantee	10% (Ten percent) of the total Contract value valid up to Defect Liability Period i.e. 24 months from the date of Handing over of entire Installation plus 3 months towards claim period.	

SECTION V

PART-B- SUPPLY

PRICE FORMAT – SUPPLY OF MISCELLANEOUS MATERIAL OF PSS								
33/.433 kV Package Substation, DTC Depot,Kushak Nallah against SCHEME no. ES22GS1016								
S No.	**Description**	**UOM**	**Qty**	**Basic (Rs)**	**Freight (Rs)**	**GST (Rs)**	**Unit Landed (Rs)**	**Total Landed Cost (Rs)**
1	Structural Steel (CHNL,STRCTL,ISMC100;100MM;50mm; 7.7mm)	MT	1					
2	3M Long Perforated GI Pipe Electrode along with Treating agent	EA	14					
3	GI Strip 75MM*10MM for Earthing (STRIP,MTLC,EARTHNG;50X6MM;MS GALVANIZED)	KG	15000					
Grand Total Landed Cost in Rs.								

BOQ shall be read in conjunction with the Tender Document & General Design Criteria

Appendix- I

COMMERCIAL TERMS AND CONDITIONS - SUPPLY

Sl No	Item Description	AS PER BRPL	BIDDER'S CONFIRMATION
1	Validity	120 days from the due date of submission or amended due date of submission	
2	Price basis	a) **Firm**, FOR Delhi store basis. Prices shall be inclusive of all taxes & duties, freight up to Delhi stores. b)Unloading at stores - in vendor's scope c) Transit insurance in Bidder scope	
3	Payment terms	d. 85 % against R/A bills within 30 days against receipt of material at site. e. 10% pro-rata after installation/erection of equipment f. 5% pro-rata after completion of successful acceptance testing, commissioning and handing over of the entire Installation and duly certified by BRPL Project-in-charge.	
4	Completion time	6 months from date of LOI/Order	
5	Defect Liability period	24 months from the date of Handing over of entire Installation.	
6	Liquidated damages	0.5% of total price for every week delay subject to maximum of 10% of total contract value	
7	Contract Performance Bank Guarantee	10% (Ten percent) of the total Contract value valid up to Defect Liability Period plus 3 months towards claim period.	

PART-B- ERECTION, TESTING & COMMISSIONING

PRICE FORMAT-ERECTION, TESTING & COMMISSIONING OF 33/.433KV PACKAGE SUBSTATION						
33/.433 kV Package Substation, DTC Depot,Kushak Nallah against SCHEME no. ES22GS1016						
Sr.No.	**Service Code**	**Description**	**Units**	**Qty**	**Basic (Rs)**	**Total amount in Rs.**
1	4060426	Transportation of various electrical equipment / material from various BRPL / BYPL Store / any site to the site of work in the Union Territory of Delhi including loading and unloading at both ends manually / by using suitable T&P for safe loading/ unloading. The material transported at site should be placed inyard where ever required. by Manually.	TRP	5		
2	4060425	Transportation of various electrical equipment / material from various BRPL / BYPL Store / any site to the site of work in the Union Territory of Delhi including loading and unloading at both ends manually / by using suitable T&P for safe loading/ unloading.The material transported at site should be placed inyard where ever required. by Using Crane.	TRP	25		
3	4060427	Transportation of Empty cable drum from site to site or from site to store any where in Union teritory of Delhi.	TRP	10		
4	4060369	Digging of cable trench as per specification and drawings. Rate is inclussive of digging and backfilling. Measurement shall be as per actual depth excavated . For Dense Carpeted bituminous Road.	CUM	85		
5	4060377	Digging of joint pit suitable for 33/66 KV cable joint box and covering the joint box with sand and providing protection as per BYPL/BRPL design. Dence carpet	CUM	18		
6	4060383	Digging of test pits of requried size(not lessthan 1/2 Mtr. Wide at site for identification of cable route). Relevent volume shall be deducted from quantities of same item of cable digging For Dense carpeted bituminous road / CC Road	EA	4		
7	4060372	Removal of Malba including Loading / Unloading on own vehicle. The payment shall be restricted to the quantity of sand laid.	CUM	16		

8		Laying of under ground cable in trench, supply and fixing of cable identification tags (9" X 4") at every 30 Mtrs, refilling the trench and ramming the surface, including watch and ward till charging of cable (This activity includes only labour jobs) for 33 KV three core cable Running Mtr	M	2000		
9	4060373	Supply of Sand for cable route as per BRPL/BYPL specification	CUM	47		
10		Laying Sand Cushioning for cable route as per BRPL/BYPL specification,Sand cushion will be min 75mm below and 75mm above the cable,	CUM	47		
11		Supply of HDPE pipes as per IS ,PN 6 class PE 80 - 180mm dia	M	100		
12	3005531	Crossing of roads by trench-less technology by laying of HDPE pipe excluding supply of pipe .Laying by Pneumatic Jack Hammer Road Cutting.laying . 180-mm dia	M	100		
13	4060394	Charges for Hi pot test - Testing equipment to be provided by the contractor. For 33 KV cables	EA	14		
14	4060249	Fabrication MS structure for different equipment like isolator, C.T.'s, P.T.'s, CVT, LA's etc, cable supporting structure including supply of nuts and bolts, consumables , welding electrode, hacksaw blades etc. excluding supply of steel.	MT	1		
15	4060348	Erection of MS as well as galvanised structure for different equipment like isolator, C.T.'s, P.T.'s, CVT, LA's , ISO etc, cable supporting structure, 33kV/66 kV GI gantry structure , Tower Structure i/c consumables , welding electrode ,tack welding & hacksaw blades etc.	MT	1		
16	4060400	Painting of Fabrication MS Structure for diff.equip.	KG	1000		
17	3003170	Laying of HT/LT cable of following size in S/ Stn. Trench. Above 70 sq mm upto 150 sqmm	M	1000		
18	3007222	Supply and making connections at where ever required (feeder pillars/service pillars/ LT panel etc.) with following size of socket including crimping of socket and complete armouring AL 25 sqmm sockets	EA	96		

19	4060208	Laying of MS flat in the excavatd trench including risers, equipment earthing, overlapping of MS flat at the joints by twice of its width and welding of over lapping and cross joints including supply of electrodes, red oxide/bitumin compound , paint etcand Laying of GI earth strip for equipment earthing, along the wall, trench, cable trays etc including fabrication of supports/cleats and fixing with wall bolts, welding works, painting of earth strip and riser with red oxide paint/bitumin compound and final. **For 50X6 sqmm**	M	700		
20	4060206	Excavation of trench below the ultimate good earth level in following type of soil including refilling after laying of eath mat riser, fixing of earth electrodes welding etc. **For Semi rocky/rocky soil with providing of good earth**	CUM	30		
21	4060405	Digging of earth pit upto depth of 10 ft. inrocky/ semi rocky as per feasibility at site of embedding 600 x600mm earth plate with M.S Flate 50 x8 mm running the same through 3/4 " dia G.I. grouting pipe. Earth Plate to be covered by charcoal 200kg. And 100 Kg. Sodium chloride in the earth pit and refilling etc. NOTE: Charcoal, commonsalt, earth plate, G.I. Pipe, MS flat, Badarpur, Cement and bricks to be supplied by the contractor	EA	14		
22	4060409	Making of civil goomitties around GI earthpipe as per standard design of BSES. Supply of necessary bricks, cement, badarpur, sand, C1 cover of size 1'x1' and providing the same at the top of goomitties.	EA	14		
23	4060396	Mounting of 33KV,3x400sq.mm.XLPE cable with cable end box on the steel structure and fixing it with suitable wooden cleats (wooden cleats shall be supplied by contractor) i/c.its jumpering with the isolator as required.	EA	16		
24	3005325	Supply and fixing of wire mesh fencing 2.5 mtr height with gate frame of 3 mtr x 2.5 mtr with complete material including painting eg angle,chain link,wire mesh and civil material etc complete as per specification & drawing of BSES.Angle iron size 50x50x6 mm & MS strip 50 x 3 mm,Wire mesh 1"x3" of 8 SWG wire to be used for wire-mesh with providing support at 1.25m distance.	SQM	210		
25		ETC OF Package Substation including : 1. Installation of Package Substation on Plinth, 2. Pre Commissioning Testing of the Package Substation at Site, 3. Protection Testing of the Package Substation, 4. Energisation of the Package Substation	EA	7		

		Total Labour Cost: Grid Substation in Rs.			
		GST@18%			
		Grand Total Grid substation cost in Rs.			

Appendix-II

COMMERCIAL TERMS AND CONDITIONS – E/T/C

Sl No	Item Description	AS PER BRPL	BIDDER'S CONFIRMATION
1	Validity	120 days from the due date of submission or amended due date of submission	
2	Price basis	**Firm**. Prices shall be inclusive of all taxes & duties.	
3	Payment terms	a) 85% pro-rata of total installation value shall be payable against R/A bills payable within 45 days after installation/erection of material at site duly certified by Engineer in charge. c) 10% pro-rata of total installation value shall be payable against R/A bills payable within 30 days after testing & commissioning of material at site duly certified by Engineer in charge. d) 5% of contract value payable after completion of successful acceptance testing, commissioning and handing over of complete systems duly certified by Engineer in charge, submission of Electrical Inspector Clearance Certificate.	
4	Completion time	08 months from date of LOI/Order	
5	Defect Liability period	24 months from the date of Handing over of entire Installation.	
6	Liquidated damages	0.5 % of the order value for each week or part there of delay until the actual date of completion up to a maximum deduction of 10% of total order value	
7	Contract Performance Bank Guarantee	10% (Ten percent) of the total Contract value valid up to Defect Liability Period i.e. 24 months from the date of Handing over of entire Installation plus 3 months towards claim period.	

SECTION X
GRAND SUMMARY OF THE QUOTED PRICE

Sr. Nos.	PART	SCHEME DESCRIPTION	Total price for supply F.O.R site inclusive all duties taxes	Total for Erection, Testing & Commissioning inclusive all Taxes(INR)	Grand Total(INR)
1	PART-A	Installation, Testing and Commissioning of 33 KV AIS Kushak Nallah Grid substations with supply of miscellaneous materials at BRPL, New Delhi.			
2	PART-B	Installation, Testing and Commissioning of 7 nos. 33/.433 KV Package substation with supply of miscellaneous materials at Kushak Nallah BRPL, New Delhi against SCHEME no. ES22GS1016.			
	TOTAL Package Cost				
In words :					

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

Date: Bidder Name:

Place: Bidders Address:

Name & Signature ……..

Designation: ……

Common Seal:……..

APPENDIX IV

BID FORM

To

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

Sir,

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

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

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

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

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

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

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

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

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

Dated this..... day of..... 22…..

Signature..... In the capacity of

……duly authorized to sign for

and on behalf of

(IN BLOCK CAPITALS).....

Appendix V

ACCEPTANCE FORM FOR PARTICIPATION IN REVERSE AUCTION EVENT

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

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

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

1. In case of bidding through Internet medium, bidders are advised to ensure availability of all associated infrastructure as required to participate in the reverse auction event. Inability to bid due to telephone glitch, internet response issues, software & hardware hangs/failures, power failures or any other reason shall not be the responsibility of BRPL.
2. In case bidder fails to participate in the reverse auction event due to any reason whatsoever, it shall be presumed that the bidder has no further discounts to offer and the initial bid submitted by them as a part of tender shall be considered as bidder's Final No Regret offer. Any off-line price bids received from a bidder in lieu of non-participation in the reverse auction event shall be rejected by BRPL.
3. The bidder is advised to understand the auto bid process t safeguard themselves against any possibility of non-participation in the reverse auction event.
4. The bidder shall be prepared with competitive price quotes during the day of reverse auction event.
5. The prices quoted by bidder in reverse auction event shall be on FOR Landed cost BRPL Store/site basis inclusive of all relevant taxes, duties, levies, transportation charges etc.
6. The prices submitted by the bidder during reverse auction event shall be binding on the Bidder.

7. The bidder agrees to non-disclosure of trade information regarding bid details e.g. purchase, Identity, bid process/technology, bid documentation etc.

8. BRPL will make every effort to make the bid process transparent. However award decision of BRPL will be final and binding on the bidder.

9. The prices submitted during reverse auction event shall be binding on the bidder.

10. No request for Time extension of the reverse auction event shall be considered by BRPL.

11. BRPL shall provide the user id and password to the authorized representative of the bidder. Authorization letter in lieu of the same shall be submitted along with the signed and stamped acceptance form.
12. The original price bids of the bidders shall be reduced on pro-rata basis against each line item based on the final all inclusive prices offered during conclusion of the reverse auction event for arriving at contract amount

APPENDIX VI

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 reAIStered office at[*address of the reAIStered office of the bank*](herein after called the "Bank"),are bound unto BSES Rajdhani Power Ltd., with it's Corporate Office at BSES Bhawan Nehru Place, New Delhi -110019 ,(herein after called —the "Purchaser")in the sum of Rs. ……/- (Rupees …….. only) for which payment well and truly to be made to the said Purchaser, the Bank binds itself, its successors, and assigns by these presents.

Sealed with the Common Seal of the said Bank this_____ day of_____ 20____.

THE CONDITIONS of this obligation are:

1 If the Bidder withdraws its Bid during the period of bid validity specified by the Bidder on the Bid Form ; or

2. If the Bidder, having been notified of the acceptance of its Bid by the Purchaser during the period of bid validity:

(a) Fails or refuses to execute the Contract Form, if required; or

(b) Fails or refuses to furnish the performance security, In accordance with the Instructions to Bidders/ Terms and Conditions;

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

This guarantee will remain in force up to and including One Hundred Twenty (120) days after the due date of submission bid, and any demand in respect thereof should reach the Bank not later than the above date.

(Stamp & signature of the bank)

Signature of the witness

APPENDIX - VII

LITIGATION HISTORY

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

APPENDIX - VIII

CURRENT CONTRACT COMMITMENTS/ WORK IN PROGRESS

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

APPENDIX - IX

FINANCIAL DATA

(Duly Certified by Chartered Accountant)

	FY 21-22	FY 20-21	FY 19-20
Total assets			
Current assets			
Total Liability			
Current Liability			
Profit before taxes			
Profit after taxes			
Sales Turnover			

APPENDIX X

CHECK LIST

Sl No	Description	Compliance
1	INDEX	YES/NO
2	COVERING LETTER	YES/NO
3	BID FORM (UNPRICED) DULY SIGNED	YES/NO
4	BILL OF MATERIAL (UNPRICED)	YES/NO
5	DOCUMENTS IN SUPPORT OF QUALIFICATION CRITERIA	YES/NO
6	TECHNICAL BID	YES/NO
7	ACCEPTANCE TO COMMERCIAL TERMS AND CONDITIONS	YES/NO
8	FINANCIAL BID (IN SEALED ENVELOPE)	YES/NO
9	EMD IN PRESCRIBED FORMAT	YES/NO
10	DEMAND DRAFT OF RS 1180/- DRAWN IN FAVOUR OF BSES RAJDHANI POWER LTD	YES/NO
11	POWER OF ATTORNEY/AUTHORISATION LETTER FOR SIGNING THE BID	YES/NO
12	FINANCIAL DATA IN TABULAR FORMAT	YES/NO
13	LIST OF CURRENT COMMITMENTS/ WORK IN PROGRESS	YES/NO
14	BANK SOLVENCY CERTIFICATE	YES/NO
15	NO LITIGATION CERTIFICATE	YES/NO

APPENDIX-XI

FORMAT FOR PERFORMANCE BANK GUARANTEE

(TO BE ISSUED ON RS 1OO/- STAMP PAPER)

Bank Guarantee No.

Place:

Date:

To
BSES Rajdhani Power Limited

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

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

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

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

And whereas the Bank under instructions from the Supplier has agreed to guarantee dIe due performance of the Contract.
Now it is agreed as follows:

1. we (Name of the Bank) having its Head Office at
(hereinafter referred to as the Bank, which expression shall unless repugnant to the context or meaning thereof, include its successors, administrators, executors and assigns) 5hall indemnify and keep indemnified the Purchaser for, and guarantee and undertake to pay to the Purchaser immediately on written demand, a sum equivalent to % of the Contract Value
as aforesaid at any time upto (day/month/year) without any demur, reservation,
contest, recourse or protest and/or without any reference to the Supplier, against all losses, damages, costs and expenses that may be caused to or suffered by the Purchaser by reason of any default on the pall of the Supplier in performing and observing any and all the terms and conditions of the Contract or breach on the part if the Supplier of terms or conditions of the Contract.

2. The demand shall consist only of an original letter issued by Purchaser stating that the Supplier has failed to fulfill its obligations under the Contract. Such demand made by the Purchaser

on the Bank shall be conclusive and binding notwithstanding any difference or dispute between the Purchaser and the Supplier or any difference or dispute pending before any Court, Tribunal, Arbitrator or any other authority.

3. The Bank undertakes not to revoke this guarantee during its currency without previous written consent of the Purchaser and further agrees that the guarantee herein contained shall continue to be enforceable during the period that would be taken for satisfactory performance and fulfillment in all respects of the Contract or in the event of any dispute between the Purchaser and Supplier until the dispute is settled (provided that d1e claim! demand under this guarantee is lodged /referred during the currency of this guarantee) or till the Purchaser discharges this guarantee whichever is earlier.

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

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

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

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

Dated this Witness day of 22……. at

1. For Bank

2. Signature
Name Power of Attorney No:

Banker's Seal

SECTION XI

VENDOR CODE OF CONDUCT

Bidder shall agree to comply with Vendor code of Conduct as mentioned in BRPL Website. Purchaser is committed to conducting its business in an ethical, legal and socially responsible manner. To encourage compliance with all legal requirements and ethical business practices, Purchaser has established this Vendor Code of Conduct (the "Code") for Purchaser's Vendors. For the purposes of this document, "Vendor" means any company, corporation or other entity that sells, or seeks to sell goods or services, to Purchaser, including the Vendor's employees, agents and other representatives. Fundamental to adopting the Code is the understanding that a business, in all of its activities, must operate in full compliance with the laws, rules and regulations of the countries in which it operates. This Code encourages Vendors to go beyond legal compliance, drawing upon internationally recognized standards, in order to advance social and environmental responsibility.

I. Labour and Human Rights

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

- Fair Treatment - Vendors must be committed to a workplace free of harassment. Vendors shall not threaten workers with or subject them to harsh or inhumane treatment, including sexual harassment, sexual abuse, corporal punishment, mental coercion, physical coercion, verbal abuse or unreasonable restrictions on entering or exiting company provided facilities.
- Antidiscrimination - Vendors shall not discriminate against any worker based on race, colour, age, gender, sexual orientation, ethnicity, disability, religion, political affiliation, union membership, national origin, or marital status in hiring and employment practices such as applications for employment, promotions, rewards, access to training, job assignments, wages, benefits, discipline, and termination. Vendors shall not require a pregnancy test or discriminate against pregnant workers except where required by applicable laws or regulations or prudent for workplace safety. In addition, Vendors shall not require workers or potential workers to undergo medical tests that could be used in a discriminatory way except where required by applicable law or regulation or prudent for workplace safety.
- Freely Chosen Employment - Forced, bonded or indentured labour or involuntary prison labour is not to be used. All work will be voluntary, and workers should be free to leave upon reasonable notice. Workers shall not be required to hand over government-issued identification, passports or work permits as a condition of employment.

- Prevention of Under Age Labour - Child labour is strictly prohibited. Vendors shall not employ children. The minimum age for employment or work shall be 15 years of age, the minimum age for employment in that country, or the age for completing compulsory education in that country, whichever is higher. This Code does not prohibit participation in legitimate workplace apprenticeship programs that are consistent with Article 6 of ILO Minimum Age Convention No. 138 or light work consistent with Article 7 of ILO Minimum Age Convention No. 138.
- Juvenile Labour - Vendors may employ juveniles who are older than the applicable legal minimum age for employment but are younger than 18 years of age, provided they do not perform work likely to jeopardize their heath, safety, or morals, consistent with ILO Minimum Age Convention No. 138.
- Minimum Wages - Compensation paid to workers shall comply with all applicable wage laws, including those relating to minimum wages, overtime hours and legally mandated benefits. Any disciplinary wage deductions are to conform to local law. The basis on which workers are being paid is to be clearly conveyed to them in a timely manner.
- Working Hours - Studies of good manufacturing practices clearly link worker strain to reduced productivity, increased turnover and increased injury and illness. Work weeks are not to exceed the maximum set by local law. Further, a work week should not be more than 60 hours per week, including overtime, except in emergency or unusual situations. Workers should be allowed at least one day off per seven-day week.
- Freedom of Association - Open communication and direct engagement between workers and management are the most effective ways to resolve workplace and compensation issues. Vendors are to respect the rights of workers to associate freely and to communicate openly with management regarding working conditions without fear of reprisal, intimidation or harassment. Workers' rights to join labour unions, seek representation and or join worker's councils in accordance with local laws should be acknowledged.

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

The health and safety standards are:

- Occupational Injury and Illness - Procedures and systems are to be in place to prevent, manage, track and report occupational injury and illness, including provisions to: a) encourage worker reporting; b) classify and record injury and illness cases; c) provide necessary medical treatment; d) investigate cases and implement corrective actions to eliminate their causes; and e) facilitate return of workers to work.
- Emergency Preparedness - Emergency situations and events are to be identified and assessed, and• their impact minimized by implementing emergency plans and response procedures, including: emergency reporting, employee notification and evacuation procedures, worker training and drills, appropriate fire detection and suppression equipment, adequate exit facilities and recovery plans.
- Occupational Safety - Worker exposure to potential safety hazards (e.g., electrical and other energy sources, fire, vehicles, and fall hazards) are to be controlled through proper design, engineering and administrative controls, preventative maintenance and safe work procedures (including lockout/tagout), and ongoing safety training. Where hazards cannot be adequately controlled by these means, workers are to be provided with appropriate, well-maintained, personal protective equipment. Workers shall not be disciplined for raising safety concerns.
- Machine Safeguarding - Production and other machinery is to be evaluated for safety hazards. Physical guards, interlocks and barriers are to be provided and properly maintained where machinery presents an injury hazard to workers.
- Industrial Hygiene - Worker exposure to chemical, biological and physical agents is to be identified, evaluated, and controlled. Engineering or administrative controls must be used to control overexposures. When hazards cannot be adequately controlled by such means, worker health is to be protected by appropriate personal protective equipment programs.
- Sanitation, Food, and Housing - Workers are to be provided with ready access to clean toilet facilities, potable water and sanitary food preparation, storage, and eating facilities. Worker dormitories provided by the Participant or a labour agent are to be maintained clean and safe, and provided with appropriate emergency egress, hot water for bathing and showering, and adequate heat and ventilation and reasonable personal space along with reasonable entry and exit privileges.
- Physically Demanding Work - Worker exposure to the hazards of physically demanding tasks,• including manual material handling and heavy or repetitive lifting, prolonged standing and highly repetitive or forceful assembly tasks is to be identified, evaluated and controlled.

III. Environmental

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

The environmental standards are:

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

IV. Ethics

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

- Corruption, Extortion, or Embezzlement - Corruption, extortion, and embezzlement, in any form, are strictly prohibited. Vendors shall not engage in corruption, extortion or embezzlement in any form and violations of this prohibition may result in immediate termination as an Vendor and in legal action.

- Disclosure of Information - Vendors must disclose information regarding its business activities, structure, financial situation, and performance in accordance with applicable laws and regulations and prevailing industry practices.
- No Improper Advantage - Vendors shall not offer or accept bribes or other means of obtaining undue or improper advantage.
- Fair Business, Advertising, and Competition - Vendors must uphold fair business standards in• advertising, sales, and competition.
- Business Integrity - The highest standards of integrity are to be expected in all business interactions. Participants shall prohibit any and all forms of corruption, extortion and embezzlement. Monitoring and enforcement procedures shall be implemented to ensure conformance.
- Community Engagement - Vendors are encouraged to engage the community to help foster social and economic development and to contribute to the sustainability of the communities in which they operate.
- Protection of Intellectual Property - Vendors must respect intellectual property rights; safeguard customer information; and transfer of technology and know-how must be done in a manner that protects intellectual property rights.

V. Management System

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

The management system should contain the following elements:

- Company Commitment - Corporate social and environmental responsibility statements affirming Vendor's commitment to compliance and continual improvement.
- Management Accountability and Responsibility - Clearly identified company representative[s] responsible for ensuring implementation and periodic review of the status of the management systems.
- Legal and Customer Requirements - Identification, monitoring and understanding of applicable laws, regulations and customer requirements.
- Risk Assessment and Risk Management - Process to identify the environmental, health and safety and labour practice risks associated with Vendor's operations. Determination of the relative significance for each risk and implementation of

appropriate procedural and physical controls to ensure regulatory compliance to control the identified risks.

- Performance Objectives with Implementation Plan and Measures - Areas to be included in a risk assessment for health and safety are warehouse and storage facilities, plant/facilities support equipment, laboratories and test areas, sanitation facilities (bathrooms), kitchen/cafeteria and worker housing /dormitories. Written standards, performance objectives, targets and implementation plans including a periodic assessment of Vendor's performance against those objectives.
- Training - Programs for training managers and workers to implement Vendor's policies, procedures and improvement objectives.
- Communication - Process for communicating clear and accurate information about Vendor's performance, practices and expectations to workers, Vendors and customers.
- Worker Feedback and Participation - Ongoing processes to assess employees' understanding of• and obtain feedback on practices and conditions covered by this Code and to foster continuous improvement.
- Audits and Assessments - Periodic self-evaluations to ensure conformity to legal and regulatory• requirements, the content of the Code and customer contractual requirements related to social and environmental responsibility.
- Corrective Action Process - Process for timely correction of deficiencies identified by internal or• external assessments, inspections, investigations and reviews.
- Documentation and Records - Creation of documents and records to ensure regulatory compliance• and conformity to company requirements along with appropriate confidentiality to protect privacy.

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

ANNEXURE-III

ROUTE MAP


Restaurants
Hotels
Attractions
Transit
Parking
Pharmacies
ATMs
Sign in
33/0.4KV PKG S/Stn (Total- 7 nos.)
33KV switching substation
33KV Incoming cable entry
33KV outgoing cables in trenches
Old Meharchand Market
Fourth Ave Rd
Bhishma Pitamah Marg
PT Usha track field
Warm Up Track Of Jawaharlal Nehru...
Car park
Indian Social Institute
Kali Bari Temple Lodi colony
Kushak Nallah Depot
SDMC office
Manish Tailor
Clothing store
Baba Banda Singh Bahadur setu
Executive Engineer F 31 PWD
Baba Banda Singh Bahadur Setu
बाबा बंदा सिंह बहादुर सेतु
IndusInd Bank
Sewa Nagar Railway Colony Rd
सेवा नगर रेलवे कॉलोनी मार्ग
Sewa Nagar
Sewa Nagar, Railway Colony
fish shop (md hasnain)
Tropical fish store
O Block, Barat Ghar (Community Center)
Sister Nivedita Sarvoday Kanya Vidyalay
Defence Colony Masjid
Ratan Lal Sahdev Marg
M&CW SEWA NAGAR
Defence Colony Post Office
Chambers of Tanveer Ahmed Mir
Intellective Law Offices
Murari Tiwari & Associate
Arjun Marg
Chetna Marg
Chandi Vithi Rd
Layers
Google
Imagery ©2022 CNES / Airbus, Maxar Technologies, Map data ©2022
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ANNEXURE-IV

TECHNICAL SPECIFICATIONS

Specification for

2 MVA 33/0.433kV DTC CHARGING STATION

Specification no – **SP-DTCPT-00-R0**

PREPARED BY	REVIEWED BY	APPROVED BY	REV	DATE
JA/AM	Abhinav Srivastava	Gopal Nariya	00	17.02.2022

1.0 Scope of supply

The scope includes the following:

1.1 Survey, design, engineering, manufacture, shop testing, inspection, packing, dispatch, loading, unloading and storage at site, storage and construction insurance for 2 MVA 33/0.433 kV Compact Substation at Delhi Transport Corporation at different locations in New Delhi, BRPL.

1.2 Assembly , erection ,structural , complete pre commissioning checks , testing and commissioning at site , obtaining statutory clearance & certification from state electrical inspector, Municipal Corporation department, Fire Officer, Horticulture department and handing over to owner after successful testing & Commissioning of 2 MVA 33/0.433 kV Compact at Delhi Transport Corporation at different locations in New Delhi, BRPL.

2.0 Codes & standards

a) Materials, equipment and methods used in the manufacture of Distribution Transformer shall conform to the latest edition of below mentioned standards.

b) Vendor shall possess valid BIS Certification.

3.0 IEC Standards

IEC 60034	Rotating Electrical Machines. (E.g. For Cooler Fan Motors.)
IEC 60071	Co-ordination of Insulation.
IEC 60076	Power transformers.
IEC 60156	Method for Determination of the Electric Strength for Insulating Oils.
IEC 60044	Current Transformers.
IEC 60214	On Load Tap Changers
IEC 60296	Specification for Unused Mineral Insulating Oils for Transformers and Switchgear.
IEC 60354	Loading Guide for Oil-Immersed Power Transformers.
IEC 60445	Basic& Safety principles for man-machine interface, marking and identification, Identification of Equipment Terminals and conductor terminals
IEC 60529	Degrees of Protection Provided by Enclosures (IP Code).
IEC 60551	Determination of Transformer and Reactor Sound Levels.

IEC 60606	Application Guide for Power Transformers.
IEC 60616	Terminal and Tapping Markings for Power Transformers.
IEC 60947	Low-Voltage Switchgear and Control gear.
IEC 60947	Bushing for alternating voltage above 1000V

4.0 British Standard

BS 148	Determination of Transformer and Reactor Sound Levels.
BS 223	Application Guide for Power Transformers.
BS 2562	Terminal and Tapping Markings for Power Transformers.

5.0 Indian Standards

IS:335	Insulating oil
IS:1271	Thermal evaluation and classification of electrical insulation
IS:2099	Bushing for Alternating voltage above 1000V
IS:2705	Current Transformers
IS:3347	Dimensions for Porcelain Transformer bushing
IS:3637	Gas operated relays
IS:3639	Fitting & Accessories for power transformers
IS:4201	Application guide for CT's
IS:6600	Guide for loading of oil immersed transformers
IS:8478	Application guide for On-load tap changer
IS:8468	On-load tap changer
IS:10028	Code of practice for selection, installation & maintenance of transformers
IS:13947	LV switchgear and Controlgear-Part1
IS 2026	Power Transformers
IS 1180	Outdoor type oil immersed distribution transformer up to and including 2.0MVA,33kV
IS 5561	Electrical Power Connectors
IS 5	Colors for ready mix paints
IS 6272	Industrial cooling fans
IS 325	Three phase induction motors

	Indian Electricity Rules
	Indian Electricity Act
	CBIP manual

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

I. Guaranteed Technical Particulars (GTP)

ii. This Specification

Iii Indian Standards / IEC standards

IV Approved Vendor Drawings

iv. Other documents

6.0 Major Design Criteria & Parameters of the Transformer

Sr. No	Description	Data by purchaser
3.1	Voltage variation on supply side	+ / - 10 %
3.2	Frequency variation on supply side	+/ - 5 %
3.3	Transient condition	- 20 % or + 10 % combined variation of voltage and frequency
3.4	Service Condition	Refer Annexure B
3.5	Insulation level	Class A
3.6	Location of equipment	Generally Outdoor but may be located indoor also with poor ventilation
3.7	Reference design ambient temperature	50 deg C
3.8	Type	Oil immersed, core type, step down
3.9	Type of cooling	ONAN
3.10	Reference standard	IS 2026/IS 1180
3.11	No. of phases	3
3.12	No. of windings per phase	2
3.13	Rated frequency (Hz)	50 Hz
3.14	Highest system voltage HV side	36 kV
3.15	Highest system voltage LV side	460 volt

3.16	Lightning Impulse withstand voltage , kV peak	
3.16.1	For nominal system voltage of 33 kV	170
3.17	Power Frequency Withstand Voltage kV rms	
3.17.1	For nominal system voltage of 33 kV	70
3.17.2	For nominal system voltage of 415 V	3
3.18	Clearances Phase to Phase , mm	
3.18.1	For nominal system voltage of 33 kV	350
3.18.2	For nominal system voltage of 415 V	25
3.19	Clearances Phase to Earth , mm	
3.19.1	For nominal system voltage of 33 kV	320
3.19.2	For nominal system voltage of 415 V	25
3.20	System Fault Level , HV side	1500 MVA
3.21	System Fault Level , LV side	35 MVA
3.22	System earthing	
3.22.1	HV	Solidly earthed
3.22.2	LV	Solidly earthed
3.23	Ratings	2000 KVA
3.24	Percentage Impedance at 75 deg C	6.25 % with IS tolerance
3.25	Max Total losses(No Load+ Load Losses at 75ºC) at 50% of the rated load , kW	
3.25.1	2000 KVA	5.05
3.26	Max Total losses(No Load+ Load Losses at 75ºC) at 100% of the rated load , kW	
3.26.2	2000 KVA	15
3.27	Phase CT Ratio , Amp	
3.27.2	2000 KVA	3000/5
3.28	HV cable size for all sizes / Conductor size	

3.29	Tinned Copper Busbar size on HV side for cable termination, mm x mm	50x6
3.30	LV cable size, 650 /1100 V grade , A2XY cable single core 1000 sqmm unarmoured (approx cable dia 40 mm)	Cable
3.30.2	2500 KVA	4 runs per phase + 3runs in Neutral
3.31	Tinned Copper Busbar size on LV side for cable termination, mm x mm	
3.31.2	2500KVA	
3.31.2.1	Phase	2 runs 100 x 12
3.31.2.2	Neutral	2 runs 100 x 12
3.32	Maximum Overall Dimension Acceptable (length x width x height), mm x mm x mm	
3.32.2	2000 KVA	2500 x 2500 x 2500 Maximum
3.33	Short Circuit withstand Capacity of the transformer	
3.34	Three phase dead short circuit at secondary terminal with rated voltage maintained on the other side	For 3 secs.
3.35	Single phase short circuit at secondary terminal with rated voltage maintained on other side	For 3 secs.
3.36	Overload Capability	As per IS 6600/IEC 60905
3.37	Noise Level	2000 KVA-60/61 Db respectively
3.38	Radio Influence Voltage	Maximum 250 microvolt
3.39	Harmonic suppression	Transformer to be designed for suppression of 3rd, 5th, 7th harmonic voltages and high frequency disturbances.

3.40	Partial Discharge	Transformer to be free from partial discharge upto 120 % of rated voltage as the voltage is reduced from 150 % of rated voltage i.e. there shall be no significant rise above background level
3.41	Tappings	Off Circuit taps on HV winding , +5% to - 10% in steps of 2.5 % , change of taps by externally operated switch
3.41.1	Rotary tap switch operating voltage	33 kV
3.41.2	Rotary tap switch current rating, Amp.	
3.41.2.1	2000 KVA	150 Amp
3.42	Loss capitalization formulae	As per CBIP manual (see note)
3.43	No load Loss capitalization figure	
3.44	Load loss capitalization figure	

Note : The bidder shall guaranteed No load losses & load loss individually without any positive tolerance , the bidder shall also guarantee losses at 50 % and 100 % load (at rated voltage & frequency & 75 deg. C) and no positive tolerance shall be allowed on max. Total losses declared by bidder for 50 % & 100 % loading values. In the event of measured loss figures during testing exceeding the guaranteed loss figures of the successful bidder, penalty shall be applied at the rate of 1.25 times the figures mentioned Cl. 3.43 and 3.44 above.

7.0 Construction & Design

4.1	Type	Double Copper wound, three phase, oil immersed, with ONAN cooling, with off circuit tap changer
4.2	Major Parts	
4.2.1	Tank	
4.2.1.1	Design	i) Completely sealed type with corrugated fins and without conservator ii) Completely oil filled or N2 cushion at top filled with positive pressure. N2 shall be technical grade in accordance with IS:1747

		iii) With bolted / welded cover iv) Type tested design
4.2.1.2	Plate / Corrugated fin / tank features	i) Adequate for meeting mechanical & electrical withstand requirements, as per applicable standard. ii) The tank and its sealing (gaskets, o-rings, etc.) shall be of adequate strength to withstand positive and negative pressures built-up inside the tank while the transformer is in operation. The maximum pressure generated inside the tank shall be as per IS 1180(2014) iii) Corrugated fins shall be built up of CRCA sheets of minimum 1.2mm thick. iv) The corrugated tank wall shall ensure sufficient cooling of the transformer and compensate for the changes in the oil volume during operation. v) The transformer shall be capable of giving continuous rated output, without exceeding the specified temperature rise. vi) Internal clearance of tank shall be such that, it shall facilitate easy lifting of core with coils from the tank and HV & LV bushings mounted on Top cover. vii) All joints of tank and fittings shall be oil tight. The tank design shall be such that the core and windings can be lifted freely with cover. The tank plate shall be of such strength that the complete transformers when filled with oil may be lifted bodily by means of lifting lugs. viii) Tanks with corrugations & without conservator shall be tested for leakage at a pressure as per the applicable standard.
4.2.1.3	Material of Construction	Robust mild steel plate without pitting and low carbon content
4.2.1.4	Plate Thickness	Adequate for meeting the requirements of pressure and vacuum type tests as per IS
4.2.1.5	Welding features	i) All seams and joints shall be double welded ii) All welding shall be stress relieved for sheet thickness greater than 35 mm iii) All pipes, stiffeners, welded to the tank

		shall be welded externally
4.2.1.6	Tank features	i) Adequate space at bottom for collection of sediments ii) Stiffeners provided for rigidity and designed to prevent accumulation of water iii) No internal pockets in which gas/air can accumulate iv) No external pocket in which water can lodge v) Tank bottom with welded skid base vi) Tank cover sloped to prevent retention of rain water vii) Minimum disconnection of pipe work and accessories for cover lifting viii) Tanks shall be of strength to prevent permanent deformation during lifting, jacking, transportation with oil filled. ix) Tank to be designed for oil filling under vacuum x) Tank cover fitted with lifting lug xi) Tank cover bent at all the ends xii) Minimum disconnection of pipe work and accessories for cover lifting
4.2.1.7	Inspection cover for bushing & Core / Wind	As per manufacturer standard
4.2.1.8	Fittings and accessories on main tank	See under fittings and accessories.
4.2.2	**Core**	
4.2.2.1	Material	High grade , non ageing, low loss, high permeability, grain oriented, cold rolled silicon steel lamination
4.2.2.2	Grade	Premium Grade minimum M3 or better

4.2.2.3	Lamination thickness	0.23 mm Max.
4.2.2.4	Design Flux Density at rated conditions at principal tap	As per Manufacturer design.
4.2.2.5	Maximum Flux Density at 12.5 % over excitation / over fluxing	1.9 T
4.2.2.6	Core Design Features	i) Magnetic circuit designed to avoid short circuit paths within core or to the earthed clamping structures ii) Magnetic circuit shall not produce flux components at right angles to the plane of lamination to avoid local heating iii) Least possible air gap and rigid clamping for minimum core loss and noise generation iv) Adequately braced to withstand bolted faults on secondary terminals without mechanical damage and damage/ displacement during transportation and positioning. v) Percentage harmonic potential with the maximum flux density under any condition limited to avoid capacitor overloading in the system vi) All steel sections used for supporting the core shall be thoroughly sand blasted after cutting , drilling, welding vii) Provision of lifting lugs for core coil assembly viii) Supporting framework designed not to obstruct complete drainage of oil from transformer
4.2.3	**Winding**	
4.2.3.1	Material	Electrolytic Copper

4.2.3.2	Maximum Current Density allowed	3 Amp per sq mm at all taps.
4.2.3.3	Winding Insulating material	Class A, non catalytic, inert to transformer oil, free from compounds liable to ooze out, shrink or collapse.
4.2.3.4	Winding Insulation	Uniform
4.2.3.5	Design features	i) Type of winding LV: Spiral/Helical HV: Crossover/Disc ii) Stacks of winding to receive adequate shrinkage treatment iii) Connections braced to withstand shock during transport, switching, short circuit, or other transients. iv) Minimum out of balance force in the transformer winding at all voltage ratios. v) Conductor width on edge exceeding six times its thickness vi) Transposed at sufficient intervals. vii) Coil assembly shall be suitably supported between adjacent sections by insulating spacers + barriers viii) Winding leads rigidly supported , using guide tubes if practicable ix) Winding structure and major insulation not to obstruct free flow of oil through ducts x) Provision of taps as per clause 3.41
4.2.4	**Transformer Oil**	
4.2.4.1	Type	Should be in accordance with specification as per Annex C of this document One sample of oil drawn from every lot of transformer offered for inspection should be tested from CPRI/ERDA for tests as listed BSES Standard

		QAP The cost of this testing should be included within the cost of transformer. The results shall be confirming to BSES specification Annex C 10% extra oil to be furnished in separate containers with each transformer
4.2.5	**Bushings and Terminations**	
4.2.5.1	Type of HV side bushing	Outdoor, Epoxy Resin cast, rated voltage and creepage as per 31mm/kV with voltage class of 12kV respectively Bushing to be considered on top cover for optimization of size
4.2.5.2	Type of LV side bushing	Outdoor, Epoxy resin cast, rated voltage and creepage as per 31mm/kV with voltage class of 1.1 kV respectively Bushing to be considered on top cover for optimization of size. Additional neutral bushing of porcelain outside on top of LT cable box with brass palm connector (as per IS 3347) shall be provided. Connection between the main neutral and additional neutral shall be provided**.** For extra neutral bushing, protection box shall be provided in order to prevent ingress of water
4.2.5.2.1	Essential provision for LV side line bushing	It shall be complete with copper palm complete with tinned copper busbar of size mentioned in clause no 3.31
4.2.5.2.2	Essential provision for LV side neutral bushing	In case of neutral bushing the stem and busbar shall be integral without bolted, threaded, brazed joints. Busbar size shall be as per clause no 3.31.
4.2.5.3	Arcing Horns	Not required
4.2.5.5	Termination on HV side	2 Runs of 3Cx400sqmm A2XFY 33kV (E) grade Cable

4.2.5.6	Termination of LV side bushing	By bimetallic terminal connectors suitable for LV Cable size of 650/1100VGrade, A2XY Cable single core 630sqmm(Approx dia 40mm)
4.2.5.7	Minimum creepage distance of all bushings and support insulators.	31mm/KV
4.2.5.8	Protected creepage distance	At least 50 % of total creepage distance
4.2.5.9	Continuous Current rating	Minimum 20 % higher than the current corresponding to the minimum tap of the transformer
4.2.5.10	Rated thermal short time current	25 times the rated current for 2 sec
4.2.5.11	Atmospheric protection for clamp and fitting of iron and steel	Hot dip galvanizing as per IS 2633
4.2.5.12	Bushing terminal lugs in oil and air	Tinned copper
4.2.5.13	Sealing washers /Gasket ring	Nitrile cork rubber (RC70C)/ Expanded TEFLON (PTFE) as applicable.
4.2.6	**HV & LV cable box**	Required
4.2.6.1	Material of Construction	Sheet Steel min. 2.5 mm thick
4.2.6.2	Cable entry	At bottom through detachable gland plate with cable clamps of non magnetic material
4.2.6.3	Cable size for HV	11 kV (E) grade , A2XFY 3C x 150 sqmm
4.2.6.4	Cable size for LV	LV cable size, 650 /1100 V grade, A2XY cable single core 630 sqmm unarmoured (approx cable dia 40 mm)
4.2.6.5	Cable size for LV Neutral	LV cable size, 650 /1100 V grade ,A2XY cable single core 630 sqmm unarmoured (approx cable dia 40 mm)
4.2.6.6	Detachable Gland Plate material for HV, LV, LV Neutral box	MS for HV cable box Al for LV cable box.

4.2.6.7	Gland plate thickness for HV, LV, LV Neutral box	3 mm for HV side cable box 5 mm for LV cable box.
4.2.6.8	Cable gland for HV cables	Nickel plated brass double compression weatherproof cable gland
4.2.6.9	Cable lug for HV, LV, LV Neutral cables	Double hole Aluminium lugs
4.2.6.10	Essential parts	i) Flange type removable front cover with handles min two nos. ii) Tinned Copper Busbar of adequate size for Purchaser's cable termination with busbar supports iii) Earthing boss for the cable box iv) Earthing link for the gasketted joints at two point for each joint v) Earthing provision for cable Armour/ Screen vi) Flanged type inspection cover on top for bushing inspection and maintenance with handle vii) Drain plug viii) Rainhood on gasketted vertical joint ix) Danger / caution plate
4.2.6.11	Terminal Clearances	700mm, Minimum
4.2.6.12	Termination height required for cable termination	1000mm, Minimum
4.2.7	**Current Transformers**	
4.2.7.1	Provision	On all three phases on LV side
4.2.7.2	Mounting	On LV side bushings on all three phases with the help of fiber glass mounting plate affixed to main tank by nut bolt arrangement
4.2.7.3	Maintenance requirements	Replacement should be possible by removing fixing nut of mounting plate after removal of

		LT cable without disturbing LT bushing
4.2.7.4	Accuracy Class	0.5
4.2.7.5	Burden	10VA
4.2.7.6	Type	Resin Cast Ring type suitable for outdoor use.
4.2.7.7	CT ratio	
	2000KVA	3000/5
4.2.7.8	**CT terminal Box**	
4.2.7.8.1	Size	650 mm height x 450 mm width x 275 mm depth.
4.2.7.8.2	Fixing of instrument / meters within box	On slotted channel 40 x 12 mm size, channel fixed on vertical slotted angle 40 x 40 mm size at two ends
4.2.7.8.3	No of horizontal channels to be provided	Four
4.2.7.8.4	Fixing of terminals within the box	On horizontal slotted channel with the help of C channel available with the terminals
4.2.7.8.5	Location	On tank wall
4.2.7.8.6	Box door design	Openable from outside with antitheft hinge, padlock facility, door fixed by stainless steel allen screw M6 size , door shall have canopy for rain protection
4.2.7.8.7	Terminal strip	Nylon 66 material, minimum 4 sq mm, screw type for control wiring and potential circuit.
4.2.7.8.8	Cables and wires	PVC insulated, extruded PVC inner sheathed, armoured, extruded PVC outer sheathed 1100 V grade control cable as per latest edition of IS 1554 part 1 minimum 2.5 sq mm for signals and 4 sq mm for CT with multi strand copper conductor
4.2.7.8.9	Cable Glands	Nickel plated brass double compression weatherproof cable gland

4.2.7.8.10	Lugs on wires	Tinned copper pre insulated Pin, Ring, Fork type as applicable
4.2.7.8.11	Potential signal in CT box	i)Tapped from main LV busbar ii)Neutral Link and Fuse to be provided by bidder for PT
4.2.7.8.12	Essential provision	Wiring diagram to be fixed on the back of door along with CT spec. on Aluminum engraved plate fixed by rivet.
4.2.7.8.13	Auxiliary Relay	4 separate auxiliary relay with indicators (220V A.C) for tripping's to be provided for indicating type of fault i.e. Pressure, Oil leakage, OTI, MOG.
4.2.8	**Off Circuit tap Switch**	
4.2.8.1	Range /Step	Off circuit taps on HV winding, +5% to -10% in steps of 2.5%, change of taps by externally operated switch.
4.2.8.2	Type	Rotary type, 3 pole gang operated, draw out type
4.2.8.3	Operating Voltage	33kV
4.2.8.4	Rated Current for tap Switch	150 Amps
4.2.8.5	Operating Handle	External at suitable height to be operated from ground level.
4.2.8.6	Essential provision	Tap position indicator, direction changing facility, locking arrangement, and caution plate metallic fixed by rivet.
4.2.9	**Pressure Relief Device**	Required
4.2.9.1	Type	PRV
4.2.9.2	Provision on explosion vent	NA
4.3	**Hardware**	
4.3.1	External	Stainless Steel
4.3.2	Internal	Cadmium plated except special hardware for frame parts and core assembly as per

		manufacturer's design
4.4	**Gasket**	
4.4.1	For Transformer , surfaces interfacing with oil like inspection cover etc.	Nitrile cork rubber RC70C grade
4.4.2	For Cable boxes, Marshalling box, etc.	Neoprene rubber based/ cork nitrile
4.5	**Valves**	
4.5.1	Material of construction	Brass / gun metal
4.5.2	Type	Both end flanged gate valve / butterfly valve depending on application
4.5.3	Size	As per manufacturer's standard
4.5.4	Essential provision	Position indicator, locking rod, padlocking facility, valve guard, cover plate.
4.6	**Cable routing on Transformer**	Control cables for accessories on transformer tank shall be routed through perforated GI trays
4.6.1	Control cable specification	PVC insulated, extruded PVC inner sheathed, armoured, extruded PVC outer sheathed 1100 V grade control cable as per latest edition of IS 1554 part 1 minimum 2.5 sq mm for signals and 4 sq mm for CT with multi strand copper conductor
4.6.2	Specification of wires to be used inside marshalling box , OLTC drive mechanism	PVC insulated multi-strand flexible copper wires of minimum 2.5 sq mm size, 1100 V grade as per latest edition of relevant IS
4.7	**Terminal Blocks to be used by the vendor**	Nylon 66 material, minimum 4 sq mm, screw type for control wiring and potential circuit.
4.7.1	Essential provision for CT terminals	Sliding link type disconnecting terminal block screwdriver operated stud type with facility for CT terminal shorting material of housing melamine/ Nylon66

4.8	**Cable glands to be used by the vendor**	Nickel plated brass double compression weatherproof cable gland
4.9	**Cable lugs to be used by the vendor**	
4.9.1	For power cables	Long barrel medium duty Aluminum lug with knurling on inside surface.
4.9.2	For Control Cable	Tinned copper pre insulated Pin, Ring, Fork type as applicable
4.10	**Painting of transformer, Radiator, marshalling box for CT, cable boxes etc.**	
4.10.1	Surface preparation	By 7 tank pretreatment process or shot blasting method
4.10.2	Finish on internal surfaces of the transformer	Bright Yellow heat resistant and oil resistant paint two coats. Paint shall neither react nor dissolve in hot transformer insulating oil.
4.10.3	Finish on inner surface of the CT terminal box, HV/LV/LVN cable box	White Polyurethane paint anti condensation type two coats , minimum dry film thickness 80 microns
4.10.4	Finish on outer surface of the transformer, radiator, CT terminal box, HV/LV/LVN cable box	Battle ship Grey shade 632 Polyurethane paint two coats , minimum dry film thickness 80 microns
4.10.5	Frame parts	Battle ship grey shade 632 IS 5, 80 micron minimum insulating oil resistant paint. Paint shall neither react nor dissolve in hot transformer insulating oil.
4.11	**Winding Temperature scanner**	Required
4.11.1	No. of RTD inputs	Five (Three for windings, one for enclosure & one shall be spare) RTD for enclosure temperature monitoring shall be fixed at enclosure Top from inside to give max.

		Enclosure temp reading & shall be wired up to temp. Scanner to indicate the reading.
4.11.2	Location of winding RTD	At location of winding where maximum temperature is expected.
4.11.3	No of potential free trip contacts	Two
4.11.4	No of potential free Alarm contacts	Two
4.11.5	Auxiliary Supply	240 V AC, 1 phase, 50 Hz. Tapped from LV side busbar through a MCB located inside box.
4.11.6	Winding Temperature Scanner terminal Box	Required
4.11.7	Size	As per manufacturers standard
4.11.8	Fixing of instrument within box	On side wall of enclosure
4.11.9	Fixing of terminals within the box	On C channel available with the terminals
4.11.10	Location	Within enclosure frame such that Marshalling Box & WTI on same side & free access to all LV side doors.
4.11.11	Terminal Strip	Nylon 66 material, minimum 4 sq mm, screw type for control wiring and potential circuit.
4.11.12	Cables & Wires	PVC insulated, extruded PVC inner sheathed, armoured, extruded PVC outer sheathed 1100 V grade control cable as per latest edition of IS 1554 part 1 minimum 2.5 sqmm for signals and 4 sqmm for CT with multistrand copper conductor & PVC insulated multistrand flexible copper wires of minimum 2.5 sqmm size, 1100 V grade as per latest edition of relevant IS
4.11.13	Cable Glands	Nickel plated brass double compression weatherproof cable gland

4.11.14	Lugs on wires	Tinned copper preinsulated Pin, Ring, Fork type as applicable
4.11.15	Auxiliary supply in box	Tapped from main LV busbars, taken via MCB for isolation and protection of scanner, MCB to be fixed on DIN rail with clamps on two sides.
4.11.16	Essential provision	Wiring diagram to be fixed on the back of door along with brief details of scanner, HV side, LV side door limit switches to be wired up-to Terminal Block, Service socket to be provided with switch, fuse and link.

8.0 5.0 Fittings and Accessories on Transformer

5.1	Rating and Diagram Plate	Required
5.1.1	Material	Anodized aluminum 16SWG
5.1.2	Background	SATIN SILVER
5.1.3	Letters, diagram & border	Black
5.1.4	Process	Etching
5.1.5	Rating and Diagram Plate details	Following details shall be provided on rating and diagram plate as a minimum i) Type/kind of transformer with winding material ii) Standard to which it is manufactured iii) Manufacturer's name; iv) Transformer serial number; v) Month and year of manufacture vi) Rated frequency in Hz vii) Rated voltages in kV viii) Number of phases ix) Rated power in KVA x) Type of cooling (ONAN) xi) Rated currents in A xii) Vector group connection symbol

		xiii) 1.2/50µs wave impulse voltage withstand level in kV xiv) Power frequency withstand voltage in kV xv) Impedance voltage at rated current and frequency in percentage at principal, minimum and maximum tap xvi) Max. Total losses at 50 % rated load xvii) Max. Total losses at 100 % rated load xviii) Load loss at 50% & 100% rated load xix) No-load loss at rated voltage and frequency xx) Energy efficiency level. xxi) Continuous ambient temperature at which ratings apply in deg C xxii) Top oil and winding temperature rise at rated load in deg C; xxiii) Winding connection diagram with taps and table of tapping voltage, current and power xxiv) Transport weight of transformer xxv) Weight of core and windings xxvi) Weight of core xxvii) Weight of winding xxviii) Total weight xxix) Volume of oil xxx) Weight of oil xxxi) Name of the purchaser xxxii) PO no and date xxxiii) Guarantee period
5.2	Terminal marking Plate for Bushing, anodized aluminium black lettering on satin silver background both inside cable boxes near termination and on cable box cover (all fixed by	Required

	rivet)	
5.3	Company Monogram Plate fixed by rivet	Required
5.4	Lifting Lug to lift complete transformer with oil	Required
5.5	Lifting lug for top cover	Required
5.6	Lashing Lug	Required
5.7	Jacking Pad with Haulage hole to raise or lower complete transformer with oil	Required
5.8	Detachable Bidirectional flat roller Assembly	Required
5.8.1	Roller center to center distance	Required
5.8.2	Essential provision	Roller dia 150 mm min., roller to be fixed in such a way so that the lowermost part of the skid is above ground by at least 100 mm when the transformer is installed on roller.
5.9	Pockets for ordinary thermometer on tank cover with metallic identification plate fixed by rivet.	Required
5.10	Drain valve (gate valve) for the main tank with cork above ground by 150mm minimum with padlocking and valve guard with metallic identification plate fixed by rivet.	Required
5.11	Filter valve (gate valve) at top with padlocking and valve guard with metallic identification plate fixed by rivet.	Required
5.12	Air Release Plug on tank cover	Required

	with metallic identification plate fixed by rivet.	
	Oil level indicator with low level switch	Required
5.13	Earthing pad on tank for transformer earthing complete with non-ferrous nut, bolt, washers, spring washers etc. with metallic identification plate fixed by rivet	Required
5.14	Rainhood for vertical gasketted joints , in cable boxes	Required
5.15	Earthing bridge by copper strip jumpers on all gasketted joints at least two points for electrical continuity	Required
5.16	Skid base welded type with haulage hole	Required
5.17	Core , Frame to tank Earthing	Required
5.18	Danger plate made of Anodized aluminum with white letters on red background on Transformer, cable boxes (all fixed by rivet)	Required
5.19	Caution plate for Off Circuit tap changer fixed by rivet.	Required
5.20	Pressure Relief Device	Required
5.21	Gas-inlet valve of non-return type	Required (for transformers with nitrogen blanket above oil)
5.22	User manual for Hermetically Sealed Transformers must be provided for review as a part of the technical proposal. The manual must be provided with, but not limited to, maintenance schedule,	Required

	frequency & method of oil-sampling, procedures for oil-filling & oil-filtration, etc.	
5.23	Oil filling hole having(1-1/4" nominal size thread) with cover	Required
5.24	An extended pipe connection on upper end with welded cover. Pipe shall be suitably threaded over a sufficient length to enable use of refilling/siphon connection after removing the welded connection or any other similar arrangement capable of reuse.	Required
5.25	Nitrogen/Air filling device/pipe with welded cover capable of reuse	Required
5.26	Protection relay for internal parameters that is pressure, temperature, Oil level and gas detection(DMCR Relay)-auxillary relay	Required
5.27	WTI/OTI Scanner	Required

9.0 6.0 Approved make of components

6.1	CT	Pragati / ECS / Kappa?Continental
6.2	Bushings	Baroda Bushing/CJI/JP
6.3	Tap Changer	Alwaye /Paragon
6.4	MOG	Sukrut/Atvus
6.5	Valves	Newman
6.6	CRGO	Nippon/JFE/Posco
6.7	Copper	Birla copper/Sterlite
6.8	Pre compressed Pressboard	Raman Board, Mysore/ Senapathy Whiteley
6.9	Laminated Wood	Permalli Wallance / Rochling Engineers
6.10	Oil	Apar/Savita/Raj Petro
6.11	Steel	TATA/Jindal/SAIL
6.12	Lugs/Glands	Jainson/Dowells/Comet
6.13	Radiators	CTR/Hi-TechRadiators/Tarang Engineers
6.14	Corrugated Tank	MPP/BSES approved make
6.15	WTI/OTI	Pecon/Precimeasure

6.16	DMCR	IDEF

Note – Any other make of component to be approved by purchaser

10.0 7.0 Quality assurance

7.1	Quality Assurance program	To be submitted before contract award. Program shall contain following i) The structure of the organisation ii) The duties and responsibilities assigned to staff ensuring quality of work. iii) The bidder should have qualified technical & dedicated QA personnel at various stages of manufacture & testing. iv) Factory inspection of bidder may be carried out to ascertain the quality system and process in place at manufacturing facility. The same is applicable to bidders not approved with BSES. v) The system for purchasing, taking delivery and verification of materials vi) The system for ensuring quality of workmanship vii) The system for control of documentation viii) The system for the retention of records ix) The arrangements for the Supplier's internal auditing x) A list of the administration and work procedures required to achieve and verify Contract's quality requirements. These procedures shall be made readily available to the Purchaser for inspection on request
7.2	Quality Plan	To be submitted by the successful bidder for approval. Plan shall contain following as a minimum i) An outline of the proposed work and programme sequence ii) The structure of the Supplier's organization for the contract iii) The duties and responsibilities assigned to staff ensuring quality of work for the contract iv) Inspection Hold and notification points

		mutually agreed. v) Submission of engineering documents required by the specification vi) The inspection of materials and components on receipt vii) Reference to the Supplier's work procedures appropriate to each activity viii) Inspection during fabrication/construction ix) Final inspection and test x) Successful bidder shall include submittal of Mills invoice, Bill of lading, Mill's test certificate for grade, physical tests, dimension, specific watt loss per kG for the core material to the purchaser for verification in the quality plan suitably

11.0 8.0 Progress Reporting

8.1	Outline Document	To be submitted for purchaser approval for outline of production, inspection, testing, packing, dispatch, documentation programme
8.2	Detailed Progress report	To be submitted to Purchaser once a month containing i) Progress on material procurement ii) Progress on fabrication iii) Progress on assembly 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 viii) Constraints ix) Forward path

12.0 9.0 Submittals

9.1	Submittals required with bid	i) Completed technical data schedule ii) Descriptive literature giving full technical details of equipment offered; iii) Outline dimension drawing for each major component, general arrangement drawing showing component layout and general schematic diagrams; iv) Type test certificates, where available, and sample routine test reports; v) Detailed reference list of customers already using equipment offered during the last 5 years

		with particular emphasis on units of similar design and rating; vi) Details of manufacturer's quality assurance programme and ISO 9000 series or equivalent national certification; vii) Deviations from this specification. Only deviations approved in writing before award of contract shall be accepted; viii) Recommended spare parts and consumable items for five years of operation with prices and spare parts catalogue with price list for future requirements ix) Transport / Shipping dimension and weights, space required for handling parts for maintenance x) Write up on oil preservation system xi) Write up on OLTC xii) Quality Assurance Program
9.2	Submittals required after award for Approval (A), Reference (R), and subsequent distribution	i) Programme for production and testing (A) ii) Guaranteed Technical Particulars (A) iii) General description of the equipment and all components, including brochures (R) iv) Calculations to substantiate choice of electrical, structural, mechanical component size/ratings (A) v) Detailed loading drawing to enable the Purchaser to design and construct foundations for the transformer (R) vi) Transport / shipping dimensions with weights, wheel base details, untanking height etc (R) vii) Terminal arrangements and cable box details (A) viii) Flow diagram of cooling system showing no of cooling banks (A) ix) Drawings of major components like Bushing , CT etc (A) x) PT fixing arrangement xi) List of makes of all fittings and accessories

		(A) xii) Statement drawing attention to all exposed points in the equipment at which contact with or in close proximity to other metals and stating clearly what protection is employed to prevent corrosion at each point (A) xiii) Detailed installation and commissioning instructions xiv) Quality Plan.
9.3	Submittals required at the final hold point prior to dispatch	i) Inspection and test reports carried out in manufacturer's works (A) ii) Test certificates of all bought out items iii) Operation and maintenance Instruction as well as trouble shooting charts/ manual
9.4	Drawing and document sizes	Standard size paper A1, A2, A3, A4
9.5	No of drgs /Documents required at different stages	As per Annexure A Scope of Supply

13.0 10.0 Inspection & testing

10.1	Inspection and Testing during manufacture	Only type tested equipment shall be acceptable
10.1.1	Tank	i) Check correct dimensions between wheels demonstrate turning of wheels through 90 deg and further dimensional check. ii) Check for physical properties of materials for lifting lugs, jacking pads etc. All load bearing welds, including lifting lug welds shall be subjected to Required load tests. iii) Certification of all test results. iv) Oil leakage test. v) Vacuum and Pressure test on tank as type test as per IS
10.1.2	Core	i) Sample testing of core material for checking specific loss, bend properties, magnetization characteristics and thickness. ii) Check on the quality of varnish if used on the stampings. a) Measurement of thickness and hardness of varnish on stampings.

		b) Solvent resistance test to check that varnish does not react in hot oil. c) Check overall quality of varnish by sampling to ensure uniform hipping colour, no bare spots. No ever burnt varnish layer and no bubbles on varnished surface. iii) Check on the amount of burns. iv) Bow check on stampings. v) Check for the overlapping of stampings. Corners of the sheet are to be apart. vi) Visual and dimensional check during assembly stage. vii) Check on complete core for measurements of iron-loss and check for any hot spot by exciting the core so as to induce the designed value of flux density in the core. viii) Check for inter laminar insulation between core sectors before and after pressing. ix) Visual and dimensional checks for straightness and roundness of core, thickness of limbs and suitability of clamps. x) High voltage test (2 KV for one minute) between core and clamps. xi) Certification of all test results. xii) One sample of CRGO to be sealed for testing at ERDA/CPRI. Tests to be conducted in accordance with annexure G
10.1.3	Insulating Materials	i) Sample check for physical properties of materials. ii) Check for dielectric strength. iii) Visual and dimensional checks. iv) Check for the reaction of hot oil on insulating materials. v) Certification of all test results.
10.1.4	Windings	i) Sample check on winding conductor for mechanical properties and electrical conductivity. ii) Visual and dimensional check on conductor for scratches, dept. mark etc. iii) Sample check on insulating paper for PE value, Bursting strength, Electric strength. iv) Check for the reaction of hot oil on insulating paper.

		v) Check for the bending of the insulating paper on conductor. vi) Check and ensure that physical condition of all materials taken for winding is satisfactory and free of dust. vii) Check for absence of short circuit between parallel strands. viii) Check for Brazed joints wherever applicable. ix) Measurement of voltage ratio to be carried out when core/ yoke is completely restocked and all connections are ready. x) Certification of all test results.
10.1.4.1	Checks before drying process	i) Check conditions of insulation on the conductor and between the windings. ii) Check insulation distance between high voltage connection distance between high voltage connection cables and earthed and other live parts. iii) Check insulation distance between low voltage connection and earthed and other parts. iv) Insulation test of core earthing. v) Check for proper cleanliness vi) Check tightness of coils i.e. no free movement. vii) Certification of all test results.
10.1.4.2	Checks during drying process	i) Measurement and recording of temperature and drying time during vacuum treatment. ii) Check for completeness of drying. iii) Certification of all test results.
10.1.5	Oil	Oil testing to be done twice in accordance with the following[R9]: 1. As per IS 335:2018- Sample shall be drawn from oil storage tank before filling into transformer at CPRI/ERDA during stage inspection, which is one time per order 2. As per IS 1866:2017- Oil sample drawn after filling into transformer and after completion of acceptance test & Temp. rise test at CPRI/ERDA during stage/ final inspection, one

		time per order In case of oil testing, if testing facility for any test is not available in CPRI and ERDA , those tests shall be waived off.
10.1.6	Test on fittings and accessories	As per manufacturer's standard
	Routine tests	The sequence of routine testing shall be as follows i) Visual and dimension check for completely assembled transformer ii) Measurements of voltage ratio iii) Measurements of winding resistance at principal tap and two extreme taps. iv) Vector Group and polarity test v) Measurements of insulation resistance* vi) Separate sources voltage withstand test. vii) Measurement of iron losses and exciting current at rated frequency and 90%, 100% and 110% rated voltage. viii) Induced voltage withstand test. ix) Load losses measurement at 50 % & 100 % of load. x) Impedance measurement of principal tap (HV and LV) of the transformer. x) Routine test of tanks xi) Induced voltage withstand test (to be repeated if type tests are conducted). xii) Measurement of Iron loss (to be repeated if type test are conducted). xiii) Measurement of capacitance and Tan Delta for transformer winding and Tan Delta for transformer oil (for all transformers). xiv) Ratio of CT xv) Oil leakage test on completely assembled transformer xvi) Magnetic balance test xvii) Power frequency voltage withstand test on all auxiliary circuits xviii) Certification of all test results. xix) Temperature Rise Test # a) Insulation resistance measurement shall be carried out at 5kV for HV and 1kV for LV. Value of IR should not be less than 2000 Mohms . Polarization Index (PI = IR_{10min}/IR_{1min}) should not be less than 1.5 (If

		one minute IR value is above 5000 Mohms and it is not be possible to obtain an accurate 10 minutes reading, in such cases polarization index can be disregarded as a measure of winding condition.) b) #Temperature rise test may be necessary to be carried one unit/lot. Purchaser's engineer, will at its discretion, select transformer for temp. rise test from any lot offered for inspection at manufacturer's works and witness the same for comparison with ERDA/CPRI type test results
10.3	Type Tests	In case of award of P.O., bidder need to conduct type tests and special test (clause No.:10.4(i)) from CPRI/ERDA lab (on one transformer of each rating and type) without any cost implication to BRPL i) Impulse withstand test on all three HV limbs of the transformers for chopped wave as per standard ii) Temperature rise test as per IS 2026 iii) Dissolved gas analysis before and after Temperature Rise Test iv) Air pressure test for sealed transformers v) Pressure and Vacuum test on tank Note – In case bidder had earlier conducted and having valid type tests report on BRPL design/supplies, and report is more than 5 years old & less than 10 years old with no change in design, then bidder do not need to conduct the type test from CPRI/ERDA lab
10.3.2	Notification to bidders	The product offered must be of type tested quality and Incase type test report is more than 5 years old & less than 10 years old with no change in design, then also it is valid for participation. In case the product offered is never type tested the same (as per above list), to be conducted by bidder at his own cost at CPRI/ERDA lab.

10.4	Special Tests	In case of award of PO bidder need to conduct the following tests on one transformer of each rating and type in inhouse NABL lab/CPRI/ERDA i) Dynamic & Thermal (3 sec) Short Circuit Test as per IS 2026 ii) Measure of zero seq. impedance (Cl. 16.10 IS 2026 Part I). iii) Measurement of acoustic noise level (Cl. 16.12 of IS 2026 Part I). iv) Measurement of harmonic level on no load current. v) Paint adhesion test. vi) High voltage withstand test shall be performed on the auxiliary equipment and wiring after complete assembly. Cost of such tests, if extra, shall be quoted separately by the Bidder. Special tests to be witnessed by BRPL representative.
10.4.1	Note for special test	In case the product offered is never tested for short circuit (Dynamic & Thermal), same to be conducted by bidder at his own cost at CPRI/ERDA lab. In case the test report is more than 5 years old & less than 10 years old with no change in design, then bidder do not need to conduct the type test from CPRI/ERDA lab.
10.5	Customer Hold Point	i) GTP & Drawings approval ii) Core Inspection(See Cl No 10.1.2) Sample to be tested at CPRI/ERDA for each lot. iii) Tank Pressure & vacuum Test iv) Core & Coil Stage inspection of each lot to be offered for final testing.

14.0 11.0 Packing, Shipping, Handling and Storage

11.1	Packing	
11.1.1	Packing protection	Against corrosion, dampness, heavy rains, breakage and vibration
11.1.2	Packing for accessories and spares	Robust wooden non returnable packing case with all the above protection

11.1.3	Packing details	On each packing case details required as follows i) Individual serial number; ii) Purchaser's name; iii) PO number; iv) Destination; v) Supplier's name; vi) Name and address of supplier's agent vii) Description and quantity viii) Manufacturer's name ix) Country of origin x) Case measurements xi) Gross and net weights in kilograms xii) All necessary slinging and stacking instructions.
11.2	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; 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
11.3	Handling and Storage	As per manufacturer's instruction

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

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. 10 of this specification, final testing at manufacturer works on completely assembled transformer before

dispatch, packing, transportation, delivery and submission of all documentation for the Distribution transformer with all accessories as below

Sr. No	Description	Scope of Supply
1.1.1	Fully assembled transformer with all major parts like CT box, Fittings and accessories as per Clause 5.0 of this specification	YES
1.1.2	Off circuit tap changer as per this specification	YES
1.1.3	HV, LV, cable boxes	YES
1.1.4	Support steel material for support of cable boxes from ground	YES
1.1.5	Foundation Bolts for complete transformer	YES
1.1.6	Support structure to support of cable from the transformer tank	YES
1.1.7	Nickel Plated brass double compression glands for HV and LV, LVN cables (in case of termination by cable)	YES
1.1.8	Long barrel heavy [R3]duty Aluminum lugs for power cables (in case of termination by cable	YES
1.1.9	Nickel Plated brass double compression glands and tinned copper lugs for control cable termination in CT box for vendor's cables	YES
1.1.10	Cables and wires for transformer accessories and internal wiring of CT box	YES
1.1.11	Touch up paint, minimum 2 litres	YES
1.1.12	Extra Transformer oil 10 % in non returnable drums	YES
1.1.13	One spare complete set of gaskets	YES
1.1.14	Routine testing as per Cl. 10.2 of this specification	YES
1.1.15	Type testing as per Cl. 10.3 of this specification	YES
1.1.16	Special testing as per Cl. 10.4 of this specification	YES
1.1.17	Submission of Documentation as detailed below	YES

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	12 copies + 1 soft copy in CD	See Clause 9 for various drawings required
Calculations	3 copies (Typical)	4 copies	6 copies + 1 soft copy in CD	See Clause 9 for details
Catalogues	1 copy		12 copies + 1 soft copy in CD	
Instruction manual for the transformer	1 copy		12 copies + 1 soft copy in CD	
Test Report	2 copies (Type test and sample Routine Test)		12 copies + 1 soft copy in CD	Type test and sample routine test reports

3.0 Delivery schedule

3.1 Delivery period start date -

3.2 Delivery period end date -

3.3 Material dispatch clearance - after inspection by purchaser & 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
	Design ambient temperature	50 deg C
c)	Relative Humidity	90 % Max
d)	Seismic Zone	4
e)	Rainfall	750 mm concentrated in four months

Annexure – C Technical Particulars of transformer Oil

Transformer oil shall be new and conform to the following requirements:

1.0 Codes & standards

Latest revision of following codes & standards with all amendments –

	Standard no	Title
1.1	IS 335-2018	New insulating oils
1.3	IS 1783	Drums for oils

2.0 Properties

The insulating material shall have following features –as per IS 335:2018

Sr. No.	Item Description	Specification Requirement
A	Function	
1	Viscosity Max.	15 mm^2 /s at 40^0C
		1800 mm^2 /s at 0^0C
2	Pour Point, Max	- 10^0C
3	Water content, Max	30 mg/Kg
4	Breakdown voltage	
	i) New unfiltered oil. Min.	30 kV
	ii) After filtration Min.	70 kV
5	Density Max.	0.895 g/ml at 20^0C
6	Dielectric dissipation factor (DDF) at 90 ^0C, Max	0.005 at 90 ^0C,
7	Particle Content	Value to be provided by the vendor
B	Refining/Stability	
1	Appearance of oil	Clear, free from sediment and suspended matter
2	Acidity Max	0.01 mg KOH/g
3	Interfacial tension at 27^0C, Min	40 mN/m
4	Total sulphur content	Value to be provided by the vendor
5	Corrosive sulphur	Not-corrosive
6	Potentially Corrosive sulphur	Not-corrosive
7	Dibenzyl Disulphide (DBDS)	Not detectable (<5 mg/kg)
8	Inhibitor	Not detectable (<0.01%)
9	Metal Passivator	Not detectable (<5 mg/kg)
10	Other additives	Type and concentration of additives to be provided
11	2-furfural and related Compounds content	Not detectable (<0.05 mg/kg) for each individual compound
C	Performance	
1	Oxidation stability	

Sr. No.	Item Description	Specification Requirement
a)	Total acidity, Max	1.2 mg KOH/g
b)	Sludge Max	0.8%
c)	Dielectric dissipation factor (DDF) at 90 ^{0}C, Max	0.5
1	Gassing Tendency	Value to be provided by the vendor
2	Electrostatic charging tendency (ECT)	Value to be provided by the vendor
D	Health, safety and Environment	
1	Flash point Min.	135^{0}C,
2	Polycyclic Aromatics content (PCA) Max	3%
3	Polychlorinated Biphenyls (PCB) content	Not detectable (<2 mg/Kg)

Annexure D Guaranteed Technical Particulars (Data by Seller)

Sr.	Particulars	Specified / Required	Offered
1.0	General		
1.1	Make		
1.2	Type	Oil immersed, core type, step down located generally outdoor but may be located indoor also with poor ventilation. Bidder shall confirm full rating available in indoor location also	
2.0	Nominal Continuous Rating, KVA		
2.1	HV winding	2000 KVA	
2.2	LV winding	2000 KVA	
3.0	Rated voltage (kV)		
3.1	HV Winding	33 kv	
3.2	LV Winding	415 volt	
4.0	Rated current (Amps)	2000 KVA	
4.1	HV Winding		

Sr.	Particulars	Specified / Required	Offered
4.2	LV Winding		
5.0	Connections		
5.1	HV Winding	Delta	
5.2	LV Winding	Star with neutral	
5.3	Vector Group reference	Dyn11	
6.0	Impedance at principal tap rated current and frequency, ohm @75 deg C		
6.1	Impedance	6.25% with IS tolerance	
6.2	Reactance		
6.3	Resistance		
6.4	Impedance at lowest tap at rated current and frequency		
6.5	Impedance at highest tap at rated current and frequency		
7.0	Resistance of the winding at 75^0 C in ohm		
7.1	a) HV		
7.2	b) LV		
8.0	Zero sequence impedance in ohm		
8.1	a) HV		
8.2	b) LV		
9.0	Guaranteed maximum Total losses at principal tap at 75°C, kW		
9.1	50 % of Load	16.1Kw	
9.2	100% of Load	5.42Kw	
9.3	No Load Loss (Max)		
9.4	Total I^2R losses of windings @ 75 deg C, KW		

Sr.	Particulars	Specified / Required	Offered
9.5	Total stray loses @ 75 deg C, KW		
9.6	Total Load losses (Max.), KW		
9.7	No load loss at maximum permissible voltage and frequency (approx.),kW		
10.0	Temperature rise over reference ambient of 40 ^{0}C		
10.1	Top oil by thermometer ^{0} C	40 ^{0}C	
10.2	Winding by resistance^0 C	45 ^{0}C	
11.0	Efficiency		
11.1	Efficiency at 75^{0}C and unity power factor %		
11.1.1	at 110% load		
11.1.2	at 100% load		
11.1.3	at 80% load	Not Less than 99.5%	
11.1.4	at 60% load		
11.1.5	at 40% load		
11.1.6	at 20% load		
11.2	Efficiency at 75^{0}C and 0.8 power factor lag %		
11.2.1	at 110% load		
11.2.2	at 100% load		
11.2.3	at 80% load		
11.2.4	at 60% load		
11.2.5	at 40% load		
11.2.6	at 20% load		
11.3	Maximum efficiency at 75^{0}C %		
11.4	Load and power factor at which it occurs		
12.0	Regulation (%)		
12.1	Regulation at full load at 75^0 C		

Sr.	Particulars	Specified / Required	Offered
12.1.1	at unity power factor		
12.1.2	at 0.8 power factor lagging		
12.2	Regulation at 110% load at 75^0 C		
12.2.1	at unity power factor		
12.2.2	at 0.8 power factor lagging		
13.0	Tappings		
13.1	Type		
13.2	Capacity		
13.3	Range-steps x % variation		
13.4	Taps provided on HV winding (Yes / No)		
13.5	Rated current of rotary switch		
14.0	Cooling system		
14.1	Type of cooling	ONAN	
14.2	No. of cooling unit Groups		
14.3	Capacity of cooling units		
14.4	Mounting of radiators		
14.5	Number of Radiators		
14.8	Total radiating surface , sqmm		
14.9	Thickness of radiator tubes, mm	Minimum 1.2 mm	
15.0	Details of Tank		
15.1	Material	Robust mild steel plate without pitting and low carbon content	
15.2	Thickness of sides mm		
15.3	Thickness of bottom mm		
15.4	Thickness of cover mm		
15.5	Confirmation of Tank designed and tested for Vacuum, Pressure (Yes/ No)		
15.5.1	Vacuum mm of Hg. / (kN/m^2)	As per IS	

Sr.	Particulars	Specified / Required	Offered
15.5.2	Pressure mm of Hg.		
15.6	Is the tank lid sloped?	Yes	
15.7	Inspection cover provided (Yes / No)	as per spec	
15.8	Location of inspection cover (Yes / No)		
15.9	Min. dimensions of inspection cover (provide list of all inspection cover with dimension), mm x mm		
16.0	Core		
16.1	Type:	Core	
16.2	Core material grade	Premium grade minimum M3 or better	
16.3	Core lamination thickness in mm		
16.4	Insulation of lamination	With insulation coating on both sides	
16.5	Design flux density at rated condition at principal tap, Tesla		
16.6	Maximum flux density at 12.5 % over excitation /over fluxing, Tesla	1.9 Tesla Max allowed	
16.7	Equivalent cross section area mm^2		
16.8	Guaranteed No Load current at 100% rated voltage , Amps		
16.8.1	HV		
16.8.2	LV		
16.9	Guaranteed No Load current At 110% rated voltage, Amps		
16.9.1	HV		
16.9.2	LV		

Sr.	Particulars	Specified / Required	Offered
17.0	Type of Winding		
17.1	HV	Crossover/Disc	
17.2	LV	Spiral/Helical	
17.3	Conductor material	Electrolytic Copper	
17.4	Current density (HV/LV)	Maximum allowed 3.0 A per sq mm.at all taps	
17.5	Gauge/area of cross section of conductor		
17.5.1	a) HV		
17.5.1	b) LV		
17.6	Insulating material		
17.6.1	HV Turn		
17.6.2	LV Turn		
17.6.3	LV Core		
17.6.4	HV - LV		
17.7	Insulating material thickness, mm		
17.7.1	HV Turn		
17.7.2	LV Turn	-	
17.7.3	LV to Core		
17.7.4	HV to LV		
18.0	Minimum design clearance, mm		
18.1	HV to earth in Air		
18.2	HV to earth in oil		
18.3	LV to earth in Air		
18.4	LV to earth in oil		
18.5	Between HV & LV in Air		
18.6	Between HV & LV in oil		
18.7	Top winding and yoke		
18.8	Bottom winding and yoke		
19.0	**Insulating oil**		
19.1	Quantity of oil Ltrs		

Sr.	Particulars	Specified / Required	Offered
19.1.1	In the Transformer tank		
19.1.2	In each radiator		
19.1.4	Total quantity		
19.2	10% excess oil furnished?	To be furnished in separate containers with each transformer	
19.3	Type of Oil	As per cl 4.2.4	
20.0	**Bushing / Support Insulator**		
20.1	Make	-	
20.2	Type		
20.2.1	HV side	As per the spec	
20.2.2	LV side	As per spec	
20.3	Reference Standard		
20.4	Voltage class, kV		
20.4.1	HV side Bushing/ Support Insulator	36 kV	
20.4.2	LV side line and neutral bushing/ Support Insulator	1.1 kV	
20.5	Creepage factor for all bushing / Support Insulator mm/KV	31 mm / kV	
20.6	Rated thermal short time current		
20.6.1	HV bushing	25 times rated current for 2 secs.	
20.6.2	LV line and neutral bushing	25 times rated current for 2 secs.	
20.7	Weight, Kg		
20.7.1	HV bushing		
20.7.2	LV line and neutral bushing		
20.8	Free space required for bushing removal, mm		
20.8.1	HV bushing		

Sr.	Particulars	Specified / Required	Offered
20.8.2	LV line and neutral bushing		
21.0	**Terminal connections**		
21.1	HV	Cable size as per Cl no 3.28	
21.2	LV	Cable size as per Cl no 3.30	
21.3	LV Neutral	Cable size as per Cl no 3.30	
22.0	**HV cable box**	Required	
22.1	Suitable for cable type, size	Cable size as per Cl no 3.28	
22.2	Termination height	750 mm min.	
22.3	Gland plate dimension, mm x mm		
22.4	Gland plate Material	MS	
22.5	Gland plate thickness	3 mm min.	
22.6	Phase to phase clearance inside box,mm	180 mm	
22.7	Phase to earth inside box,mm	120 mm	
23.0	**LV Cable box**	Required	
23.1	Suitable for cable type , size	Cable size as per Cl no 3.30	
23.2	Termination height	1000 mm, min.	
23.3	Gland plate dimension, mmxmm		
23.4	Gland plate material	Aluminum	
23.5	Gland plate thickness	.	
23.6	Phase to phase	25 mm	
23.7	Phase to earth	25 mm	
24.0	L.V neutral Cable termination arrangement	Separate cable box not required (LV-N to be provided in LV cable box.)	
25.0	Current Transformer on LV phases		
25.1	Type		
25.2	Make		
25.3	Reference Standard		

Sr.	Particulars	Specified / Required	Offered
25.4	CT Ratio		
25.5	Burden, VA		
25.6	Class of Accuracy		
25.7	CT terminal box size		
26.0	Pressure release device		
26.1	Minimum pressure the device is set to rupture		
26.1.1	For Main Tank		
27.0	Fittings Accessories Each Transformer furnished as per Clause No 5. (Bidder shall attach separate sheet giving details, make and bill of materials)		
27.1	WTI/OTI Scanner details		
27.1.1	Make		
27.1.2	Model no.		
27.1.3	Manual submitted		
27.2	DMCR Relay details		
27.2.1	Make		
27.2.2	Model no.		
27.2.3	Manual submitted		
28.0	Painting: as per clause for the transformer, cable boxes, radiator, Marshalling box (Yes/No)		
29.0	Max over all transformer dimensions	**As per Clause 3.32**	
29.1	Length, mm		
29.2	Breadth, mm		
29.3	Height, mm		
30.0	Transformer Tank Dimensions		
30.1	Length, mm		

Sr.	Particulars	Specified / Required	Offered
30.2	Breadth, mm		
30.3	Height, mm		
31.0	Weight data		
31.1	Core, kG		
31.2	Frame parts, kG		
31.3	Core and frame, kG		
31.4	Total Winding, kG		
31.5	Core , Frame, Winding, kG		
31.6	Tank, kG		
31.7	Tank lid, kG		
31.8	Empty conservator tank, kG	NA	
31.9	Each radiator empty, kG	NA	
31.10	Total weight of all radiators empty, kG	NA	
31.11	Weight of oil in Tank, kG		
31.12	Weight of oil in Conservator, kG	NA	
41.13	Weight of oil in each Radiators, kG	NA	
31.14	Total weight of oil in Radiators, kG	NA	
31.16	Total Transport weight of the transformer, kG		
32.0	Volume Data		
32.1	Volume of oil in main tank, litres		
32.2	Volume of oil between highest and lowest levels of main conservator, litres	NA	
32.4	Volume of oil in each radiator, litres	NA	
32.5	Total volume of oil in radiators, litres	NA	
32.7	Transformer total oil volume, litres		

Sr.	Particulars	Specified / Required	Offered
33.0	Shipping Data		
33.1	Weight of heaviest package, kG		
33.2	Dimensions of the largest package (L x B x H) mm		
34.3	Tests		
34.1	All in process tests confirmed as per Cl. (Yes/ No)		
34.2	All Type Tests confirmed as per Cl. (Yes / No)		
34.3	All Routine Tests confirmed as per Cl. (Yes/ No)		
34.4	All Special Tests confirmed as per Cl. (Yes/ No)		

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		No	
4		No	
5		No	
6		No	

Anexure G - CRGO & Testing Points

In addition to the BSES specification following points to be verified during manufacturing/inspection.	
1	Transformer core shall be low loss, non-ageing, high permeability PRIME GRADE CRGO with M3 Grade or better with max thickness of 0.23mm and with max core loss of 0.8 **[R3]**W/Kg, perfectly insulated and clamped to minimize noise and vibrations.
2	Following stage inspections will be carried out by purchaser or by third party engineers appointed by BSES :
2.1	Verification & inspection of the mother coil at port & putting stamp & seal may be inspected by BSES.
2.2	Reconciliation of mother coil by checking stamp & seal at factory before slitting. One sample of CRGO to be sealed for testing at ERDA/CPRI. Following Tests shall be conducted on the sample**[R3]:** 1) Specific core loss measurement 2) Magnetic polarization 3) Magnetic permeability 4) Specific core loss measurement after accelerated ageing test 5) Surface insulation resistivity 6) Electrical resistivity measurement 7) Stacking factor 8) Ductility(Bend test) 9) Lamination thickness 10) Magnetization characteristics (B-H curve)
2.3	Bidder should have in house core cutting facility for proper monitoring & control on quality. In case it is done outside cutting shall be done in presence of BSES.
2.4	Following documents to be submitted during the stage inspection :
2.4.1	Invoice of supplier
2.4.2	Mills test certificates
2.4.3	Packing list
2.4.4	Bill of lading
2.4.5	Bill of entry certificates by customs
2.4.6	Core material shall be directly procured either from the BSES approved manufacturer or through their authorized service centre/distributor and not through any contractor.
2.5	Bidder should have hydraulic core lifting facility to avoid any jerk at the time of core building.

2.6	BSES may appoint recognized testing authority like CPRI /ERDA with their instruments & engineer's team and measure no load loss, load loss and percentage impedance of the transformer at supplier's works at our own cost. Bidder shall agree and give them full co-operation during their stay & testing at shop floor. The losses & impedance values so obtained will be considered as final.
2.7	Bidder should have in-house NABL accredited testing facility. 1. Prospective bidders whose NABL accreditation is in process, Team of BRPL (NABL certified Engineers) may visit prospective bidder's works and may give their inputs to take NABL accreditation {R4} 2. Based on bidder's status of NABL accreditation ongoing process, it may be qualified (by submission of undertaking that in defined time bidder shall get NABL accreditation certification) {R4}

SPECIFICATION FOR
LTACB / SFU
Specification no – GN101-03-SP-83-02

PREPARED BY	REVIEWED BY	APPROVED BY	REV	DATE
JA/AM	Abhinav Srivastava	K.Sheshadri	00	17.05.2022

INDEX

RECORD OF REVISION

Sr. No.	Revision No.	Cl. No.	Nature of Change	Approved By
1	R1	4.11.1	Neutral bus bar CT protection	VP
2	R1	5.6	Rated Ultimate breaking capacity at rated voltage	VP
3	R1	6.5.1	Cable Termination for 3200A ACB	VP
4	R1	6.7.1	Bus bar Size for 3200A ACB	VP
5	R2	5.9	Rated making current Ampacity –Icm revised	KS/AT
6	R2	6.5.1	3200Amp ACB, number of O/G Cable description revised	KS/AT
7	R2	11.1	Type test cl. revised	KS/AT
8	R2	11.2	Special test cl. Added	KS/AT
9	R2	4.10	Release and Tripping Mechanism	KS/AT
10	R2	5.12.2.1	Short Circuit setting time delay	KS/AT
11	R2	5.12.4.1	Earth fault setting time delay	KS/AT

SCOPE OF SUPPLY

This specification covers the design, engineering, manufacture, assembly and testing at manufacturer's works and supply of Manual LT ACB along with all hardware and accessories required for installation and operation.

CODES & STANDARDS

2.1	IS:8623	Specification for factory built assemblies of switchgear & control gear for voltages up to and including 1000V AC/1200 V DC.
2.2	IS/IEC 60947	Specification for Low-voltage Switchgear and Controlgear - Part 2,3 & 4 : Circuit Breakers
2.3	IS:10118	Code of practice for selection, installation and maintenance switchgear and control gear
2.4	IS:2705	Current transformers
2.5	IS:3231	Electrical relays for power system protection
2.6	IS:1248	Electrical Indicating instruments
2.7	IS:4794	Switches and push buttons
2.8	IS:6005	Code of practice of phosphating iron and steel
2.9	IS:5082	Wrought Aluminum and aluminum alloys for electrical purposes
2.10	IS 3043	Code of practice for Earthing
2.11	IS 5	Colours for ready mixed paints and enamels
2.12	IEC 60529	Degree of protection provided by enclosure (IP code)

SERVICE CONDITION

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

3.1	**Location**	**At various location in the Delhi**
3.2	System Configuration	3 Phase 4 Wire with neutral solidly grounded
3.3	Supply Voltage	415 volt +/- 10%
3.4	Supply frequency	50Hz
3.5	Location	Outdoor
3.6	Maximum ambient temperature (ºC)	50
3.7	Minimum ambient temperature (ºC)	0
3.8	Maximum altitude above mean sea level (m)	1000
3.9	Relative Humidity (%)	100
3.10	Rainy month	June to October
3.11	Maximum Rainfall (mm)	1450
3.12	Wind Pressure (Kg/Sq.m)	195

3.13	Seismic Zone	Zone IV as per IS : 1893

GENERAL FEATURS

4.1	ACB mounting	Fixed type
4.2	Line-Load Reversibility	Required
4.3	Terminals	Suitable for connection with aluminium bus-bars with phase barriers & shrouds
4.4	Operating mechanism	Manual LT ACB - manual spring charging, stored energy type
4.5	Operation counter	4 digit minimum, non-reversible
4.6	Operating handle	Required for manual spring charging
4.7	Local control	ON / OFF push buttons or lever with transparent shutter & locking facility
4.8	ACB auxiliary contacts	2 NO + 2 NC minimum
4.9	ACB operating knob sealing	Possible in OFF condition
4.10	Release and Tripping Mechanism	Microprocessor based release should have LCD display for protection data, running load value & should have fault record facility min. 5 nos.
4.11	Protections Required	Overload, short-circuit, Instantaneous & earth fault
4.11.1	Neutral bus bar protection	CT Required [R1]
4.12	Fault indication on front panel	Required
4.13	Access to releases, coils & add on type replaceable parts to ACB	From front only
4.14	ACB indications	a. Separate ON / OFF / TRIP b. Spring charge status
4.15	ACB ingress protection (without enclosure)	IP2X minimum
4.16	Pollution degree as per IS	2 – nonconductive pollution
4.17	ACB temperature rise limits	As per table 2 & 3 of IS 13947-1
4.18	Hardware	
4.18.1	Nuts and bolts materials	Hot Dip Galvanised
4.18.2	Washers and spring washers materials	Carbon steel

OPERATIONAL FEATURES

5.1	Number of poles	Three pole
5.2	Rated Operational Voltage(V)	415V
5.2	Rated Insulation Voltage (V)	1000V
5.4	Rated Impulse Voltage	8 kV for main circuit
5.5	Category of utilization	B
5.6	Rated Ultimate breaking capacity	Icu [R1]

	at rated voltage	
5.6.1	Rating up to 4000A	70 kA (minimum)
5.7	Rated Service breaking capacity at rated voltage Ics	Ics =100% Icu
5.8	Rated short term withstand current for 1 sec at rated voltage – Icw	Icw = 100% Icu
5.9	Rated making current ampacity – Icm	Icm = 210% Icu
5.10	Number of operating cycles at rated current (open + close)without changing arcing contact	As per IS / IEC up to 4000 A ACB
5.11	Number of mechanical operating cycles (open + close)	20000 up to 2500A ACB 10000 above 2500A ACB
5.12	Tripping characteristic	With long time & short time characteristics
5.12.1	Overload setting	40% -100% In, steps of 10%.
5.12.1.1	Overload setting time delay	2.5 s to 40 s minimum three settings
5.12.2	Short Circuit Setting	100% - 800% of In, steps of 10%.
5.12.2.1	Short Circuit setting time delay	50ms - 400 ms in steps of 50ms
5.12.3	Instantaneous setting	400% - 1500% of In & OFF
5.12.4	Earth fault setting	10- 100 % of In, steps of 10%
5.12.4.1	Earth fault setting time delay	50ms - 400 ms in steps of 50ms
5.13	Release requirement	self-powered, not tapped from neutral
5.14	Microprocessor release	Setting panel with locking arrangement

BUSBAR

6.1	Material	High conductivity electrolytic grade aluminium
6.2	Bus bar size	a) Suitable for carrying rated continuous current. Current density should be 1A per sqmm. b) Size of neutral busbar should be same as phase busbar. c) Busbar shall be designed for maximum of 40 degrees temperature rise over ambient d) Bus bars shall be colour coded with heat resistant sleeves for R,Y,B phases and black sleeves for neutral
6.3	Clearances	a) All live parts of the ACBs shall have adequate clearance between the phase to phase and phase to earth / body of enclosure as per the standard. All the clearance shall be more than the minimum standard laid down as per IS standard.

6.4	Bus bar arrangement	a) All the busbars are to be extended on rear side incorporating proper arrangement for connecting LT XLPE/PVC cables b) Busbar to be extended in such a way that adequate insulation is provided between the enclosure and busbar. c) Inter phase barriers to be provided on both incoming and outgoing side busbar d) Entry / exit of rear side busbar from the LT ACB shall have separate openings for I/C &O/G circuits. Separate opening shall be provided for each phases and shall be sealed with Bakelite/FRP/POLYCARBONATE covers
6.5	Cable termination	Arrangement shall be as shown in annexure-A. Appropriate working clearances have to be maintained and are subject to approval during detailed engineering stage.
6.5.1	3200 A ACB as Incomer 400 A SFU as Outgoing	a) Incomer – 1nos. x 1C x 1000sqmm cable per phase. b) Outgoing –7 nos. x 4C x 300sqmm cable per phase (Refer attached SLD in Annexure .)
6.6	Earthing	Two number Earthing bolts of size M8 to be provided with suitable green colour earth logo
6.7	Incoming & Outgoing Bus bar Size	
6.7.1	3200 A (Phase & Neutral)	3 nos. X 120 X 10 mm **OR** 3 nos. X 100 X 12 mm [R1]
6.7.2	400A (Phase & Neutral)	1 no. X 50 X 10 mm
6.8	Cu & Al bus bar Connection	insulating paint as well as phase barrier shall be provided on Internal as well as external busbar

ACB ENCLOSURE

7.1	Type	Enclosure shall be suitable for outdoor installation. All the welding shall be continuous type
7.2	Ingress Protection	IP55 supported by CPRI/ERDA test report. Change in enclosure design has to be validated by CPRI/ERDA
7.3	Enclosure Sheet material and thickness	a) Minimum 2.0 mm CRCA sheet for load bearing members b) Minimum 2.0 mm CRCA sheet for doors and covers c) No welds, rivets, hinges or bolts shall be visible from outside. d) Make of CRCA sheet to be TATA/SAIL/JINDAL

7.4	Canopy	Suitable canopy to be provided on the enclosure for preventing rain water accommodation. Canopy to be extended at both front and rear side.
7.5	Doors and covers	a) Door shall be opened vertically. Suitable bonnet type locking arrangement shall be provided to hold the door at open position. b) Handle shall be provided to open the door. c) The door shall be non-removable type and hinges shall be concealed type. d) The front cover shall have a viewing window of required size for monitoring the close, open, trip and spring charge status of breaker from outside without opening the door. The viewing window shall be transparent, steel reinforced glass material which shall be fixed on the front cover by using neoprene gasket and suitable screws/rivets. e) The door of the ACBs shall be lockable and shall be fitted with neoprene gaskets.
7.6	Door Hinges	Door Hinges shall be Anti-theft type
7.8	Mounting of the panel	ACB with enclosure shall be suitable for mounting on poles/plinth. The enclosure shall have proper mounting bucket.
7.9	Paint	
7.9.1	Surface Preparation	By 7 tanks Pre-treatment process or shot blasting method.
7.9.2	Colour shade of powder coating	Light orange 557 as per IS 5
7.9.3	Paint thickness	70 microns (minimum)

8.0 400 Amp SWITCH FUSE UNIT (SFU)

S.No.	Description	Particulars
1.	Body Material	Polyamide or Better
2	Rated operational current	400 Amp
3	Rated operational voltage(In)	433V, 50Hz
4	Rated operational Current(In)	400 Amp
5	Rated insulation voltage (ui)	As per IS / IEC
6	Rated short time current (Icw)	As per IS / IEC
7	Cable size	Up to 300 Sq.mm
8	Fuse Link	As per IS / IEC
9	Dimension	
10	Weight	As per IS / IEC

NAME PLATES & MARKINGS

9.1	Panel nameplate	Nameplate shall be made of anodized Aluminium riveted on a side of the enclosure panel. It shall have a nameplate clearly indicating the following: a) Customer Name - BSES Rajdhani Power Ltd b) PO No. & date c) Material code d) Type of Panel e) Current rating f) Guarantee period
9.2	Danger plate	Danger plate shall be anodized Aluminium plate riveted to the enclosure or danger mar king can be screen printed on the front cover.

EQUIPMENT ID MARKING

BSES Equipment ID shall be painted on two side of Enclosure (in Front & on side of Enclosure). Equipment id details & specification shall be provide you at the time of GTP approval

APPROVED MAKE OF ACB

10.0	ACB	L&T/Siemens/ABB/GE/Schneider/C&S/HPL/Havells

INSPECTION AND TESTING

11	Type test on Breaker / LTACB / SFU (Mandatory requirement for bid participation)	Equipment should be of type tested quality only, complete type tests certificates from CPRI/ERDA to be submitted at the time of bid submission as per relevant IS/IEC List of type tests are as below— 1. Verification of overload release 2. Rated short-time withstand current 3. Rated service short circuit breaking capacity 4. Verification of operational capability 5. Verification of dielectric withstand 6. Verification of temperature rise 7. Verification of overload release Type test reports shall be valid of the last 10 years subject to no change in relevant IS/IEC 60947 In case of change in IS/IEC , bidder need to submit fresh type test report from CPRI/ERDA as per latest relevant IS revision
11.1	Special test on ACB along with Enclosure to be witnessed by Purchaser after awarding of P.O	Following tests shall be conducted from CPRI/ERDA lab only- a. Temperature rise test on one sample of each rating of ACB from the awarded P.O. as per relevant IS b. Ingress Protection (IP-55) test on one sample of any one rating of ACB from the awarded P.O. as per

		relevant IS Cost of the above tests shall be borne by the Bidders
11.2	Routine tests & Acceptance tests	• As per relevant Indian standard (IS) • **The testing of LT ACB shall be done in presence of BRPL representative at vendor's work & test certificate shall be submitted to BRPL before dispatch**

PACKING, SHIPPING, HANDLING & SITE SUPPORT

12.1	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.
12.2	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.
12.3	Packing Identification Label	On each packing case, following details are required:
12.4	Individual serial number	
12.5	Purchaser's name	
12.6	PO number (along with SAP item code, if any) & date	
12.7	Equipment Tag no. (if any)	
12.8	Destination	
12.9	Manufacturer / Supplier's name	
12.10	Address of Manufacturer / Supplier / it's agent	
12.11	Description	
12.12	Country of origin	
12.13	Month & year of Manufacturing	
12.14	Case measurements	
12.15	Gross and net weight	
12.16	All necessary slinging and stacking instructions	
12.17	Shipping	The seller shall be responsible for all transit damage due to improper packing.
12.18	Handling and Storage	Manufacturer instruction shall be followed.
12.19	Detail handling & storage instruction sheet / manual to be furnished before commencement of supply.	

DEVIATIONS

13.1	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.

DOCUMENTS SUBMISSION

The bidder has to submit the following documents along with bid:-

14.1	List of major customers using the offered product from last 5 years specifying details like customer name, PO no. and PO date, year of supply and supply quantity
14.2	Completely filled compliance GTP sheet as per clause 16.0 of this specification
14.3	Complete product catalogue, Manual and calibration certificate of the equipment
14.4	Type test reports
14.5	Deviation Sheet (if any)

GTP OF ACB / MCCB / SFU

S. No.	Item descriptions	Specification Requirement	Data by Vendor
1	Manufacturer	Name	
1.1		Address	
1.2		Contact person	
1.3		Contact/telephone no	
1.4	ACB / SFU Brand name	Manufacturer cataloguer reference	
2	ACB / SFU rated current at 50 deg. C	400 SFU / LTACB 3200 A	
3	No of poles	Three	
4	Rated voltage	415 V	
5	Rated insulation voltage	1000V at 50 Hz	
6	Rated impulse withstand voltage	8 kV for main and 4 kV auxiliary ckt.	
7	Category of utilization	B	
8	Rated ultimate breaking capacity at rated voltage	Icu	
8.1	Ratings up to 2000A	50 kA minimum	
8.2	Rating 2500A above	65 kA minimum	
9	Rated service breaking capacity Ics	Ics = 100% Icuat rated voltage	
10	Rated short time withstand current for1 sec.	Icw = 100% Icsat rated voltage	
10.1	Rated making current	Icm = 210% Icu	
11	Number of operating cycles at rated current (open +close) without changing arching contacts	up to 3200 A ACB / MCCB	
12	Number of mechanical operating cycles (open + close)	up to 3200 ACB / MCCB	
13	De-rating of ACB	0% at 50Deg.C	

14	ACB clearance in air	As per table XIII of IS:13947-1	YES /NO
15	ACB temperature rise limits	As per table 2 & 3 of IS:13947-1	YES /NO
16	ACB mounting	Fixed or Draw-out	
17	ACB operating counter	Required	
18	Line load reversibility	Provided	YES /NO
19	ACB operation	ON / OFF pushbuttons	
20	Safety shutter and racking interlock	Required	
21	Terminal	Size in **mm*mm**	
22	Operating handle	Required	YES /NO
23	ACB position indicator	ON / OFF / Trip / Spring charged	YES /NO
24	ACB ingress protection	IP 2X minimum	YES /NO
25	Pollution degree as per IS	2 minimum	YES /NO
26	Product Information as per clause 5 ofIS:13947, part – 1	In addition name of the purchaser shall be marked on the front of the devices as BSES Delhi	
27	Release and Tripping Mechanism	Microprocessor based release should have LCD display for protection data, running load value & should have fault record facility min. 5 nos.	
28	Tripping characteristic requirement		
28	Overload setting	50 % to 100% In	
28	Time delay	2.5s to 40s	
29	Short circuit setting	200 % - 800 %In	
29	Time delay	50 - 400 ms	
30	Instantaneous setting	1000% In & off	
31	Earth fault setting	10 - 50 % of In	
31	Time delay	50 - 400 ms	
32	Release requirement	Self-powered, not tapped from neutral	
32	Minimum primary current	Required for operation release	
33	ACB opening time	in ms	
34	ACB closing time	in ms	
35	ACB dimension	L X B X H in mm	
36	ACB weight	in Kg	

37	ACB watt loss at rated current (W)	At rated voltage and current	
38	Copy of type test report		YES /NO
39	Copy of ACB catalogue		YES /NO
40	Deviation sheet		YES /NO

GTP OF STEEL ENCLOSURE

S. No.	Description	Specification Requirement	Data by Vendor
1	General arrangement		
2	Sheet steel thickness for frame door &cover		
3	Make of CRCA	TATA/SAIL	
4	Powder Coating	7 tank pre-treatment or short blasting method	
a	Color shade of powder	Light orange 557as per IS:5	
b	Minimum thickness of coating	70 microns	
5	Danger Plate		
6	The enclosure shall be designed for system faults of35MVA		
7	Size of electrolytic grade, extended Al. busbar (Ph & N)		
8	All Al. bus-bar shall be insulated by heat shrinkable sleeves. The bus bar shall have proper R, Y, B phase colour sleeves and black for neutral		
9	Thickness of Bakelite plate between xtended Al. bus and frame.		
10	Thickness of phase barriers provided between individual phases at incoming &outgoing		
11	Neutral Bus bar with CT protection	Req.	
12	Weight of ACB with	Kg	

	enclosure		
13	Enclosure dimensions	LXWXH in mm	
14	Drawing of danger plate and name plate submitted.	Yes/No	
15	Type test report ofIP55 protection of enclosure submitted	Yes/No	
16	Type test report of class 10K submitted	Yes/No	
17	Reference IS/IEC standard		

Technical Specification

For

33 kV Motorized Ring Main Unit

Specification no – **SP-DTCPT-00-R0**

PREPARED BY	REVIEWED BY	APPROVED BY	REV	DATE
JA/AM	Abhinav Srivastava	K.Sheshadri	00	22.02.2022

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Scope of work

33kV MotorizedRMU with FRTU, Modem (4G, GSM), Battery, Battery charger and auxiliary transformer (for outdoor RMU only) shall be supplied as per the specification. All the accessories mentioned above shall be supplied along with RMU's as a composite unit. Inside the composite unit, battery and battery charger shall be inbuilt inside RMU compartment and FRTU, modem shall be inbuilt inside LV compartment. Refer Annexure-J for drawing. Make of all accessories shall be as per Annexure-I. Spares are also to be supplied by bidder along with RMU as per the list mentioned in Annexure-D.

Codes & standards

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

S No.	Title
Indian Electricity Rules	With latest amendments
Indian electricity act	IE act 2003
IS 3427	A.C. Metal Enclosed Switchgear and Control gear for Rated Voltages Above 1 Kv
IS 9920 part 1,3 & 4	High voltage switches above rated voltage 1kv
IS 13118	General requirements of circuit breakers above rated voltage 1kv
IS 3231	Electric Relays for Power System Protection
IS 2705	Current Transformer**{R1}**
IS 3156	Voltage Transformer**{R1}**
IEC 60059	Preferred current ratings of high voltage switchgear
IEC 60298	AC metal enclosed switchgear
IEC 60529	Classification of degrees of protection provided by enclosures
IEC 60255	Electrical relays
IEC 62271	HV Switchgear and Control gear
IEC 62271 – 103	HV Switchgear and Control gear - Switches for rated voltages above 1 kV up to and including 52 kV

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

Note:

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

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

Electrical Distribution System Data

3.1	Supply	3 phase AC, 3 wire
3.2	Voltage	33000volt ±10%
3.3	Frequency	50 Hz ± 5%
3.4	System neutral	Earthed at upstream 11kV source

11 kV RMU System layout

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

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

RMU panel construction

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

		set of required Special tools per RMU (if any) shall be in the scope of supply. All kind of nuts and bolts must be stainless steel
5.7	Construction	(Stainless steel tank. 3.0 mm thickness shall be based on validated type tests for 31kA 1sec IAC test and 31.5kA, 3sec short ckt tests.)
5.8	Base frame	1. Base frame shall be made with 75mm ISMC/ISA channel 2. for both Indoor and Outdoor type RMU. Proper Bolted fixing arrangement shall be provided for erection on RCC foundation. Also, base frame shall be painted with 2 coats of anti rust red oxide and 2 coats of bitumen paint shall be provided. {R9}Adjustable HDPE clits as cable supporting clamps for each power cable (to suit the cable size from 150 to 400 sq mm PILC / XLPE cable. Exact size shall be provided during drawing approval stage.), also cleat shall be adjustable vertically.
5.9	Lifting lugs	Four numbers
5.10	Cable Entry	1. Bottom 2. 3mm metallic, removable type & split type in two parts, with 1no. 90 mm diameter knocks out punch/hole in the centre. Hole arrangement shall be done up to 33Kv, 3cx400 sqmm cable. (For double cable boxes, Un-drilled gland plate to be supplied. Approval should be taken for the same during drawing submission)
5.12	Cable type & size	3CX400sq mm Aluminum conductor XLPE/ PILC with armor & PVC outer sheath
5.13	Terminals for 33 kV cable termination	Suitable for Ring Type Bimetallic lug along with reducer/adapter check nuts/bolts for different type lugs sizes as per annexure F
5.13.1	Right angled boots	Single piece cold shrink type (Minimum 20mm spacing between boots preferred)
5.13.2	Brass Nut bolt	Shall be suitable for all kind of lugs of cable size 33Kv, 3cx400 sqmm (Reducer to be provided to fit the nuts/bolts for all kind of lugs with all the bushing and all kind of nuts/bolt shall be the part of supply)
5.13.3	Bimetallic washers	Required (Not applicable for silver quoted bushing)
5.13.4	Termination type	suitable for heat shrinkable type
5.13.5	Termination height	For Indoor / Outdoor : Min. height from top of the gland plate to bushing center shall be as per IS / IEC standards
5.14	Bus bar	Copper with sleeve (Sizing Calculation to be submitted in support of its Guaranteed S.C. rating / Capability) {R1}

5.14.1	Bus bar continuous rated current	630amp (at designed 40 deg.C ambient)
5.14.2	Bus bar short time withstand capacity	26.3 KA for 3 sec
5.14.3	Bus bar support insulator material	SMC / DMC resin
5.14.4	Maximum temperature rise abovereference ambient 40 deg C	In line with Table 3 of IEC62271-1
5.15	Earth bus bar	Tinned Copper flat sized for rated fault duty for 3 sec
5.16	Earth bus internal connection to all Noncurrent carrying metal parts	By 2.5sq mm copper flexible wire, Earthconnection point maximum 1 meter awayfrom cable test facility
5.17	Earth bus external connection to owners earth	Studs on both sides with holes for M10 bolt +hardware to readily receive purchaser earthconnection
5.18	Cooling arrangement	By natural air without fan
5.19	Panel internal wiring	Multi strand flexible color coded PVC insulated Cu wire 1 sq mm (SCADA) / 2.5 sq mm (for CT's) 1100 volt grade (AC-black, DC – grey, Earth – green) with ferrules at both ends.
5.20	Hardware (Nut, bolts & handle)	Stainless steel (Except termination nut-bolts which are Brass)
5.21	Gasket	Neoprene rubber
5.22	Marshalling terminal blocks	1 Sq mm, Nylon 66 material, Disconnecting type terminal blocks shall be provided. 20% spare in each row of TB.
5.23	Panel cover fixing bolts	Allen head 6mm with hexagonal slot Seals shall be provided between the Panel and removable covers to avoid theft. The seals shall be opened/broken by using specific equipment.
5.24	Padlock facility	Required for all earth switches & all handles
5.25	Bushings for future extensions of RMU	LHS extensible. Should be duly insulated & covered withmetallic covers in unused condition, In addition a removable boot cover shall be provided on the extensible bushings.
5.26	Explosion vents	To ensure operator's safety, design should ensure that gases / flames generated during flash over / blast in any of the compartment, must not come out from the front of RMU

		as well shall not go to adjacent cable compartment. AFLR Internal arc test report (for Cable compartment & other compartments) must be submitted to support above, along with RMU GA drawing indicating these vents. There shall not be any type of holes, gaps etc on the walls of cable termination compartment.
5.27	SF6 Gas Annual Loss	< 0.1% of total mass. Pressure of SF6 gas shall be above the operating limit throughout the life of the equipment.
5.28	VPIS	VPIS shall be provided with terminals facility for phasing purpose.VPIS sensor shall be installed on screened bushing NO/NC Contact shall be provided with VPIS for taking the Live line indication status to remote SCADA through FRTU. **{R1}**
5.29	Push Buttons	On/Off PBS shall be shrouded / covered to prevent accidental operation.
5.30	Internal Arc Classification	Shall comply to the requirements of IEC 62271-200, Accessibility type AFLR.Operators of equipment shall be protected against the effects of an arcing fault inany of the MV compartment at all times , including while carrying out themaintenance works on other compartments

Load break switch (LBS) / Isolator

6.1	Type	Three poles operated simultaneously by a commonshaft
6.2	Arc interruption indielectric medium	SF6 or Vacuum
6.3	Operation	3 position operation
6.3.1	Operating mechanism forclose / open	Motorized LBS Each motor shall be provided with separate MCB or Local-Remote switch.
6.3.2	Manual operation	Possible without removal of motor
6.4.1	Addition / removal of motor	Without overhaul of operating mechanism
6.4.3	Motor rated voltage	24V DC
6.5.1	Battery type & size	1. Li-ionbattery(LIB) 2. Battery provided in enclosure shall be rated for 10 close & 10 open operations of LBS / CB + 2 hrs back up for SCADA FRTU load (10watt).®
6.5.2	Battery charger rating	Two chargers of rating 10A each with parallel connection
6.5.3	Battery charger configuration	With auto changeover between two chargers using10Amp diodes
6.5.4	MCBs at charger input &output supply	Required 2nos for AC Incoming supply. All the MCBsshall be easily accessible for operation, with properlabeling.

6.5.5	Charger temperature rise at heatsink at full load for 2 hours	Maximum 55 deg C above ambient of 40 deg C
6.5.6	DC power supply for FRTU	24v DC +/- 1 volt thru 2 Amp MCB
6.5.7	Battery charger cooling method	Natural without any fans
6.5.8	Individual LBS DC Control	Required with MCB
6.6.1	Continuous rating of LBS	630 Amp at design 40 deg C ambient
6.6.2	Short time withstand capacity	31.5 KA for 3 sec
6.7	Fault making capacity	50 kA peak
6.8	Minimum number of operations at rated current (as per IEC 62271-102)	Mechanical Endurance – Class M1(1000 operations) Electrical Endurance – Class E3 (100 operations**)**
6.9	Minimum number of operations at rated fault current (as per IEC 62271-102)	Class E3 (Min 10 operations)
6.10	Fault passage indicator (FPI) (Earth fault and over current protection type)	To be provided on each and every LBS for RMU.FPI shall be earth fault and over current protection type and shall be suitable for remote load monitoring at SCADA for LBS**{R1}**
6.10. 1	Earth Fault and over current Indicator	CBCT – Split open type suitable for mounting without disconnection of cable for EF. Phase sensor – 3 Nos. for short ckt. purpose with mounting arrangement
6.10.2	Connection of CT sensors with FPI	Cable connection of FPI with CBCT/phase CTs shall be of pre moulded type on the CBCT side. Cable shall be 2.5 sq.mm cu cable
6.10.3	Fault Passage Indicator (Earth fault and over current protection type)	Digital type and shall operate as the current exceeds the set value. Flash indication for identifying faults with red LED with one flash for every one sec. Test & rest button 1 NO + 1 NC potential free contact for remote indication FPI power supply unit shall use lithium battery with minimum life of 1000 blinking hours , so that FPI shall continue to function even after main feeder has tripped. FPI shall be powered by 24V DC in all motorized RMUs and shall be suitable for remote load monitoring at SCADA for LBS**{R1}**

6.10.4	Data by Purchaser	
6.10.4.1	System Fault Level	
6.10.4.2	Type of Grounding	Solidly Grounded
6.10.4.3	Fault clearing time	100ms
6.10.4.4	Cable Type	PILC / XLPE to 400 sq.mm
6.10.4.5	**Earth Fault Indicator**	
6.10.4.5.1	Sensing Current	50 to 400A
6.10.4.5.2	Sensing Time	30 to 100 ms in steps of 10ms.
6.10.4.5.3	Reset Time	0.5 -1-2-3-4 hr
6.10.4.5.4	Resetting Facility	a) Self rest after reset time b) Self rest after restoration of voltage c) Manual d) Remote resetting
6.10.4.5.5	Contact Rating	1A at 230 V
6.10.4.5.6	Degree of Protection	IP 54
6.10.4.5.7	Mounting Arrangement	Surface or Flush Mounting
6.10.4.5.8	Ambient Temperature	-20 to 55 Deg C
6.10.5.5	**Short Ckt indicator**	
6.10.5.5.1	Sensing Current	200 to 120 0 A
6.10.5.5.2	Sensing Time	30 to 100 ms in steps of 10 ms
6.10.5.5.3	Reset time	0.5-1-2-3-4 hr

Circuit breaker (CB)

7.1.1	Type	Three pole, operated simultaneously by a common shaft
7.1.3	Circuit breaker - CB	For controlling cable feeder, manual and remote operation. Remote trip operation by SCADA
7.2	Arc interruption in dielectric medium	Vacuum Bottle
7.3.1	NA	NA
7.3.2	Operating mechanism - CB	Manual and Motorized spring charged stored energy type, remote electrical close / open operation possible.
7.3.3	Addition / removal of motor	Without overhaul of operating mechanism
7.3.4	Motor rated voltage	24V DC
7.4	Emergency trip / open push button	On panel front with Protective flap to prevent any accidental tripping of breaker.
7.5.1	Continuous rating at design 40deg C ambient	630amp
7.5.2	Short time withstand	26.3 KA for 3 sec

	capacity	
7.6	Minimum number of operations at rated current (as per IEC 62271-100)	Mechanical Endurance – Class M1(2000 operations) Electrical Endurance – Class E2
7.7	Fault making capacity	50 KA peak
7.8	Fault breaking capacity	21 KA Minimum
7.9	Maximum number of operations at rated Fault current *(as per IEC 62271-100*)	Electrical Endurance – Class E2 . To be guaranteed by manufacturer with authorized lab test reports
7.10	Breaker status auxiliary contact	2NO + 2NC wired to terminal block
7.11	Current transformer	1. 75-400 / 1 amp for TCB/ FCB. {R9} 2. Considering three core cable terminations, mounting flexibility shall be provided for CT's (in horizontal & vertical direction both). Additionally, CAUTION marking (by sticker/ paint) shall be provided to avoid CT's installation above the screen of cable. (I.e. earth potential point.) 3. Position of CTs inside compartment shall be adjustable in vertical and horizontal direction
7.12	CT accuracy class	5P10 minimum
7.13	Protection relay	**Relay features.**
	Technology and Functionality	Numerical, microprocessor based with provision for multifunction protection, control, metering and monitoring
	Mounting	Flush Mounting, IP5X
	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.
	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.
	SCADA Interface port	(a) RS485 for IEC 103 communication. (b) Dual fibre optic port for interfacing with SCADA on IEC 61850 with PRP compatibility. Through this port relays shall be connected to Ethernet switches.
	Communication Protocol	IEC103 (Data Type 9) and Dual fibre optic port for interfacing with SCADA on IEC 61850 with PRP compatibility. Through these ports relays shall be connected to switches. Communication protocol shall be selectable at site.
	Processing Indications	SCADA functions in monitoring direction shall be executed on SPI (Single Point Input) and DPI (Double Point Input). DPI shall only be used in case of Isolator and Circuit

		breaker “close” and “open” indication.
	Command Processing	Functionality of command processing offered for SCADA interface shall include the processing of single and double commands i.e SCO (Single Command Output) and DCO (Double object command Output). DCO shall only be used in case of Isolator and Circuit Breaker close” and “open” command.
	PC Interface port	Front port (preferably serial) for configuration/data download using PC.
	GOOSE messaging	Relays shall communicate all status signals, commands and events on GOOSE messaging. Interlocks if any shall also be on GOOSE Messaging and wiring for that shall be in vendor’s scope.
	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.
	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.
	Event and Fault records	(c) 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. (d) Relay shall store records for last 100 events (minimum) (e) Relay shall store records for last 10 faults (minimum). (f) It should be possible to download records locally to PC and to remote SCADA.
	Measurement	Relays shall be capable of transmitting current, voltage, power, fault type and other measured parameters to SCADA.
	Self diagnosis	Relay shall be able to detect internal failures and same shall be transmitted to SCADA as a soft signal. A watchdog relay with changeover contact shall provide information about the failure for annunciation.
	Time synchronization	All relays shall be capable of being synchronized with the system clock through SCADA, PC and GPS.
	Operation Indicators	(a) LEDs with push button for resetting. (b) Resetting of LEDs shall be possible from SCADA
	Test Facility	Inbuilt
	Relay 1	Combined Line differential and distance protection

		Dedicated port for communication with remote end relay through optical fibre. This port should be in addition to PC interface and SCADA interface ports.
		Software based CT ratio correction
	User Configurable DIs and DOs	(a) Relay-1 should have DIs and DOs as per scheme requirement. Same shall be finalized during detailed engineering. 2 DIs and 2 DO shall be spare for future use. (b) Relay-2 should have minimum of 32 DIs and 16 DOs Exclusively for SCADA interfacing. DIs and DOs fortripping and interlocking shall be additional as perscheme requirement. If DIs and DOs for tripping andinterlocking are integrated with DIs and DOs meant for SCADA (may be done to optimize DI/DO configuration), atleast 4 DIs and 4 DOs should beavailable as spare in each panel for future use.
		Relay -2 Self powered, Microprocessor based Numerical relay (with LCD display), IDMT over current and earth fault protection with high set element, manual reset type Relay mounting flush to panel front Display shall be powered with 24V DCor 230V AC for all motorized RMU RS-485 Port to be provided on the Relay for remote communication of the parameters to the SCADA through FRTU over MODBUS Protocol. Necessary internal wiring also shall be done between Relay and FRTU. Licensed software shall be provided for Relay communication with Laptop along with necessary cables for interconnection between Laptop and Relay (Based on requirement). Appropriate wiring to be done to connect all the relays to the FRTU. **{R1}**
7.14	Relay auxiliary contacts for remote indication	Potential free contact 1NO + 1NC wired to terminal block RS-485 Port to be provided on the Relay for remote communication of the parameters to the SCADA through FRTU over MODBUS Protocol. Necessary internal wiring also shall be done between Relay and FRTU. Licensed software shall be provided for Relay communication with Laptop along with necessary cables for interconnection between Laptop and Relay (Based on requirement).. Appropriate wiring to be done to connect all the relays to the FRTU. **{R1}**
7.15	Shunt trip 230v AC (for WTI, OTI trip & door limit switch of Dry type transformer) & for remote trip from SCADA.	To be wired to terminal blocks (If the functional requirement is achieved by the Protection relay, then shunt trip is not required.

7.16	Breaking Timing	40 to 60 ms**{R1}**

Earth switch (ES)

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

Requirements of sealed housing live parts

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

Operational interlocks

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

Indication & signals (for SCADA / Local)

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

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

11.10.4	RS 485 MODBUS output of Protection relay	Required
11.10.5	Interlock Card Remote Reset	Required

Mimic diagram, labels & finish

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

Quality assurance

13.1	Vendor quality plan	To be submitted for purchaser approval

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

Inspection & testing

14.1	Type test	1. Equipment of type tested quality only, including internal arc test (AFLR)on various compartments like cable chamber, SF6 gas tank etc. 2. Type test certificate along with AFLR internal test report from CPRI/ERDA/Any other reputed independent international Lab equivalent or better than CPRI/ERDA to be submitted along with offer for scrutiny. Type test more than 5 years old will not be acceptable. In case type test is more than 5 years old, bidder shall conduct type test from CPRI/ERDA/Any other reputed independent international Lab equivalent or better than CPRI/ERDAas per standard without any cost implication to BRPL. In this regards if BRPL want to witness the test , all the expenses of BRPL inspector shall be borne by bidder. 3. Bidder to submit following test report for DC charger. a) temperature rise test b) voltage regulation test
14.2	Routine test	As per relevant Indian standard
14.3	Acceptance test	To be performed in presence of purchaser at manufacturer works. BRPL may carry out integration of the FRTU/Modem and BRPL SCADA during Inspection stage. OEM to carry out the configuration of both Modem and FRTU in this case to establish connection between FRTU and SCADA.SIM shall be provided by BRPL
		1. Physical inspection & BOM, wiring check
		2. Insulation resistance test (Before & after HV test)
		3. HV test for one minute,
		4. Operation & interlock check
		5. Measurement of resistance of main circuit
		6. Voltage Indication check

		7. Functional testing of Fault passage Indicator for Alarm
		8. Primary current injection test for each circuit breaker feeder with relay
		9. Breaker closing & opening time measurement
		10. Temperature rise test
		11. Functional test of FRTU
		12. Motor Operation
		13. Partial Discharge
		14. Raw material docs verification

1.0 Shipping, Handling and Site support

15.1	Packing Protection	Against corrosion, dampness, heavy rains, breakage and vibration
15.2	Packing for accessories and spares	Robust wooden non returnable packing case with all the above protection & identification Label
15.3	Packing Identification Label (Anodized Aluminum Plate)	On each packing case, following details are required:
		i. Individual serial number
		ii. Purchaser's name
		iii. PO number (along with SAP item code, if any) & date
		iv. Equipment Tag no. (if any)
		v. Destination
		vi. Manufacturer / Supplier's name
		vii. Address of Manufacturer / Supplier / it's agent
		viii. Description (Configuration of RMU; e.g. 1CB + 2 ISO, Motorized / Non Motorized, Extensible / Non Extensible) and Quantity must be prominently displayed at least 3 sides of packing box & on top.

		ix. Country of origin
		x. Month & year of Manufacturing
		xi. Case measurements
		xii. Gross and net weights in kilograms
		xiii. All necessary slinging and stacking instructions
15.4	Shipping	The seller shall be responsible for all transit damage.
15.5	Handling and Storage	1. Manufacturer instruction shall be followed. 2. Detail handling & storage instruction sheet / manual to be furnished before commencement of supply.

Deviations

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

Drawings/Documents and Software Submission

17.1	To be submitted along with bid	The seller has to submit following:
17.1.1	GA / cross sectional drawing of product showing all the views / sections	
17.1.2	Detailed reference list of customers using the offered product during the last 5 years with similar design and rating	
17.1.3	Completely filled GTP	
17.1.4	Manufacturer's quality assurance plan and certification for quality standards	
17.1.5	Type test reports for the type, size & rating of product / equipment offered	
17.1.6	Complete product catalogue and Manual.	
17.1	Recommended spare parts and consumable items for five years of operation and spare parts catalogue with price list	
17.2	All documents as per clause 13 of this specification	
17.3	After award of contract, Seller has to submit following drawings for buyer's Approval (A) / Reference (R)	
17.3.1	Program for production and testing (A)	

17.3.2	Guaranteed Technical Particulars (A)	
17.3.3	GA drawing along with civil foundation details.	
17.3.4	Schematic and wiring drawings for all components	
17.3.5	Terminal arrangement & cable box details including gland plate arrangement etc	
17.3.6	Bill of material	
17.3.7	Detailed loading drawing to enable the buyer to design and construct foundations	
17.3.8	Transport / Shipping dimensions with weights, wheel base details, un tanking height	
17.3.9	Detailed installation and commissioning instructions	
17.3.10	quality plan	
17.4	Submittals required prior to dispatch	
	-Inspection and test reports, carried out in manufacturer's works	
	-Test certificates of all bought out items	
	-Operation and maintenance Instruction as well as trouble shooting charts/ manuals	
17.5	Drawing and document sizes	Standard size paper A3, A4
17.6	Number of Documents required at different stages shall be per Annexure-A	
17.7	1. As Built Drawings. (One set of As Built drawing to be provided with each RMU during dispatch. As Built drawing shall be provided to BRPL in soft copy) 2. IO termination chart shall be provided along with the schematic drawing for approval. IO Termination chart shall be provided on the inside of FRTU Compartment door. 3. The FRTU and modem Configuration file for every FRTU shall be shared with BRPL after successful on-site integration with SCADA. 4. FRTU and modem licensed software to be provided to BRPL. Any future software upgrades and support to be provided to BRPL without any cost implication till warranty period. 5. FRTU and modem features brochure and tutorial for configuration to be provided to BRPL for reference during configuration for their engineers	
Note :	Duly signed & stamped copies of the drawings / documentation are required to be submitted to BRPL for approval along with deviation sheet.	

18.0 Equipment ID

- A Slot shall be provided on the Compartment door at a clearly readable height from the base level of FRTU compartment. This slot shall be provided with a Fibre card which shall be accessible from inside only but shall be visible outside. Equipment ID shall be painted/printed on the Fibre Cardand

- Equipment ID shall be painted on any appropriate face of RMU at a clearly readable height from the base level. Front recommended type face for the signage is True type or Post script

- Font Size: All painting should be in UPPERCASE. Recommended height of 50 mm with spacing between alphabets of 3 mm.
- Total No's of Character: 18
- Height of Font: 50 mm
- Height of Base: 100 mm
- Spacing between alphabets: : 3 mm
- Paint: Base coat – Dense Yellow. Letters – Black Quick Drying paint 2 coats.
- Equipment ID shall be separately provided by BRPL
- Equipment IDprinting shall complete at factory by seller on each and every motorized RMU before dispatch.

19.0 BATTERY HEALTH MONITORING UNIT

I. BHMU will have Autoand Manual test facility. In Auto Mode it ensures battery automatic discharge at preset set period with 100W discharge resistor along with suitable algorithm to check the healthiness based on rate of discharge.

II. In manual Mode PB provided for battery testing.

III. Provision for Bypass mode pof BHMU also required.

IV. Output contacts :230V/24V DC -5A

a. Battery Fail: 1 CO b.Test In process

V. Indications:

b. BHMU healthy b. Battery Fail c. Battery Low d.Test On.

VI. Make :as per annexure- I

Annexure A Scope of supply

1.2 The scope of supply shall include following

1.3 Design, manufacture, testing at manufacturer works before dispatch, packing, delivery and submission of all documentation the 33kv Ring Main Unit (RMU).

1.4 33kV RMU shall be as per scheme enclosed as Annexure E.

1.5 FRTU along with necessary software's as per detailed specification in Annexure H

1.6 Supply of Modem (Dual SIM, Auto Change Over, 4G, and GSM) for FRTU communication with Control Centre as per specification in Annexure G. SIM card shall be provided by BRPL.

1.7 Battery, Battery Charger and BHMU

1.8 Configuration of 33kV RMU shall be as per Purchase Requisition.

1.9 Testing & Commissioning of all motorized RMUs at site before charging is included in the scope of vendor including all operational checks, LV wiring checks, battery / charger checks, VPI , FPI, self powered relay, FRTU and SCADA integration. Vendor shall depute the service team with 1 day prior notice from owner.

1.10 FRTU customization, parameterization along with integration of FRTU with Control Centre has to be carried out at all sites by vendor engineer.

1.11 Guarantee Period for RMU along with FRTU & Modem: 66 months from the date of supply or 60months from date of commissioning, whichever is earlier.

1.12 Service Performance Requirements During Guarantee Period:

a) RMU including battery charger: Complaint to be attended on urgent basis and to be resolved within24hrs, 1day from intimation. Necessary spares may be maintained by vendor service team at Delhi.

b) FRTU:After reporting of FRTU modules compliant / failure, within 24 hours FRTU modules shall be replaced by vendor at site. Spare cards / modules shall be maintained by the vendor at Delhi during the guarantee period.

c) Modem: After reporting of Modem compliant / failure, within 24 hours Modem to be rectified / replaced by vendor at site. Spare modems if required shall be maintained by the vendor at Delhi during the guarantee period.

1.13 Each RMU shall be supplied with 2 sets of Operating Handle.

1.14 All the accessories mentioned above shall be supplied along with RMU's as a composite unit. Inside the composite unit, battery and battery charger shall be inbuilt inside RMU compartment and FRTU, modem shall be inbuilt inside LV compartment. Refer Annexure-J for drawing.

1.15 Supplier scope includes training of BRPL team – 4 batches (each batch with 4-6 engineers or team member as per BRPL requirement.) for minimum 3 days each at factory as well as at BRPL site for erection, testing commissioning and maintenance trouble shooting mechanism of Motorized RMU including Automation part. This shall be carried out 1 week from date of 1st shipment/ dispatch. Supplier shall also provide training for Self Powered relay & FRTU at respective manufacturer' factory as well as at BRPL site for minimum 3 days for BRPL team – 4 batches (each batch with 4-6 engineers or team member as per BRPL requirement.) ..This is applicable for each and every P.O. of Motorized RMU's.

1.16 Unit price for Conversion kit should be offered separately for converting the RMU from single cable termination design to double cable termination design, at site.

1.17 BOQ as following –

Sr No	Purchaser Equipment Tag No / SAP code	RMU standard configuration Type	Unit	Quantity
1				
2				
3				
4				

2.0 Submission of documents

	Along with offer	For Approval after award of contract	Final after approval

Documents as given in clause no 17 of specification	3 copies + 1 soft copy on CD	4 copies + 1soft copy on CD	6 copies + 1 soft copy on CD for all type of documents

3.0 Delivery schedule

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

Annexure B Technical particulars (Data by purchaser)

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

Annexure C Guaranteed Technical Particulars (Data by Supplier)

Bidder shall furnish the GTP format with all details against each clause.
Bidder shall not change the format of GTP or clause description.
Deviation sheets shall be submitted separately along with company seal and sign. Deviation mentioned in submitted GTP or any other documents except deviation sheet shall not be considered as a deviation.

Sr. No.	Description	Data to be filled by Manufacturer
1	33 kV RMU (as per scope of supply annexure A)	Separate GTP to be filled for each type of RMU
2	Equipment make	
	Equipment type / brand name	
3	Conformance to design standards as per specification clause no 2.0 –	Yes/No

4	Conformance to specification clause no 3.0 to 17.0 –	Yes/No
5	If NO for pt 3 or pt 4 above, Submission of deviation sheet for each specification clause no –	Yes/No
6	Panel overall dimensions in mm	
	Width (measured from front)	
	Depth	
	Height	
7	Panel weight in kg	
8	Panel extensible on RHS sides	Yes
9	Panel enclosure protection offered	
10	Panel tested for internal arc (Cable & other compartments) –Yes / No	
11	Heat generated by the panel in Kw	
12	Insulation level for complete panel	
12.1	Impulse withstand (kV peak) -170kvp min	
12.2	Power frequency withstand (kV rms) – 70kV min	
13	Bus bar	
13.1	Material & grade	
13.2	Bus bar cross section area in sq mm	
13.3	Bus bar rated current in amp i) at designed 40 deg.C ambient ii) at 50 deg.C ambient	
13.4	Max temperature rise above reference ambient of 40 deg C	
13.5	Short time current withstand capacity for 3 seconds (in KA)	
13.6	Bus bar clearances in mm P-P / P-E	
13.7	Bus bar with insulation sleeve / barriers	
13.8	Bus bar support insulator type	

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

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

16.1	Disconnect switch continuous rating (Amp)	
16.2	Disconnect switch Short time withstand rating -20kA for 3 sec minimum	Yes / No
16.3	One LBS open operation possible in the event of loss of SF6 gas	Yes/No
16.4	**DC charger rating in amps – min 10 Amp Dual**	Yes
a	MCB rating at 230v AC input of charger	Amp
b	MCB rating at 24v DC output of charger	Amp
c	Charger heat sink temperature rise (max 55 deg C above ambient 40 deg C)	
d	Voltage variation in 24v Dc output for FRTU	(Max +/-1 V)
e	Charger with natural cooling (no cooling fans)	Yes/No
f	Charger tested for input supply voltage regulation test (input variation 150v-250v, output Dc voltage variation +/- 1 volt max)	Yes/No
g	Charger temperature rise test certificate submitted	Yes/No
16.5	DC battery rating in Ah – 20Ah standard	Yes/No
16.6	DC charger changeover – Diode rating 10A min	Yes/No
17.1	Cable termination – Height of power terminal from gland plate	Mm
17.2	Torque required for tightening terminal lug	
18	Mimic diagram, labels & finish as per cl no 12	Yes / No
19	Submission of RMU / component	Yes/No

	catalogue	
20	Unit price for Conversion kit offered separately for converting the RMU from single cable termination design to double cable termination design	Yes / No
21	Earth Switch	
21.1	Minimum number of operations at no load- Mechanical Endurance class	
21.2	Making capacity endurance of earth switch – Electrical endurance class	
22	Self Powered Relay – Make / Model	As per Annexure-I
22.1	CT Input	
22.2	IDMT Setting Range 4 element – Over Current & Earth fault & steps	As per BRPL requirement
22.3	Operating Time	Over Current – IDMT Instantaneous
22.4	Pick up Current	
22.5	Resetting Current	
22.6	Relay Burden	
22.7	Time Accuracy	
22.8	Tripping Coil O/P – type & duration	
22.9	Fault Current Display	
22.10	No of Fault Current Latching with time stamping	
22.11	Display Facility / Type	
22.12	Operational Indicators	
22.13	Potential Free Output Contacts	
22.14	Thermal Withstand Capacity of Relay	
23	Fault Passage Indicator (shall be for both earth fault and over current protection)	
23.1	CBCT	
a	Type	
b	Mounting Arrangement	

c	CT to indicator connection	
d	ID of sensor	
e	Make	As per Annexure-I
23.2	Phase CT – LBS	
A	Type	
B	Mounting Arrangement	
C	CT to indicator connection	
D	ID of sensor	
23.2	Earth Fault Indicator make	As per Annexure-I
a	Sensing Current (i) Earth Fault (ii) Short Ckt Indicator	
b	Sensing Time (i) Earth Fault (ii) Short Ckt Indicator	
c	Indication	
d	Reset Time (i) Earth Fault (ii) Short Ckt Indicator	
e	Resetting Facility	
f	Output Contact	
g	Contact Rating	
h	Aux Power Supply	
i	Degree of Protection	
j	Mounting Arrangement	
k	Ambient Temperature	
l	Make	As per Annexure-I
24	Current Transformer- Make	As per Annexure-I
24.1	Ratio	
24.2	Burden	
24.3	Accuracy Class	
25	Voltage Presence Indicator- Make / Model	As per Annexure-I

26	FRTU	
26.1	Make & Model No	As per Annexure-I
26.2	No of DI Modules	
26.2.1	Type I – 1CB + 2ISO	
26.2.2	Type 2 – 2CB + 2ISO	
26.3	No of DO Modules	
26.3.1	Type I – 1CB + 2ISO	
26.3.2	Type 2 – 2CB + 2ISO	
26.4	No of AI Modules	
26.4.1	Type 1/ Type 2	
26.5	Make of Protocol converter	As per Annexure-I
26.6	Modem	Make -As per Annexure-I
	Type – 4G, GSM, Dual SIM Auto Change Over Facility Speed – 800/1900 MHZ	Yes / No Yes / No
26.7	Interposing Relay with freewheeling diode	
	Make	As per Annexure-I
	Rating	
	Model No	
26.8	Terminal Blocks, Disconnecting type fuses make	As per Annexure-I

Bidder / Vendor seal / signature ----------

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

Annexure-D Recommended spares

List of recommended and mandatory sparesare as following

Mandatory spares are the part of supply along with RMU.

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

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

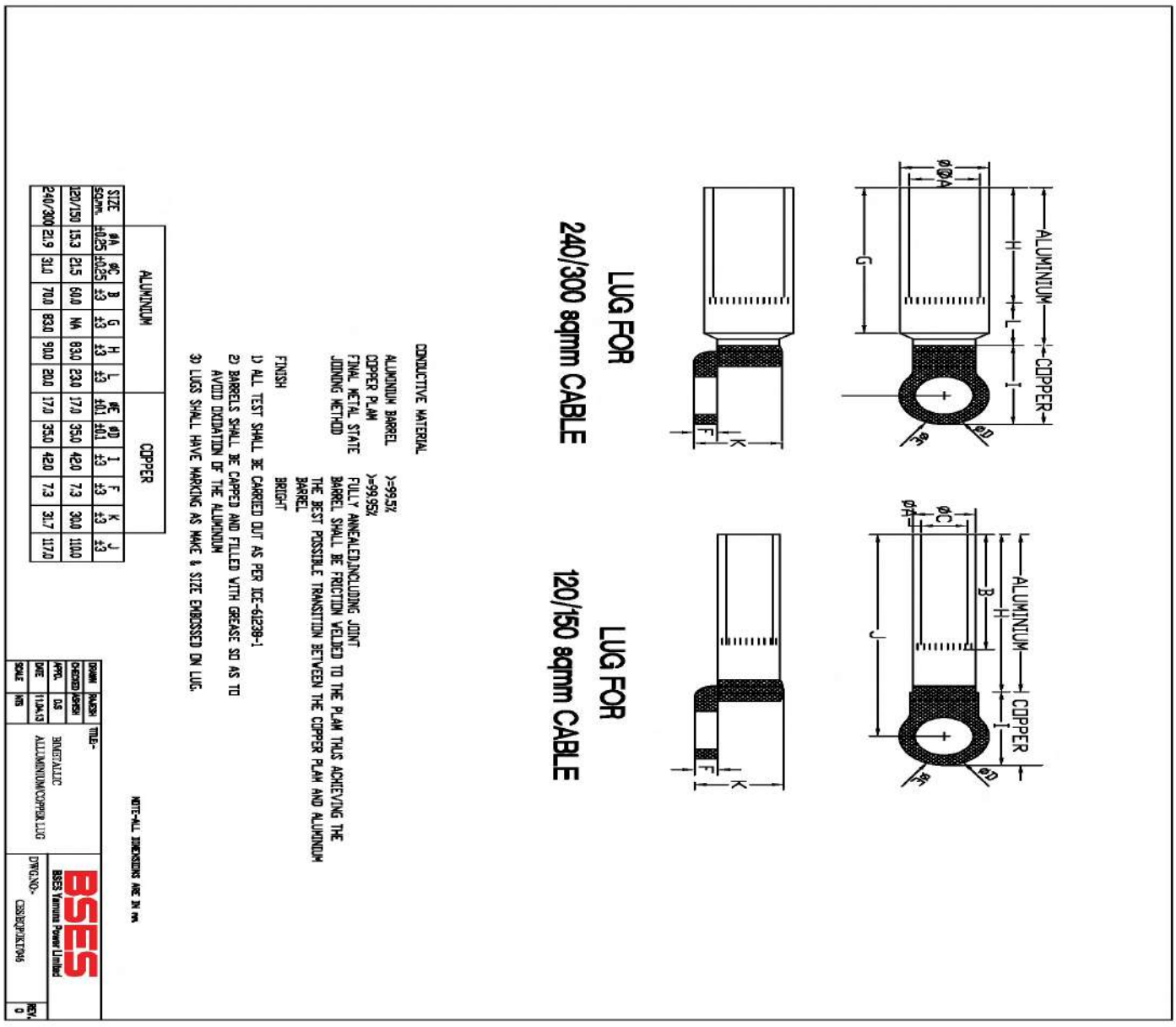
a) 33kv RMU shall have circuit breakers (CB) with Load break switches(LBS) as per configuration defined inPurchase Requisition.

b) Motor drive for LBS or CB is shown by letter ‘M’.

d) 33 kv RMU shall be suitable for extension onRHS for addition of LBS, CB.

e) Fault passage indicator (FPI) including associated CT & connecting cable is shown byletter ‘F’.

Annexure F Drawing of Bimetallic Ring Type Lug



SIZE sqmm.	ØA ±0.25	ØC ±0.25	B ±3	G ±3	H ±3	L ±3	ØE ±0.1	ØD ±0.1	I ±3	F ±3	K ±3	J ±3
	ALUMINIUM						COPPER					
120/150	153	215	500	NA	830	230	170	350	420	73	300	1100
240/300	219	310	700	830	900	200	170	350	420	73	317	1170

Annexure G Specification for Modem

Modem	: 4G GSM (800/1900 MHZ), (Dual SIM auto change over-optional.) Modem should be able to send a power failure signal in case when battery/battery charger fails before shutting down.
Make-	As per Annexure-I
RUIM Interface	: External RUIM 3.0V
SMS	: Supports Text
Data	: Data circuit Asynchronous and non transparent Up to 153.6 kbps Autobaud rate (2400, 4800, 9600, 19200, 38400, 57600 bps) Fixbaud rate (300, 600, 1200, 9600, 115200 bps)
AT Commands Interface	: RS-232 port for supporting AT commands, PPP Protocol
Communication Interface	: Remote management features like telnet & remotely download facility.
LED Indications	: Power ON, Network
Connectors / Switches	: RS-232 Serial, RUIM Card Holder, DC power connector,SMA Antenna connector, Make shall be As per Annexure-I
Power Supply	: 6 – 30V DC (with reverse current protection)
Enclosure	: Aluminium Extrusion
Mounting	: DIN Rail Mounting
Temperature	: Operating (-10 to 65 Degree Centigrade)
Antenna	: : 12 dB High gain multi directional antenna with 15Mtr wire to be provided . Provision for taking antenna wire outside to be provided.Adequate accessories for mounting Antenna at appropriate Sub-station location (Roof/wall) for trouble free operation such as wall mounting bracket, roof mounting bracket etc.
Accessories	: a) 1 Meter cable for connecting to external DC power source (5V – 30V) b) Standard RS232 serial data cable(1 Meter)
SIM Capability	: The Modem shall be provided with GSM 4G compatible. Dual SIM Capability along with auto change over facility between the two SIM may be provided as a optional.

Annexure G(1)

SERVICING AND WARRANTY REQUIREMENT- EQUIPMENT SUPPLY (33 KV RING MAIN UNIT)

INDEX

1. Purpose

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

2. Applicability

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

3. Priority

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

4. Liability

i) Supplier shall be liable to arrange OEM qualified service engineers as and when required by BRPL Rajdhani Power Limited to attend defects, trouble shooting to restore equipment health to ensure 100 % capacity availability.

ii) OEM shall be liable to provide essential spares at reasonable price for entire lifespan of the equipment.

iii) Service call shall be attended within reasonable time frame as mentioned in this document.

iv) Service cannot be denied by supplier/OEM till completion of useful life of the equipment.

v) The commercial liability shall be restricted to supply/service contract provision.

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

5.Warranty Requirements

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

ii) The cost incurred for service, spares, transportation, consumable and manpower / labour shall be borne by supplier.

iii) OEM is bound to send service engineer to site on request for troubleshooting promptly.

iv) There is no cap on number of visit or spare replacement required to repair / trouble soot the problem in the equipment during warranty period.

v) Each break down / problem reported shall be analysed scientifically to establish the root cause of breakdown.

vi) In case it is established that any component or accessories is not performing satisfactorily or causing repeated failure due to poor performance, manufacturing mistakes, design mistakes or not suitable to our environment condition applicable to NCR region, the OEM shall be liable to rectify or replace the same in all equipment supplied to BRPL irrespective of warranty period.

vii) In case if RMU supplier is not OEM of the equipment / accessories, the supplier will be liable to tie up with OEM to provide service / spares to meet warranty / servicing requirement stipulated in this documents.

viii) Irrespective of onsite or workshop repairing, it will be responsibility of OEM to maintain work quality to ensure no compromise on performance and useful life of the equipment.

6. Process requirements

6.1 Complain Registration.

i) Supplier to provide communication details for complaint registration in O&M Manual, on website as well as shall be printed on the equipment. In case of changes, same shall be communicated to BRPL.

ii) BRPL will register complain through a e-mail / telephonic call to the call centre / service centre

6.2 Confirmation and Service time Schedule.

i) All timing will be counted from date of call registration by BRPL till restoration of equipment health at respective site in operation condition satisfactory of BRPL engineer.

ii) Service call confirmation & service engineer visit schedule shall be provided within two hour for working hour call (09:00AM to 06:00PM, Monday to Saturday) and before 10 AM next working day for off working hour calls.

iii) Emergency trouble shooting calls - within 12 Hrs including spare arrangements.

iv) Normal trouble shooting call - within 48 Hrs.

v) On site repairing / component replacement - within 7 days.

vi) OEM workshop repairing - within 30 days including returning to BRPL stores.

vii) Replacement of complete RMU - within 45 days.

viii) The service engineer shall intimate necessary requirement to attend call along with confirmations

6.3 Site visit & Investigation.

i) The OEM shall depute qualified and experienced engineer to carryout trouble shoot as well as testing and collecting necessary data / details essential for root cause analysis.

ii) The service engineer shall collect preliminary details to understand and estimate the spare requirement, shutdown time requirement from our respective area engineer whose details will be provided along with service call.

iii) The necessary tools shall be carried by service engineer attending calls.

iv) Service engineer to get call attendance certificate from respective area BRPL engineers.

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

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

6.4 Recommendation.

i) Shall be based on scientific study / test results only.

ii) Shall cover root cause analysis for failure.

iii) Shall cover spares / component list for repairing.

iv) Shall cover time requirement.

v) Shall cover site preparation / condition requirement.

vi) Other critical measures essential for quality work.

6.5 On Site Repairing.

i) All site repairing shall be under supervision of OEM engineer and shall meet all OEM recommendation to ensure quality of work.

ii) All spares arrangement shall be carried out well in advance to minimize outage time. The list must be shared with CES team

iii) Necessary repairing process to be intimated to CES team in advance. It shall include in process & final quality and performance checks / test.

iv) The repairing process shall be certified by OEM design / quality expert.

v) Detailed time schedule and spares arrangement details shall be submitted to CES team for necessary planning.

vi) The repairing work shall be witness by BRPL CES engineer, who may insist in process / performance checks / test in addition to above if felt essential.

vii) If BRPL engineer observed any quality problem / skill problem, may insist for repairing at OEM facility.

6.6 Repairing at OEM facility.

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

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

ii) In case if BRPL felt that site repairing is not up to the required quality or felt necessary to analyze cause of failure, the same shall be organized by OEM.

iii) Equipment unpacking, testing and opening for analysis inspection shall be carried out in presence of BRPL engineer. It shall be intimated to BRPL at least 3 days in advance for necessary travel arrangement.

iv) If cause of failure observed due to design mistake / manufacturing mistakes, the same shall be rectified in all other similar design equipment without any cost to BRPL.

v) OEM to intimate the final testing for inspection. BRPL may depute engineer or third party representative to carryout inspection / testing before dispatch.

vi) Dispatch shall be carried out only after BRPL clearance.

vii) Necessary lifting, shifting, loading / unloading & transportation arrangement shall be in the scope of OEM / supplier.

viii) A document required essential for lifting and shifting of equipment will be intimated at least two days in advance.

6.6 Witness / Inspection stages.

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

i) On site inspection, repairing/replacement work.

ii) Testing / inspection equipments / any accessories / component to establish the cause of failure.

iii) Opening of equipment for internal part inspection.

iv) Final testing/inspection before despatch.

v) Testing / checking of the evidence causing failure / problem.

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

7 .0 Documents / records / report submission

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

i) Root cause analysis report.

ii) All test report.

iii) Minutes of meeting.

iv) Spares / accessories test report / calibration certificates.

v) Proof of expenditure for cost incurred to BRPL.

vi) Copy of transportation documents.

vii) All technical details of parts / accessories being replaced.

8.0 Qualification requirements for service engineers

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

9.0 Safety.

i) All necessary personal protective equipments requirement for the personal and labour will be in the scope of OEM / supplier.

ii) It will be liability of OEM / Supplier to meet the necessary safety norms , standards, rules & regulation .

iii) BRPL may audit the same during on site work.

10.0 Communications.

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

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

11.0 Changes / revision management.

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

Specification for

FRTU

ANNEXURE-H:FRTU DETAILS

Index

Record of Revision

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

Feeder Remote Terminal Units

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

1.1.0 FRTU Architecture

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

Central Processing Module

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

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

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

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

I/O Module

Each I/O module shall be capable of interfacing with digital inputs, control output points and combinations of point types. I/O modules shall be replaceable without reprogramming, redefinition of configuration parameters or rewiring.
A control disable switch shall be provided within each I/O module. When the switch is in the control position, the SCADA/DMS or test set shall have control of the digital control outputs. When the switch is in the disable position, the digital control outputs shall be disabled. A status input contact shall be available to monitor the position of this switch. The switch position shall be reported to the SCADA/DMS system. The required number of points shall be the responsibility of the Contractor.

FRTU Time and Date Facility

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

Functional Requirements

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

Input / Output Point Types

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

Status Inputs

The Contractor shall supply the necessary sensing voltage, current limiting, input isolation, and bounce filtering for all status inputs. The debouncetime period for each status input shall be

individually configurable. The input circuit of the status input modules shall be optically isolated from the external signal. In addition, each input circuit shall include an LED indicator next to the circuit terminations to show the status of the associated input contact.

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

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

1) Single Contact, Two-State Status: For single contact, two-state status points, a single contact shall represent both states of the monitored device. One position of the contact shall indicate an alarm or failure condition, while the opposite state of the contact shall indicate the normal condition.

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

Control Outputs

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

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

FRTU control outputs shall be equipped with high power relays with free-wheeling diodes that are integral to the FRTU so that external auxiliary control relays are not required. The associated high and low control power shall be obtained from the dc power supply in the switch. The voltage rating

of the control output contacts shall be 24 V DC. All control outputs shall be capable of driving a load of eight (8) amps at the primary control voltage with provision for an additional NO contact for DI status of Command Execute Acknowledgement wired up to terminal blocks. External auxiliary control relays are not preferred, but may be applied if integral relays do not satisfy the above ratings. These relays shall be supplied by the Contractor.

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

1. The point selection command is received from the SCADA/DMS master station.
2. The FRTU checks that no other point is selected.
3. The FRTU selects the addressed point and transmits a selection confirmation to the SCADA/DMS.
4. The FRTU starts the command receipt timer and checks that only the required point remains selected and no other points become selected.
5. The operate command is received from the SCADA/DMS.
6. The FRTU verifies the operate command and energizes the selected control point relay for a predetermined time.

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

Input / Output Point Counts

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

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

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

Analog Inputs

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

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

Programmable Logic Control (PLC)

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

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

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

FRTU Data Communications

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

The FRTU's shall have three (3) number serial ports, one port used for communication with slave device and one port for communication with BCC and MCC, and one RS485 port for Modbus

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

1.2.8Wifi Connectivity for local access

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

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

1.2.9 Cyber Security

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

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

FRTU Enclosures

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

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

The dimensions shall be suitable to accommodate FRTU CPM and I/O modules, power supply accessories, terminal blocks, communication modem with power adaptor, Ethernet switch for FO

connection and ease of intra-panel wiring/termination and maintenance thereafter. Suitably sized PVC perforated channels to be used for routing intra-panel wiring.

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

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

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

Contractor shall indicate gross weight of FRTU in GA drawing.

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

FRTU Power Supply

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

The main DC circuits shall be protected by incoming circuit breakers. Each circuit shall be tapped through single pole MCBs so as to provide an individual DC feed to each of the I/O modules, modems and protocol converters. Contractor shall provide maximum power consumption data of each of the type of FRTU.

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

FRTU Test Systems

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

1 Each test system shall support all maintenance aspects: verifying proper operation, troubleshooting, reconfiguring, and setting operational parameters for the FRTU's.

2 The test systems shall support all functional capabilities of the FRTU's, including functions which are not explicitly required in these Technical Specifications and functions which may not be included in the delivered FRTU's.

3 It shall be possible to use a test system locally at the site of the FRTU under test, and also remotely wherever access can be obtained to the communication channel of the FRTU.

4 All the required data rates shall be easily selectable.

5 It shall be possible to use the test systems to monitor communications between the respective SCADA/DMS and the FRTU's by selecting specific data streams, or portions of such data streams, both to and from FRTU. The data shall be displayed in a form that is easy for the user to interpret.

6 It shall be possible to connect the test system directly to the FRTU and to use the test system to perform all necessary FRTU management and expansion functions, monitor all stored data, monitor FRTU inputs, exercise FRTU outputs, and diagnose and troubleshoot the FRTU. It shall also be possible to use the test system as a local user interface at the FRTU location.

7 No programming skills shall be required to use the field test system. Interactive procedures relying mostly on pull down menus shall be used. The user shall not be required to type in commands, and shall be prompted when data entry is needed.

8 The test system shall be ruggedly constructed and suitable for field work and transportation in trucks. All cables, connectors, equipment, and documentation associated with their operation shall be included and stored either within the test system package or in suitable separate containers.

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

Software / Firmware

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

General

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

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

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

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

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

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

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

Diagnostic Software

Software shall be provided to continuously monitor operation of the FRTU and report FRTU hardware errors to the SCADA/DMS. The software shall check for memory, processor, and input/output errors and failures. It is desirable that internal diagnostics be sufficiently detailed to detect malfunctions to the level of the smallest replaceable component.

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

FRTU Testing

1.7.1 Type Tests

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

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

1.7.2 Routine Tests

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

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

1. Visual tests to confirm that construction and sizing requirements have been met.
2. Rigorous testing of each input and output function of the FRTU's. This shall include the fault detection and the disturbance data storage functions as well as the operation and performance of the FRTU time and date facilities.
3. Verification of the use of the FRTU test equipment for maintenance and testing.
4. Verification of the ability to download parameters and configuration data from the SCADA/DMS master station.
5. Verification that FRTU software and firmware support FRTU sizing and expansion requirements.
6. Verification of successful communications (i.e. protocols) at all the required data rates.

7. Testing for secure operation, including verification that: a) Communication errors are detected. b) SCBO procedures are properly performed for control outputs. c) No erroneous control operation occurs and no incorrect data is generated when power is turned on or off or when operating on low battery voltage.

FRTU Spares:

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

FRTU Types:

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

High Gain Antenna

Scope :

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

Annexure –1: Guaranteed Technical Particulars

FRTU Types	Digital Input Channels	Digital Output Channels	Analogue Channels
1	24	8	6
2	32	16	6
3	48	24	6
4	64	32	6
5	80	40	6
6	96	48	6
7	112	32	6

(Vendors shall furnish the General Technical Particulars along with their offer. Any kind of

deviation along with offer shall be listed and submitted separately clause wise as per the deviation format given in this specification for approval of BRPL. Deviation shall not be considered which mentioned in any other submitted bid documents)

Sr. No.	Description	Buyer's Requirement	Vendors Data
1	Vendors Name		
2	Guarantee period	5 yrs.	
3	Make of FRTU base module	As per Annexure-I	
4	No. of DI modules		
	Type 2	2 x 16	
5	No. of DO modules		
	Type 2	2 x 8	
6	No. of AI modules		
	Type 1 to 2	1x 6	
7	Dimensions &Weight of FRTU		
	Type 2	Vendor shall Provide	
8	Make of protocol converter	As per Annexure-I	
9	Interposing relay with freewheeling diode		
	Make	As per Annexure-I	
	Capacity	>8 A	
	Model	CR-P with 2C/O contacts / Eqv	
10	AC & DC MCB	As per Annexure-I	
11	Terminal Blocks	As per Annexure-I	
12	Disconnecting type fuses make	As per Annexure-I	
13	Enclosure		
	Sheet steel thickness	As per type test design	
	Painting process	10 tank and powder coating	
	Construction of steel according to IEC 529 , index of protection	IP52	
	Shade	RAL-7035	
	Louvers with filters	2 Nos	

Annexure – 2: IO List{R1}

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

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

Signals List for Motorized RMU

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

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

	Oil Level	AI3
	Spare	AI4 to AI8

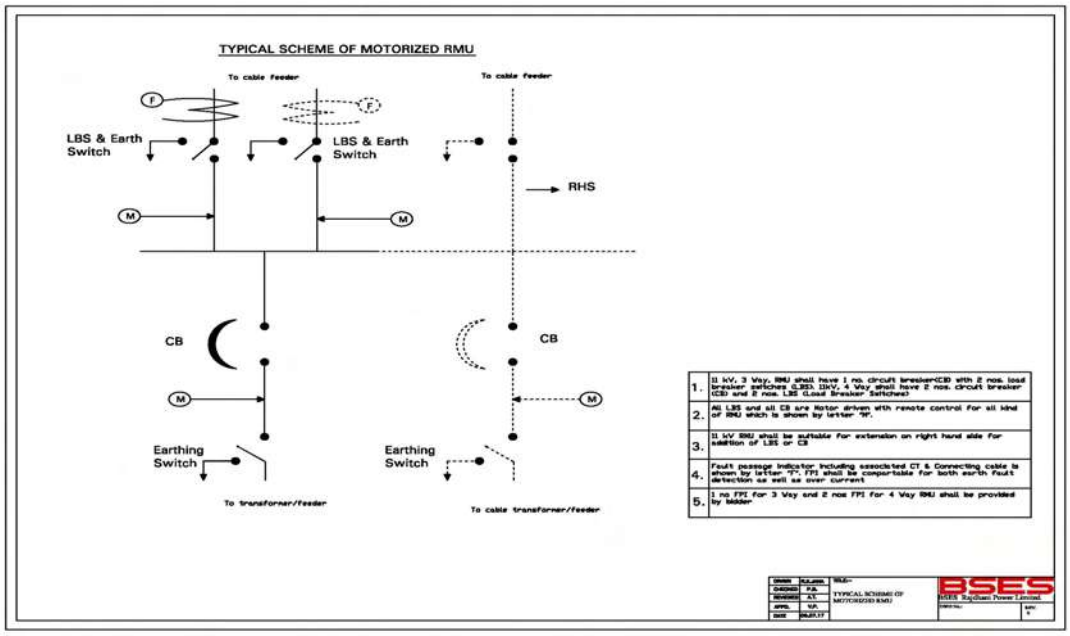
Serial Port	DT Energy Meter Data	SP1
	Relay of RMU (Both relays to be connected to FRTU in case of 4 Way RMU)	SP2

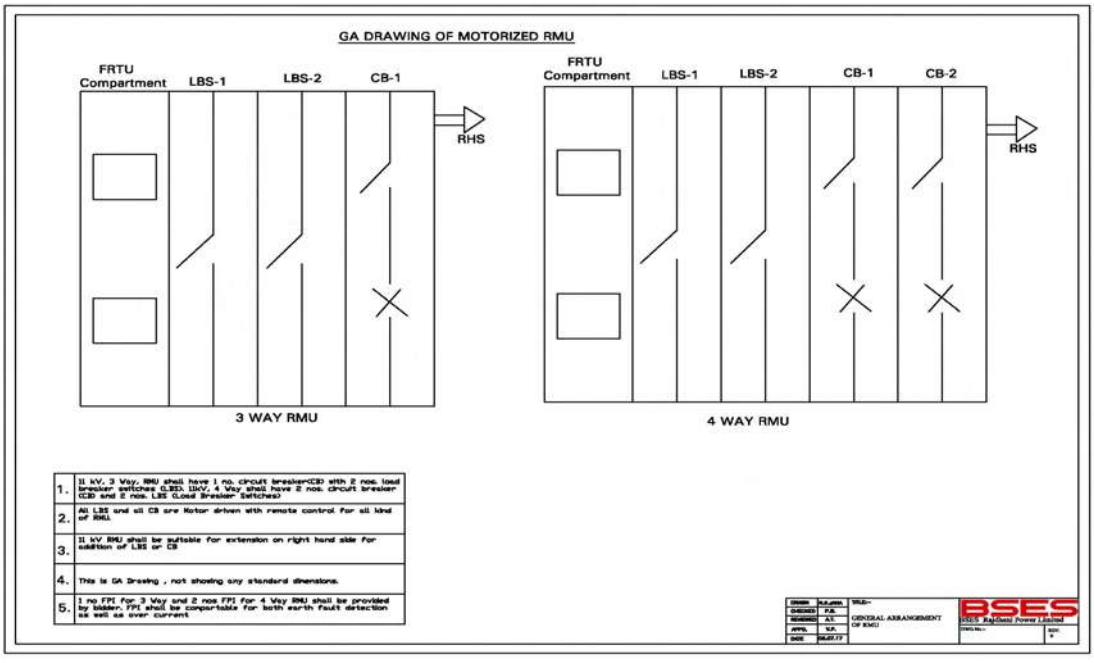
Annexure-I : Make List

Make List of RMU's Accessories		
Sl. No.	Descriptions	Make
1	**Relay (Self Power+ External DC Supply+ Communicable){R1}**	Ashida (ADR241S-761),
2	**CT and Aux PT{R1}**	Narayan Power Tech (NPT)/Gilbert Maxwell, Pragati,Nortex
3	FRTU	Schneider - HUA/HUBI ABB - RTU520 CG - USP-020i Wago (Model-750) Phoenix (ILC 171 ETH 2TX)
4	Interposing relay with freewheeling diode	ABB/Tyco/OEN

5	FPI(Both for Earth fault and Over current protection)	EMG/Schneider/SIEMENS/C&S
6	CBCT (Both for Earth fault and Over current protection)	EMG/Schneider/SIEMENS/C&S
7	Boot	3M/Raychem/K.D.Joshi
8	**Modem (GSM 4G+) {R1}**	Nomus
9	Battery	GOGATE/Allan
10	Battery Charger (2 nos. For each RMU with free wheelingdiode)	GOGATE/Allan
11	Wire	Polycab/Havells/Finolex/KEI
12	AC & DC MCB	SIEMENS/Havells/C&S/ Schneider
13	Disconnecting type fuses	Connectwell/Wago/Phoenix/Elmex
14	TB (disconnecting type)	Connectwell/Wago/Phoenix/Elmex
15	Protocol converter	ABB/Tyco/OEN
16	DC power connector	Wago/Havells/Connectwell
20	**Vacuum Interrupter{R1}**	CG/ ABB/Schneider/SIEMENS/Any other type tested (CPRI/ERDA)make
21	Battery Health Monitoring Unit	GOGATE/Allan

Annexure-J: Composite RMU Drawing





Annexure-K: Deviation Sheet Format

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

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

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

Special Requirement:

Sl. No	Descriptions
1	Animated video for ETC guide of RMU shall be submitted to BRPL before delivery of first lot
2	Relay Protection setting (min 10%)
3	All the communicable accessories shall have Latch contact
4	NO/NC contact for manometer shall be provided
5	--Bidders shall have additional RMU readily available of each type to replace under warranty faulty RMU in case it is repairable at OEM factory --In case of under warranty failure and if the faulty RMU is repairable only at OEM factory, bidder has to replace the faulty RMU during lifting with new/ operatable same type of RMU within the time period mentioned in the tech spec warranty clauses. --BRPL shall not issue any RMU from their assests for replacement activity. In case of delay, penalty shall be imposed as per this corrigendum sl no 9 --After Warranty period completion (5 years), these clause shall not be applicable to OEM
6	Sample RMU
6.1	1 sample RMU of each type shall be manufactured as per BRPL specification after award of PO. BRPL will do the routine testing and inspection of the sample RMU and if found satisfactory as per BRPL specification, BRPL will give clearance/ approval for bulk manufacturing
6.2	During inspection of the sample RMU, BRPL may ask the vendor to modify/ change the design as per BRPL requirement including the make of accessories mentioned in the specification. OEM is liable to modify the design irrespective of the offer submitted during tender stage.However, BRPL will not ask for the requirement beyond the technical specification.
6.3	The lead time required to arrange the accessories/ to modify the design required as per BRPL requirement shall be in the account of bidder.

Sl. No	Descriptions
6.4	BRPL is not liable to bear any extra cost out of the PO for the approval of sample RMU and the bulk quantity afterwards.
6.5	The sample may be used in BRPL network based on fulfilment of technical requirement and BRPL approval.Else fesh RMUs as per the approved sample shall be supplied in line with PO quantity.
6.6	During bulk manufacturing and PO execution, BRPL may ask necessary changes to be done (if required). Bidder is liable to provide the required changes as per the BRPL requirement irrespective of the offer / design given during tendering stage without any cost implication to BRPL. However, BRPL will not ask any changes out of BRPL Technical specification
7	Warranty clause's terms & conditions mentioned in the technical specification Annexure- G(1), Clause no-6.2 shall be strictly followed by the OEM, in the event of violation of warranty clauses, BRPL is liable to impose penalty with1% of RMU unit rate per day basis (Unit rate shall be considered as per the PO)
8	Submission of Type test report (not more than 5 years from the date of tender opening date) of internal arc for 1 sec (AFLR 20kA for 1 sec) from CPRI/ERDA is mandatory with 3 way RMU
9	Complete Civil foundation Drawing along with sectional view (RCC casting shall be followed) and BBS shall be submitted by bidders along with drawing
10	Submission of 3nos as built drawing to BRPL before dispatch of first lot of material is mandatory. Also one set of as built drawing shall send with each unit of supplied RMU. Proper holding arrangement to be provided to place as built drawing inside the RMU.
11	Test bushing feature-The bushing of RMU must have the feature of "Test Bushing".
12	Broken conductor feature in relay-The relay must have the feature of detecting change in impedance (negative phase sequence over current)
13	**Aux-PT for Outdoor RMU Only** 1. Cast Resin, Single Phase Auxiliary Power transformer to be provided. Turns ratio – 11kV to 230V 2. 230V AC supply to be provided to RMU battery charger for power supply 3. Minimum VA Burden – 500VA 4. HRC Fuses to be provided on HT and MCB to be provided on LT Side of the Aux. Transformer 5. Aux Transformer to be placed on LHS of RMU 6. Resin material type shall be cycloaliphatic 7. CPRI/ERDA type test report shall be submitted for review and same shall not be older than 5 years. In case of type test report is more than 5 years old, type test shall be conducted form CPRI/ERDA without any cost implications to BRPL.

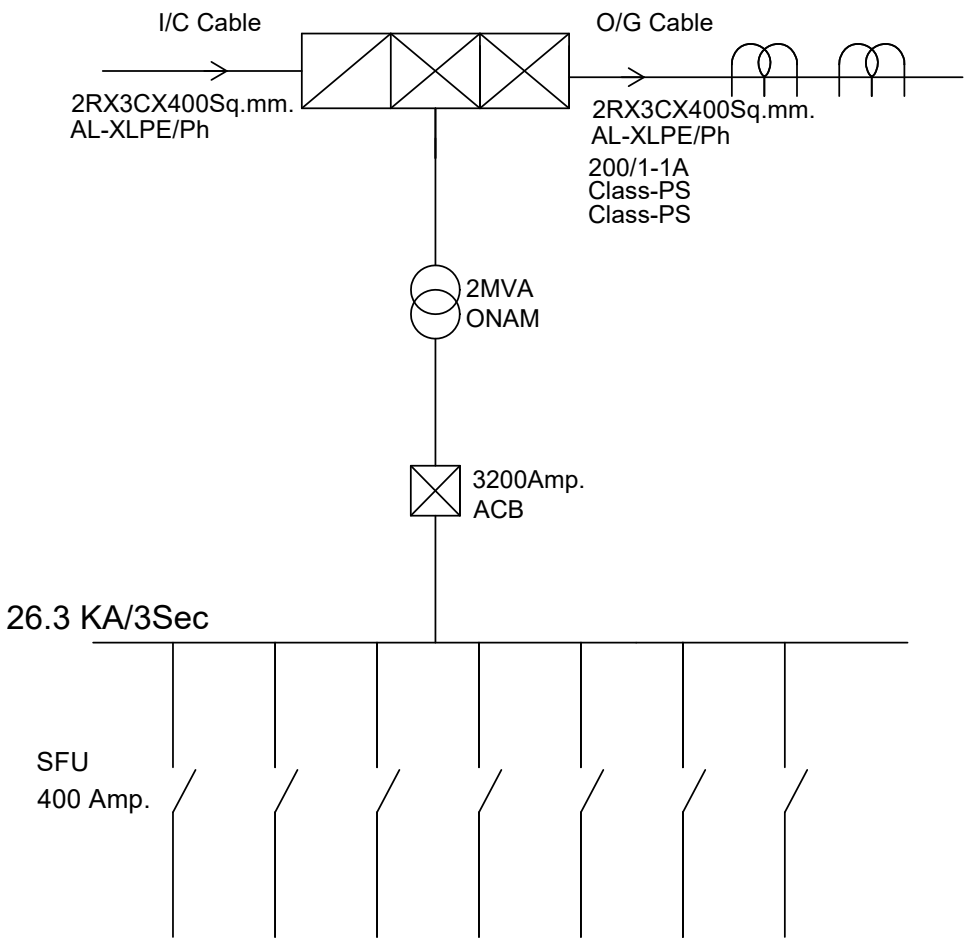
Sl. No	Descriptions
	8. GA drawing for auxiliary voltage transformer arrangement along with schematic diagram, ratings and fuse details to be submitted for approval

Inspection

Cost of all the inspections within India and abroad (including re inspections) including flight Tickets, local conveyance, Boarding and lodging (Minimum 4 Star Hotel for India and Minimum 5 Star for Abroad) shall be in scope of Vendor. The Factory visits will be held at OEM Factory & Etc.

33/0.433 KV Compact Substation

ANNEXURE - A



Technical Specification

For

Grounding and Lightening Protection System

Specification no – BSES-TS-76-GES-R0

Rev:		0
Date:		06 May 2022
Prepared by	Bhanu Gehlot	
	Uttam Shukla	
Reviewed by	Abhinav Srivastava	
Approved by	Gopal Nariya	

INDEX TABLE

1. SCOPE

This specification covers the guidelines of earthing & lightening protection at 66/11, 33/11, 66/33/11 kV Grid substation and the technical requirements of material required for earthing system.

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)

3. REQUIREMENT OF EARTHING

3.1.	Primary guidelines	Following are primary guidelines for a good earthing system in a Grid substation: a. The impedance to ground should be as low as possible. In general it should not exceed **0.5ohm**. b. The step and touch potentials shall be within safe limits. c. The contractor shall do the calculation for number of earthing rods being used in a substation for achieving the desired earth resistance.

3.2.	Design Parameters	Earthing Calculation parameters shall be taken as: 1) Duration of shock current ts=1sec. 2) Top Gravel resistivity shall be 3000 Ohm Meter. 3) Split/ Diversion Factor shall be considered as 1 4) Earth conductor/ electrodes size calculation based upon corrosion considered for next 40 years. 5) The final diameter of earth conductors/rod shall be maximum of calculated dia or 25 mm (prescribed in clause 5)
3.3.	Earthing lead size	a. The actual size of earthing lead will depend on the maximum fault current which the earthing lead will be required to carry safely. b. Please refer **AnnexureA1** for HT fault level.
3.4.	Earthing type	a. Rod earthing shall be provided for the Grid substation. b. 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. c. 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. d. The vertically driven rods shall be interconnected with each other using horizontal grid conductors.
3.5.	Earth Pit	a. As per clause 20.5.2 of IS 3043, the minimum distance between the vertical earth electrodesshall not be less thanthe length of rod. b. Minimum of 1m distance of earth pit from electrical equipment and structures shall be maintained. c. The earth pits shall be backfilled with earth enhancing material as per Drawing . d. Treated Earth pits shall be used where earth resistance value is getting over the prescribed value in specification i.e. 0.5 ohms. e. Treated Pipe earthing required for 2 nos. each for PTR & Station TRF neutral and RTU/ SCADA. f. 50% quantity of the total earth electrodes to be provided with earth enhancing material (Terec++/ marconite).
3.6.	Horizontal Conductor	a. The entire earth rod driven in ground vertically shall be interconnected with earth grid conductors horizontally under the ground. b. The Horizontal conductors shall be laid 600mm below FGL. c. Minimum earth coverage of 300 mm shall be provided between the Horizontal conductor and the bottom of trench/foundation/underground pipe at the crossing. d. Horizontal conductors around a building /switchyard fence shall be buried outside the boundary at a minimum distance of 2000 mm. e. Risers shall be provided 300mm above the ground level for equipment earthing. Two number treated earth pits shall be provided with riser for connection of transformer neutral. f. 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. g. 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. h. Where a 66 kV overhead line terminates at the substation, a

		metallic continuity between the end tower and the substation earth grid should be established with two independent connections. i. To ensure good welding, it should be carried out only after scratching off the galvanization, dirt, grease etc by thorough cleaning of contact surface. After welding it will be made with anticorrosive zinc rich paint.
3.7.	Equipment earthing	a. GI strips shall be used for the equipment earthing. b. Two separate and distinct earth connections shall be provided for earthing of electrical frameworks. c. The connection of GI strip with riser of earth mat shall be electric arc welding arrangement;connection ofequipment 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 Copper braid 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. For prefabricated cable trays, a separate ground conductor shall run along the entire length of cable tray and shall be suitably clamped on each cable tray at periodic intervals. Each continuous laid out lengths of cable tray shall be earthed at minimum two places by GS flats to Owner's earthing system, the distance between earthing points shall not exceed 30 metre. Wherever earthmat is not available Contractor shall do the necessary connections by driving an earth electrode in the ground. i. Earthing conductor's crossings the road shall be installed at 1000 mm depth and where adequate earth coverage is not provided it shall be installed in Hume pipes. Earthing conductors embedded in the concrete floor of the building shall have approximately 50mm concrete cover. j. 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. k. 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. l. **In case of GIS substation, earthing rods to be considered in RCC floor as per GIS OEM recommendation.**
3.8.	Lightening protection	a. Direct stroke lightning protection (DSLP) shall be provided in the EHV switchyard by shield wires/ High mast spike gaurd. The final arrangement shall be decided after approval of the DSLP calculations. The Contractor is required to carry out the DSLP

		calculations and submit the same to the Owner for approval of the same at detailed engineering stage after award of contract. b. DSLP protection shall be provided for control room building as per design calculation following Indian standards. The down conductor should be high conductivity bare copper tape with minimum size of 75 sqmm. c. Connection between each down conductor & Test link shall be located approximately 2000mm above ground Level. d. Separate earth electrodes shall be provided for building DSLP connecting the down conductors to the risers & finally to the Earthmesh. Minimum electrodes to be provided – 4 Nos.

4. SPECIFICATION OF EARTHING MATERIALS

4.1.	GI earthing strip	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	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 3m 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.

5. SIZES OF THE EARTHING MATERIALSFOR 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	75X10	Flat	Sqmm	2
5.9	Fan	GI		As per sizes mentioned for fans		
	11 KV System					
5.10	11 KV Swithcgear	GI	50X6	Flat	Sqmm	2
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	As per clause 3.7 (e)
5.26	Hand Rail	GI	8	Wire	Swg	1

6. TESTING AND INSPECTION

6.1.	Earthing materials	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/BRPL representative. The bidder shall give intimation in advance to witness the test. b. Acceptance test for GI earthing strips – Tests for Visual examination, dimensional verification and galvanization shall be witnessed at the time of inspection. c. Acceptance test of Earth enhancement compound – Tests for leaching, sulphur determination, corrosion and resistivity shall be done as per IEC 62561-7 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.

6.2.	Measurement of Earth resistance	a. After the completion of work ground resistance of each installation shall be measured by BYPL/BRPL/Contractor. b. The measurement of resistance shall be witnessed and signed by representative of BYPL/BRPL 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. c. The desire 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**. 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.

7. DEVIATIONS

7.1.	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.

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/BRPL 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 or calculated Dia whichever is higher	
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)	
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

of

Illumination and Lighting System

Specification no – BSES-TS-98-ILS-R0

Rev		0
Page		1 of 12
Date		17 May 2022
Prepared by	Bhanu Gehlot	
	Uttam Shukla	
Reviewed by	Abhinav Srivastava	
Approved by	Gopal Nariya	

INDEX

1. SCOPE

The specification covers the design, engineering, manufacture, assembly and testing at manufacturer's work, supply and installation of Illumination system for substation including normal distribution pillars, normal lighting board, emergency distribution pillar, emergency lighting board, Junction boxes, Illumination lamps with required lux level.

2. STANDARDS AND CODES

Standard Code	Standard Description
IS 16101 : 2012	General Lighting -LEDs and LED modules – Terms and Definitions
IS16102(Part 1) 2012	Self-Ballasted LED Lamps for General Lighting Services, Part 1 Safety Requirements
IS16102(Part 2) 2012	Self-Ballasted LED Lamps for General Lighting Services, Part 2 Performance Requirements
IS16103(Part 1) 2012	Led Modules for General Lighting, Part 1Safety Requirements
IS16103(Part 2) 2012	Led Modules for General Lighting, Part 2 Performance Requirements
IS15885(Part2/Sec13)	Safety of Lamp Control Gear , Part 2 Particular Requirements , Section 13 dc. or ac. Supplied Electronic Control gear for Led Modules
IS16104 : 2012	d.c. or a.c. Supplied Electronic Control Gear for LED Modules - Performance Requirements
IS16105 : 2012	Method of Measurement of Lumen Maintenance of Solid State Light (LED) Sources
IS16106 : 2012	Method of Electrical and Photometric Measurements of Solid-State Lighting (LED) Products
IS 16107(Part 1)2012	Luminaires Performance ,Part 1 General Requirements
IS 16107(Part 2)2012	Luminaires Performance, Part 2 Particular Requirements ,Section 1 LED Luminaire
IS 16108 : 2012	Photo biological Safety of Lamps and Lamp Systems
IS 10322 : 2012	Luminaires: Part 5 Particular requirements, Section 3 Luminaires for road and street lighting
IS 5	Colours for Ready Mixed Paints and Enamels
IS 613	Copper Rods and Bars for electrical purposes
IS 694	PVC Insulated cables for working voltages up to and including 1100 V
IS 2551	Danger notice plates
IS 5082	Wrought Aluminium and Aluminium alloy bars, rods, tubes and sections for electrical purpose
IS 6665	Code of practice for industrial lighting
IS 13703	LV Fuses for voltage not exceeding 1000V ac or 1500V dc
IS 10118	Code of Practice for Selection, Installation and Maintenance of

	Switchgear and Controlgear
International Standard	
IEC 62612	Self-ballasted LED lamps for general lighting services for voltage above 50 V — Performance requirements
IEC : 60598-2-3	Particular requirements - Luminaries for road and street lighting
IEC 62471	Photo biological safety of lamps and lamp systems
IEC 62778	Application of IEC 62471 for the assessment of blue light hazard to light sources and luminaries
IEC 61000-4-5	Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement techniques - Surge immunity test
IEC 60439	Low Voltage Switchgear and Controlgear assemblies - Type tested and partially type tested assemblies
IEC 60529	Degrees of protection provided by enclosures (IP Code)
IEC 60947-1	Low Voltage Switchgear and Controlgear - General Rules
IEC 60947-2	Low Voltage Switchgear and Controlgear - Circuit breakers
IEC 61643	Low-voltage surge protective devices

3. ILLUMINATION SYSTEM

3.1.	Lux level requirement	3.1.1. The design of the illumination system shall ensure availability of the average illumination levels as specified below with the maximum possible uniformity in the entire substation. The illumination system shall consist of the normal lighting system and emergency lighting system. The minimum illumination levels shall be as specified below(Reference IS3646(Part II)). 3.1.1.1. Roads within substation : 20 lux 3.1.1.2. Boundary wall of the substation : 10 lux 3.1.1.3. Control room : 300 lux 3.1.1.4. Switchgear Room : 200 lux 3.1.1.5. Battery room : 100 lux 3.1.1.6. Stair case : 100 lux 3.1.1.7. Power Transformers : 100 lux 3.1.1.8. Cable cellar/ Indoor trench : 70 lux 3.1.1.9. Outdoor switchyard : 70 lux 3.1.1.10. APFC/ station trafo : 70 lux 3.1.2. Contractor shall design the lighting system with the help of desired software. Owner shall verify the same post commissioning with lux meter to check the levels. In case desired lux levels are not met contractor has to install addition fitting in outdoor and indoor location as per requirement. 3.1.3. Complete design calculation sheets for arriving at the number of luminaires required for the normal and emergency requirements shall be furnished by the bidder. Design calculation sheets for the selection of cables, MCB, HRC fuses, bus bars, etc. are also required to be furnished for Owner's approval.

3.2.	Illumination circuit	3.2.1.	The illumination system load and welding load in the substation area shall be supplied from 415/230 volt ACDBs to be provided in the substation control room. Requisite numbers of 3-phase, 4-wire, cable circuits for illumination system and welding socket outlets shall be extended from the above board. The laying of cables from the Board to the illumination system/welding socket outlets and their installation are included in the Bidder's scope.
		3.2.2.	Each outgoing cable circuit for illumination loads from the 415 volt switchboard shall terminate in the respective outdoor pillar boxes located in the substation. Outgoing feeders from the illumination shall be taken to the various illumination points in the substation. Necessary fuses shall be provided near light fixtures in the substation.
		3.2.3.	The emergency illumination load shall be supplied from the main emergency illumination board located in the control room. Necessary cable circuits with appropriate fuses shall be provided by the Contractor for the supply system for emergency illumination load of the substation.
		3.2.4.	Emergency DC lighting system shall be provided in the substation wherever required. The emergency lighting shall be adequate for safe movement by the operating personnel in the substation in the event of failure of normal lighting system. Number of lights shall be decided at the time of detailed engineering. A total of minimum 12 no's individually controllable 18 watt LEDs shall be provided in the substation.
		3.2.5.	6 Nos. welding sockets to be provided, 4 Nos. in Outdoor Yard & 2 Nos. in Control room building.
		3.2.6.	Illumination to be provided inside the Indoor trenches as per required lux level.
3.3.	Wiring	3.3.1.	All lighting fixtures and 5A convenience outlets shall be wired with 1.1 KV grade PVC insulated extra flexible, multistranded, copper conductor cables of size not less than 2.5 sq.mm.
		3.3.2.	For 15A heavy-duty outlets copper conductor cables of size not less than 6 sq. mm shall be used.
		3.3.3.	The wiring shall consist of phase, neutral and ground. For grounding the lighting fixtures/convenience outlets etc. Green CU wire of size 2.5 sqmm shall be used. The phase and neutral conductor shall be suitably colour coded. For DC black & white wires to be used.
		3.3.4.	Supply shall be looped between the lighting fixtures of the same circuit by using junction boxes. For this purpose one (1) 100 mm x 100 mm square junction box shall be provided for each lighting fixture. For recessed lighting fixtures, supply shall be extended from the junction boxes to the fixtures by means of flexible conduits. The conduits shall be of HMS (High mechanical stress) type and of minimum dia 25 MM. While for stem-mounted/wall-mounted lighting fixtures the junction box shall be

		mounted below one of the mounting stems. 3.3.5. For lighting branch circuits the nos. of lighting switches shall be decided keeping in mind the ease of control, as well as to limit the current to 2.5A per circuit. 3.3.6. For convenience outlets, the bidder shall design the wiring scheme so as to limit 6 nos. of 5A outlets per branch circuit and two nos. of 15A outlets per branch circuit. 3.3.7. All wiring materials such as terminals, crimping lugs, ferrules etc. shall also be provided by the Contractor. 3.3.8. No section of the conduit shall be filled with more than 70% of its area. Any consumable material that is required for pulling the wires through conduit shall also be provided by the Contractor. 3.3.9. Lighting fixtures coming in one area shall be evenly distributed between three phases so that tripping of one phase or two phases does not cause total loss of illumination in that area.
3.4.	Required documents to be submitted	Complete manufacturer's literature/catalogues, performance curves, illumination distribution curves, G.A. drawings, specification sheets, etc. as relevant in respect of all materials/equipment to be supplied shall be submitted by the Contractor.
3.5.	Illumination system check after installation	After completion of installation of the illumination system in the substation, the actual illumination level at different locations shall be measured by the Contractor in the presence of Owner's authorised representative. If the average value of the measured illumination levels is found to fall short of the specified levels, the Contractor shall have to provide additional lighting fixtures so as to achieve the specified levels of illumination at no additional cost to the Owner. While measuring the illumination levels due allowance shall be made on account of maintenance factor. The specified lux levels shall be suitably increased to cover maintenance factor of 0.6 for outdoor areas.

4. DISTRIBUTION PILLARS FOR NORMAL ILLUMINATION SYSTEM

4.1.	Construction	4.1.1. Distribution pillars of adequate dimensions shall be constructed from sheet steel having a thickness not less than 2 mm. 4.1.2. The pillars shall be totally enclosed weather-proof, dustproof, vermin-proof, having hinged doors with locking arrangement and shall be capable of being mounted in the substation. 4.1.3. The pillars suitable for cable entry at the bottom shall be designed for easy access of connections to terminals and inspection of equipment mounted therein. 4.1.4. The degree of protection of the board shall be IP55. 4.1.5. The enclosure shall be painted externally with Shade No., 692 of IS:5 and internally with brilliant white of semi-glossy finish of IS:5. 4.1.6. Location of LDB, ELDB & PDB to be finalized during

		detailed engineering.
4.2.	Configuration	4.2.1. Each pillar shall accommodate the following: 4.2.2. One incoming, 4-pole (3 phase and neutral) isolating switch with MCB of appropriate current rating. 4.2.3. 3-phase and neutral bus bars of appropriate current rating. 4.2.4. Single-poleearth leakage circuit breakers of suitable current ratings on all outgoing circuits. 4.2.5. Neutral links for all outgoing circuits. 4.2.6. Cable lugs, compression type cable glands, name plates, circuit numbers, earthing lugs, etc. to make the pillar complete in all respects. 4.2.7. 20% spare outlets shall be provided for outgoing feeders. 4.2.8. Three (3) indicating lamps with fuses to indicate that supply is 'ON'.

5. LIGHTING DISTRIBUTION BOARDS

5.1.	Construction	5.1.1. Metal-clad enclosure with minimum 2 mm CRCA sheets for load-bearing members and 1.6 mm for non load-bearing members suitably reinforced with structural. 5.1.2. 3-phase, 4-wire bus bar system with high conductivity aluminium busbars mounting on FRP insulators having anti-tractive property with minimum 25 mm phase-to-phase and minimum 19 mm phase-to-earth clearances. The busbars shall be uniform throughout the length of the LDB and busbar joints shall be silver plated and covered with shrouds. 5.1.3. All cables shall enter from the bottom. 5.1.4. The degree of protection for the LDB shall be IP-54. 5.1.5. The enclosure shall be painted externally with Shade No., 692 of IS:5 and internally with brilliant white of semi-glossy finish of IS:5.
5.2.	Configuration	Each LDB shall accommodate the following: 5.2.1. One incoming, 4-pole (3 phase and neutral) isolating switch with MCB of appropriate current rating. 5.2.2. 3-phase and neutral bus bars of appropriate current rating. 5.2.3. 4 Pole outgoing MCBs of appropriate rating 5.2.4. Cable lugs, compression type cable glands, name plates, circuit numbers, earthing lugs, etc. to make the pillar complete in all respects. 5.2.5. 20% spare outlets shall be provided for outgoing feeders. 5.2.6. Three (3) Nos. indication lamps (Red, Yellow, Blue) shall be provided to indicate that the incoming supply is available. Similarly, 3 Nos. indication lamps shall be provided to indicate that the busbar is energised.
5.3.	Busbar	5.3.1. The busbars shall be suitable for short-time current rating of 40KA for 1 Sec.

		5.3.2. The busbar temperature rise shall not exceed 35 Deg C over an ambient of 50 Deg C. 5.3.3. The LDBs shall be provided with a continuous busbar of 25 x 6 sq.mm (electrolytic copper) with suitable hardware for connection to the main grounding grid

6. MAIN EMERGENCY LIGHTING BOARD

6.1.	Construction	6.1.1. Metal-clad enclosure with minimum 2 mm CRCA sheets for load-bearing members and 1.6 mm for non load-bearing members suitably reinforced with structural. 6.1.2. All cables shall enter from the bottom. 6.1.3. The degree of protection for the LDB shall be IP-54. 6.1.4. The enclosure shall be painted externally with Shade No., 692 to IS:5 and internally with brilliant white of semi-glossy finish to IS:5.
6.2.	Configuration	6.2.1. Each Board shall accommodate the followings: 6.2.2. Automatic changeover contactor. 6.2.3. Voltage sensing relays. 6.2.4. Time delay relay. 6.2.5. Bus Bars. 6.2.6. Two pole MCBs of adequate ratings for incoming and outgoing feeders. 6.2.7. Test switch, push button type. 6.2.8. Indicating lamps, ac - Green, dc - Red. 6.2.9. Terminals for remote indication 6.2.10. Cable lugs, compression type cable glands, name-plates, circuit numbers, earthing lugs and remote indication wiring upto substation 415V a.c. control board, to make the board complete in all respects.
6.3.	Changeover facility	The main emergency lighting board shall have an automatic changeover switch to energise the dc lighting system in the event of AC power failure. It shall have voltage-sensing relays to perform the changeover automatically when AC voltage of any one phase falls below 60 percent of 240 volts and continues at that low level for more than 10 seconds. These shall changeover from DC to AC again when 70 percent of 240 volt is restored and this continues for 10 seconds.
6.4.	Emergency Lighting Pillar	Local Emergency Lighting Pillar shall be identical in details to Lighting Distribution Pillar specified in clause 4 except that it shall have two pole isolating switch fuse unit on the incoming side and only two busbars and shall be without neutral links.

7. LUMINAIRES

7.1.	Luminaires type	Luminaires for use in normal and emergency illumination systems in the substation shall be suitable for LED lamps. All the luminaires shall be supplied complete with all accessories and lamps. The LED lamps ratings shall be adequate to achieve the required Lux level and calculation for number of luminaires shall be in the bidder's scope. Minimum rating shall be a follows - 7.1.1. Outdoor –90W minimum 7.1.2. Indoor –36W minimum
7.2.	Flood lights	The flood light luminaires in the substation shall be fixed at suitable height on the substation structures/ building, so as to provide the specified average illumination in the substation area without causing any glare to the operational/ maintenance staff working in the substation. While fixing the luminaires it shall be ensured that the stipulated electrical clearances are not violated. The Contractor shall supply and install suitable type of non-mettalic street light poles or octagonal galvanished poles required for installing the fittings for illuminating the roads, fence boundary wall etc.
7.3.	Reliability	Substation lighting circuits shall be divided into two or three sections and provided with time switches of suitable ratings.
7.4.	Design features for Outdoor Luminaires	
7.5.	Fixture	7.5.1. The luminaries housing shall be either extruded or pressure die casted aluminium of minimum 1.6 mm thickness. Body must be Corrosion Resistant Powder Coated and UV resistant. 7.5.2. The entire housing shall be dust and waterproof having Ingress protection of housing as IP65 or above as per IEC 60529. 7.5.3. Luminaire should be covered with suitable Glass or diffuser with high Transitivity. All luminaires shall be supplied with either clear toughened glass or clear polycarbonate cover for better IP retention and higher life.
7.6.	LED	7.6.1. Theluminousefficacy of LEDluminaireshall be atleast 85 lumen/watt. 7.6.2. LED module efficacy shall not be less than 90 percent of the rated LED module Efficacy. 7.6.3. Color Rendering Index (CRI) shall be at least 70 7.6.4. Color Temperature shall be 5500-6500K 7.6.5. Uniformity Emin/Eavg> 0.4, Emin/Emax>0.33
7.7.	LED Driver	LED driver shall have following features: 7.7.1. LED driver shall be applicable for Power supply 240V AC±10%, at 50Hz+3% / -5%. 7.7.2. Output voltage of the driver shall bedesigned to meet the

		Power Requirementsof the system. 7.7.3. Power factorofcompletefitting shall bemorethan 0.90atfull load. 7.7.4. Total Harmonic Distortion (THD) shall be< 10 %
7.8.	General Requirements	7.8.1. The connecting wires used inside the Luminaire, shall be low smoke halogen free, fire retardant e-beam cable and fuse protection shall be provided in input side. 7.8.2. Thelumenmaintenanceof all theLEDfixturesshallnotbelessthan70%after50,000 hours. 7.8.3. Built in protection features for Short circuit, Surges (at least upto 5kV), and overvoltage shall be provided. 7.8.4. High /Low voltage cut-off shall be provided. 7.8.5. The whole luminaire shall be eco-friendly green technology based i.e. mercury free. 7.8.6. No UV and IR radiations shall be produced. 7.8.7. Access of driver for maintenance shall be provided at the top/side of the luminaire fixture. 7.8.8. All fasteners must be of stainless steel.

8. JUNCTION BOXES/WALL BOXES

8.1.	Size	100 mm x 100 mm junction boxes and wall boxes of standard size shall be provided.
8.2.	Construction	Wall boxes and junction boxes shall be made of FRP with a thickness of 2.0mm. Necessary conduit termination fittings such as bushings, locknuts etc. also be provided.

9. AUTOMATIC LIGHTING CONTROLLER

9.1.	Size	Contractor shall provide microprocessor based automatic lighting controller for controlling switching arrangement of indoor and outdoor lighting. The controller shall have provision of setting 52 week ON / OFF time as per astronomical clock or as per user requirement. All abnormal events shall be recorded in the controller. Secure / Genus or equivalent are approved makes.

10. SOCKETS & SWITCHES

10.1.	Indoor	All sockets and switches shall be modular and universal type suitable for 5/15A
10.2.	Outdoor	Two nos transformer oil filtration sockets shall be provided, one at each transformer bay. These sockets shall be three phase industrial type and rated for 100A.

11. NAMEPLATE & MARKING

11.1.	Name plate details of LED housing	Followings shall be clearly engraved/embossed on the die cast housing of LED: Rated voltage or voltage range (marked 'V' or 'Volt'); 11.1.1. Rated current (marked A' or 'Ampere'); 11.1.2. Rated wattage (marked 'W' or 'Watts'); 11.1.3. Rated frequency (marked in 'Hz') 11.1.4. Rated lumen 11.1.5. Indian/International Standards to which it is manufactured 11.1.6. Month and year manufacture 11.1.7. Customer Name - BSES Yamuna / Rajdhani Power Ltd 11.1.8. Fitting serial number 11.1.9. PO no and date 11.1.10. Guarantee period
11.2.	Panel nameplate and marking details	
11.2.1.	Panel nameplate	Panel shall have a nameplate clearly indicating the following: 11.2.1.1. Panel Serial No.- 11.2.1.2. Customer Name - BSES Yamuna/Rajdhani Power Ltd 11.2.1.3. PO No. & date - 11.2.1.4. Panel Name - 11.2.1.5. Current rating - 11.2.1.6. Guarantee period -
11.2.2.	Feeder nameplate	Large and bold name plate carrying the feeder identification shall be provided on the top of each module.
11.2.3.	Danger plate	Panel shall have a danger plate of anodized Aluminium clearly indicating the danger logo and voltage details.
11.2.4.	Material	Anodized Aluminium 16SWG. Nameplates shall be satin silver in colour with black letters engraved on them. Stickers are not allowed.
11.2.5.	Fixing	All nameplates shall be riveted to the panels at all four corners. Bolting/screwing is not acceptable.

12. APPROVED MAKE OF COMPONENTS

12.1.	Relays	ABB/Jyoti/Omran
12.2.	HRC Fuse Links	GE/ Siemens/ L&T
12.3.	AC Contractors/ DC contactor	L&T/Siemens/Telemechanique/GE/ABB

12.4.	Terminals	Connectwell/Elmex/Wago/Phoenix
12.5.	Push buttons / Actuator	L&T/Siemens/Vaishno/Schneider
12.6.	MCB	Legrand/Hager/Schneider/ABB
12.7.	LED	NICHIA/ OSRAM/ CREE/ PHILIPS//EDISON
12.8.	Luminaire fittings	GE/Philips/Crompton/Bajaj
12.9.	Indicating lamps	Vaishno/Binay/Teknic/Siemens/Mimic/C&S

13. INSPECTION & TESTING

13.1.	Type test	All Equipment should be of type tested quality only, type test certificate to be submitted along with offer. If the manufacturer's lab is accredited by govt. / authorized body then it shall be acceptable for type testing.
13.2.	Acceptance & Routine tests	As per relevant Indian standard

14. DEVIATION

14.1.	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.

BSES Rajdhani Power Limited
BSES Bhawan, Nehru Place, New Delhi- 19

TECHNICAL SPECIFICATION

FOR

CABLE INSTALLATION & ACCESSORIES

Prepared by	**Javed Ahmed**		**Rev: 1**
Reviewed by	**Abhinav Srivastava**		**Date: 12th June 2018**
Approved by	**K.Sheshadri**		

Technical Specification for Cable Installation and Accessories

1.0 INSTALLATION OF CABLES:

1.1 The cable shall be laid as per IS 1255. The Contractor shall prepare cable schedules for all the cable circuits associated with the equipment in the substation showing length, size and routing of each cable which shall be given suitable code numbers and submit the same for Owner's/Engineer's information/approval. Cable and Conduit laying shall be done strictly in accordance with the cable schedules.

1.2 The control and power cables shall be laid in conduits, concrete pipes, ducts, trays or cable trenches unless indicated otherwise. The power and control cables shall be laid in different trays. Cables shall be cleated to the cable tray after properly dressing.

1.3 Ducts shall be provided wherever cable trenches cross roads with provision of one spare duct for future use.

1.4 All civil works, viz, excavations, sand cover, providing brick cover on directly laid cables, construction of foundations, trenches with cable tray supports, cable ducts under roads, back filling, finishing associated with cabling work shall be duly completed.

1.5 The Contractor shall supply and install all the surface mounted/ embedded rigid and flexible conduits, their connections, and associated clamps, bushings, lock-nuts, caps etc required in the cabling work.

1.6 All conduits and their accessories shall be made of galvanized heavy gauge steel as per BIS Specification. The internal bore of all pipes shall be smooth and suitable for pulling PVC sheathed cables without damage.

1.7 The Contractor shall supply all fittings including ordinary tees and elbows, check nuts, male and female fittings pull boxes, junction boxes, conduit outlets, outlet boxes, splice boxes, terminal boxes, gaskets and box covers, saddles and all supporting steel work and all such arrangements which are required to complete the conduit installations.

1.8 Pre-fabricated junction boxes, conduit boxes and conduits shall be shop fabricated out of malleable iron or steel plates and shall be galvanized and provided with galvanized malleable iron or steel plate covers and rubber gaskets

1.9 All the apparatus, connections and cable work shall be designed and arranged to eliminate the risk of fire and minimize damage which might be caused in the event of fire. Wherever cables pass through floor or wall openings or other partitions, suitable bushes of approved type shall be supplied and put in position by the Contractor.

1.10 Standard cable grips, reels and rollers shall be utilized for cable pulling.

1.11 Each cable, whether power or control, shall be provided with a metallic or plastic tag of an approved type, bearing cable reference number indicated in the cable schedule prepared by the Contractor, at every 10 meter run and at both ends of the cable, adjacent to the

terminations as well as where cables enter or leave ducts. Cable routing shall be so done that cables are accessible for identification and maintenance easily, and are arranged neatly.

1.12 In no case the cables shall be bent sharply or kinked with the radius of bending falling below 15D where D is the overall diameter of the cable.

1.13 When power cables are laid in the proximity of communication cables, the minimum horizontal and vertical separation between power and communication cables shall be 600 mm. Wherever possible the power and communication cables shall be located as far from each other as possible. The power and communication cables shall cross each other at right angles.

1.14 Wherever cables cross roads, water, oil, sewage or steam-lines, special care shall be taken while designing the trenches/ducts for protection of the cables.

1.15 In each cable run, some extra length shall be provided at a suitable location to enable making of one or two straight-through joints for carrying out repairs if the cable develops fault at a later date.

1.16 Cable splices shall not be permitted except where called for as per the construction drawings, or where permitted by the Engineer. Straight-through joints in the run of cables wherever unavoidable shall be through joint-boxes.

1.17 The termination of cables at various equipments shall be carefully made in accordance with the manufacturer's instructions and detailed connection diagrams.

Termination materials for all cables shall match with the type of cable insulation and have thermal and electrical ratings and chemical properties similar to those of the associated cable.
All terminating materials except for those already supplied with the electrical equipment shall be provided by the Contractor.

1.18 Control cable terminations shall be made in accordance with the color code marked wiring diagrams of control circuits. Multi-conductor control cable jackets shall be removed as required to train and terminate the conductors. The cable jacket shall be left on the cable, to the extent possible. The insulated conductors from which the jacket is removed shall be neatly trained in bundles and terminated. The bundles shall be firmly, but not tightly, tied utilizing plastic or nylon ties or specially treated fungus-proof cord.

1.19 The connectors for control cables shall preferably terminate in Ross Courteny terminals and washers and be covered with transparent insulating sleeves so as to prevent accidental contact with ground or adjacent terminals. The insulating sleeves shall be fire resistant and shall be long enough to overlap the conductor insulation.

1.20 When control cables are to be fanned out and tied together with cord, the Contractor shall make connections to terminal blocks and test the equipment for proper operation before tying the cables together with cord.

1.21 Jointing of cables shall be made in accordance with the applicable Bureau of Indian Standards Code of practice, Owners approval and manufacturer's special instructions. The materials and tools required for cable jointing work shall be in the Contractor's scope.

1.22 The supply of joint boxes shall include all hardware fittings, compounds, tapes and other materials required for making the joints.

Special tools, clips and saddles, glands, seals, PVC sealing compound, locknut, etc, required for connection and termination of cables shall be in the Contractor's scope.

1.23 All cables shall be megger-tested before jointing. After jointing is completed all L.V cables shall be megger-tested.

Cable cores shall be tested for:

i. Continuity.
ii. Absence of cross phasing
iii. Insulation resistance to earth.
iv. Insulation resistance between conductors.

2.0 CABLE TRAYS, ACCESSORIES & TRAY SUPPORTS, CONDUITS, PIPES AND DUCTS

2.1 Cable trays shall be run either in concrete cable trench or overhead supported from building steel. The cable trays shall be ladder type for power cable and perforated type for Control cable. The trays shall be supplied with matching fittings and accessories.

2.2 Cable tray shall be fabricated out of rolled mild steel sheets free from flaws such as laminations, rolling marks, pitting etc. Minimum thickness of cable trays shall be 2.0mm.

2.3 Cables shall be clamped to the cable trays in the horizontal runs with 18 gauge GI wires. For vertical runs the cables shall be clamped with suitable site-fabricated clamps.

2.4 All cable trays including perforated sheet trays, weld mesh trays, vertical raceways shall be hot-dip galvanized and epoxy coated. The trays shall be of standard width of 150mm, 300mm, 450mm & 600mm and standard length of 2.5M. Trays upto 300mm shall be perforated type and above 300 mm shall be ladder type.

2.5 The conductors carrying AC and DC supplies shall not be bunched together in a conduit. Where single-core cables are individually drawn into separate pipes, HDPE pipes shall be used.

Technical Specification for Cable Installation and Accessories

2.6 Flexible metallic conduits shall be used for termination of connections to equipment to be disconnected at periodic intervals and also for termination of connections to level switches, limit switches, pressure switches etc.

2.7 In order to minimize condensation or sweating inside the conduit, all outlets of the conduit system shall be properly drained and ventilated so to prevent entry of insects and water as far as possible.

2.8 The conduits or pipes shall be run along walls, floor and ceilings, on steel supports, embedded in soil, floor, wall or foundation, in accordance with the relevant layout drawings, approved by the Owner.

2.9 All fittings in the conduit systems having threaded connections shall be tightened with full thread engagement and with a minimum of wrench work in order to avoid wrench outs.

2.10 Embedded conduits running parallel to a masonry surface shall, wherever possible, have a cover of at least 38 mm.

2.11 The conduits shall be lead into terminal boxes through the entry points provided by the equipment manufacturers unless otherwise shown in the drawings or unless otherwise directed by the Engineer.

2.12 While installing asbestos pipe or other fiber conduit, cracked pieces shall not be used. The sections cracked or broken during or after placement shall be replaced.

2.13 For underground conduit runs the Contractor shall excavate and backfill as necessary.

2.14 Exposed conduit shall be adequately supported by racks and clamps or straps or by other approved means.

2.15 Where conduits are stubbed out of masonry for future extension outside the structure, they shall be specially protected against corrosion and shall be boxed in against possible physical damage.

2.16 Each conduit run shall be marked with its designation as indicated on the drawings - 'Identification'.

2.17 Where conduit and boxes in locations of severe exposure require, painting of galvanized surfaces with Alkyd Resin Zinc Dust paint following by a finish coat of Aluminum paint, shall be performed by the Contractor in a good and approved manner.

2.18 The Contractor shall bond of metal pipes or conduits in which cables have been installed to the main earthing system.

2.19 The conduits and accessories shall be adequately protected against mechanical damage as well as corrosion.

3.0 TERMINATION AND STRIGHT THROUGH JOINTS

3.1 Termination and jointing kits for 11KV and 33KV grade XLPE insulated Aluminum cables shall be proven design and make already been extensively used and type tested. Termination kit and jointing kits shall be pre moulded type, taped type or heat shrinkable. The joints and termination shall be tested as per IS 13573. The kit contents shall be of proven design and type tested. Kit contents shall be supplied from the same source as were used for type tested. The kit shall be complete with Aluminum solderless crimping cable lugs and ferrules as DIN standard

The termination kit make and specification shall be strictly as per approval of the Owner.

3.2 The straight through and termination kit shall be suitable to withstand the fault level for 11KV and 33KV system

4.0 CABLE GLANDS, LUGS & ACCESSORIES

4.1 The cable shall be terminated using double compression type cable glands. The cable glands shall confirm to BS 6121 and of robust construction capable of clamping the cables and armour firmly without injury to the insulation. The cable glands shall be made out of heavy duty brass machine finished and nickel chrome plated. The thickness of plating shall not be less than 10 micron. The rubber component shall be made out of neoprene and tested quality.

4.2 The trefoil clamps for single core cables shall be pressurized die cast Aluminum or fiber Glass or Nylon and shall include necessary fixing accessories such as GI bolts and nuts. Trefoil clamps shall have adequate mechanical strength to withstand the forces generated by short circuit current.

4.3 Cable End seal (Roxtec/MCT Brattberg) shall be provided for all Control Cable and Power Cable (including outgoing HT panels) at all the points wherever cable entries in the control room building or between room to room. 30% Spare modules shall be provided along with centre core has to be provided. System shall take up variation margin of +/-3mm in diameter of Cable. For details refer specs.

5.0 DEVIATIONS

Deviation from this specification, if any, shall be clearly brought out in the offer. Unless owner explicitly accepts such deviations, it shall be considered that the offer fully complies with the specification.

BSES Rajdhani Power Limited
BSES Bhawan, Nehru Place, New Delhi- 19

TECHNICAL SPECIFICATION

FOR

EXHAUST & VENTILATION SYSTEM INCLUDING AIRCONDITIONING

Prepared by					**Rev: 0**
Reviewed by					**Date:**
Approved by					

Technical Specification Exhaust and Ventilation System

1.0 INTENT OF SPECIFICATION

1.1 This specification is intended to cover the design, manufacture, assembly, testing at manufacturer's works, supply & delivery, properly packed for transport for site of Air Conditioning system and Ventilation system for substation control room building complete with all materials and accessories for efficient and trouble free operation

1.2 In the event of any discrepancy with the listed documents, the stipulation this specification shall govern.

2.0 SCOPE OF SUPPLY

The following equipment shall be furnished with all accessories.

a) Exhaust Fan system.
b) Air Conditioning
c) All necessary components for operation of the above equipment.
d) All wiring & accessories to complete the installation.
e) All relevant drawings, data & instruction manuals.
f) Mandatory spares.
g) Commissioning spares and recommended spare part list for three (3)

3.0 GENERAL REQUIREMENT

3.1 All equipment and material shall be designed, manufactured and tested in accordance with the latest applicable Indian Standards except where modified and/or supplemented by this specification.

3.2 Equipment and materials conforming to any other standard, which ensures equal or greater quality, may be accepted. In such case copies of the English version of the standard adopted shall be submitted along with the bid.

3.3 In particular, the following standards and specifications are applicable.

3.4 Air conditioners suitable for 230V, 50 Hz single phase AC supply shall be capable of performing the functions as cooling, dehumidifying, air circulating and filtering. The air conditioners shall be complete with automatic temperature control and cut-in and cutout etc. for temperature range 16 to 25 degree C.

3.5 Outdoor unit of the air conditioners shall be fitted discharge cooled type rotary Compressor.

3.6 Air Conditioner shall be 5 Star rated

3.7 Air Conditioning shall maintain 22 Degree Celsius in summers and Winters, Environment condition shall be referred from General Design Criteria Chapter 1

3.8 Approved make of AC is Voltas/LG/Carrier.

3.9 The minimum thickness of the base in outdoor unit shall be 1.20 mm & sheet thickness for rest of the body shall be 0.70 mm (Min.) with galvanized coating thickness of 120 g/ sq. m and shall be provided with stiffeners for robust construction and shall have rounded corners.

3.10 The casing of the indoor units shall be made of ABS/HIPS/GS and shall be impact resistant. The control box of indoor unit shall withstand flame retardant.

3.11 Remote cordless control with LCD/LED Display for Air conditioner shall be provided with one On/Off timer, selecting fan speed (three speed) and setting up of temperature. Display shall be provided on indoor unit or on handset or on both.

3.12 Maximum power consumption of the split air conditioners shall be measured at capacity rating test conditions. Overall power factor of the unit shall be at least 0.85 at capacity rating test conditions

This specification shall be read and constructed in conjunction with the bid documents and annexure to determine the scope of work.

DESIGN CRITERIA

	Air Conditioning shall be supplied in Control Room and Switchgear Room including GIS Room, maintenance room and SCADA room. Exhaust system shall be supplied in following rooms -Toilet – one Pantry- One Cable Celler- Industrial type numbers shall be as per calculation
Number and details of wall mounted/Ceiling fan	Battery room – 1 No Control room – 3 No's Switchgear Room – 6 No's GIS Room-As per Calculation, 6 Nos(Minimum). **Note: Wall mounted fan shall be industrial type, domestic fans shall not be acceptable**
Power Point & socket	Each room shall be provided with at least 2 No's 15 Ampere Switch socket and 2 no's 5 ampere switch sockets. Two no's industrial 16 ampere points shall be provided in control room for installation of air conditioning system for future.

	All equipment, accessories and wiring shall have fungus protection, involving special treatment of insulation and metal against fungus, insects and corrosion.

4.0 DEVIATIONS

Deviation from this specification, if any, shall be clearly brought out in the offer. Unless owner explicitly accepts such deviations, it shall be considered that the offer fully complies with the specification.

BSES Rajdhani Power Limited
BSES Bhawan, Nehru Place, New Delhi- 19

TECHNICAL SPECIFICATION

FOR

FIRE EXTINGUISHER

Prepared by					**Rev: 1**
Reviewed by					**Date: 24.05.21**
Approved by					

Technical Specification Fire Extinguisher

1.0 INTENT OF SPECIFICATION:

This specification is intended to cover the design, manufacture, assembly, testing at manufacturer's works, supply & delivery, properly packed for transport FOR site of Portable wall and trolley mounted Fire extinguisher and fire buckets for substation control room building complete with all materials and accessories for efficient and trouble free operation.

In the even of any discrepancy with the listed documents, the stipulation of this specification shall govern.

2.0 SCOPE OF WORK

2.1 Scope of Supply

The following equipment shall be furnished with all accessories:-

a) Wall mounted fire extinguisher-15 Nos. of 4.5kG (CO_2 Type)
b) Trolley mounted fire extinguisher- 5 Nos. of 22.5kg (CO_2 Type)
c) Sand buckets with stand- 4 Set with 4 bucket in each stand
d) All installation hardware.
e) All relevant drawings, data & instruction manuals.
f) Mandatory spares.
g) Commissioning spares and recommended spare part list for three (3) years of operation.
h) Rubber Mat for entire Indoor equipments front and backside(as per latest IS)

3.0 GENERAL REQUIREMENT

3.1 Codes and Standard

All equipment and material shall be designed, manufactured and tested in accordance with the latest applicable Indian Standards except where modified and/or supplemented by this specification.

Equipment and materials conforming to any other standard which ensures equal or greater quality may be accepted. In such case copies of the English version of the standard adopted shall be submitted along with the bid.

In particular, the following standards and specifications are applicable.

Indian Electricity Rules	Relevant safety regulation of CEA
Indian electricity act	
IS 2190	Selection, installation & maintenance of first aid, fire extinguisher.
	Tariff Advisory Committee Manual
IS 1646	Code for practice for fire safety of buildings
IS 940	Portable fire extinguisher, Water type - specification
IS 2878	Fire extinguisher CO2 type
IS 2171	Specification for fire extinguisher dry powder.
IS 10204	Specification for fire extinguisher Mechanical foam type.

This specification shall be read and constructed in conjunction with the bid documents and annexure to determine the scope of work.

4.0 DESIGN CRITERIA

General	The contractor shall supply the required type and quantities of fire extinguisher and Sand buckets. The quantity shall be as per TAC recommendations.
Location	Fire extinguisher and sand buckets shall be installed in Control room, battery room, switchgear room, ACDB & battery charger room, Cable cellar, Transformer yard, Outdoor switchyard and Capacitor bank.
Distribution	The fire extinguishers in various locations shall be as per the guidelines of TAC-India.
Tests	All equipment shall be completely assembled wired, adjusted and routine tested at the factory as per relevant standards.

5.0 DEVIATIONS

Deviation from this specification, if any, shall be clearly brought out in the offer. Unless owner explicitly accepts such deviations, it shall be considered that the offer fully complies with the specification.

TECHNICAL SPECIFICATION

FOR

VIDEO SURVEILLANCE SYSTEM

Prepared by	**Javed Ahmed**		**Rev: 2**
Reviewed by	**Abhinav Srivastava**		
Approved by	**K.Sheshadri**		**Date: 2rd Feb 2021**

1. SCOPE:

Design, Engineering, procurement of bought out items, manufacture, integration, inspection, factory testing and supply of complete CCTV System for the entire plant as per requisition consisting of following including necessary hardware, software and accessories as applicable.

2. STANDARDS:

In accordance with Latest Relevant IS/IEC.

3. SCOPE OF SUPPLY:

- CCTV cameras suitable for remote operation with all necessary accessories and installation hardware consisting of, but not limited to the following:

1. High speed zoom lens.
2. 360 Degree Cameras
3. Automatic Iris
4. Pan & tilt unit
5. Receiver unit
6. Weatherproof junction box
7. Weatherproof housing for unit camera.
8. Glass Dome with reflector shield on outside.
9. Night Vision.
10. One set of 360 camera shall be installed before start of work

- System cabinet consisting of following:-

1. Video encoder, network switches, etc.
2. Central control unit with all control functions like pan, tilt, focus and consisting of switching unit.
3. Video Motion Detection system
4. Video recorder to record video images

- 2 Nos -21'' FULL HD, LED Monitor with HDMI interface to CPU with Keyboard, Optical Mouse for monitoring at Main Control Room & Security Security Room.

- Monitoring unit also including Programming unit consisting of programming Monitor LED 21", keyboard and optical mouse, independent of monitoring unit with all required hardware and software for CCTV functioning.

- All furniture required in the Control room and Security Gate, to mount the CCTV equipment like TV, PC, keyboard , DVR, etc.

- All types of Cables (Video, Control/data, Optic Fiber and Power Supply etc.), cable glands, plugs, connectors and accessories, for interconnection of all the equipments supplied by vendor.

- Junction boxes, Power distribution boxes, repeaters, cable glands, etc. as necessary.

- Mounting poles for mounting the camera along with a climbing ladder.

- The Ladder to be provided with wheels & brakes for easy movement on roads.

- HDPE pipe with required pipe fittings for laying optical fiber cables between CCTV Cameras and main control room, and between main control room and security control room (gate / security house).
- Cable trays for CCTV cables within control rooms with required accessories in case required at site. Cable trays outside control room (where main cable duct is not available). Buried cable trench for cabling along the boundary walls.
- All necessary supports for installation of all items supplied by vendor.
- All mounting accessories required to mount various items supplied by vendor.
- Earthing material required for earthing of CCTV equipment installed by Vendor.
- Necessary base frame support for mounting CCTV cabinets in main control room.
- Any other item necessary but not specifically listed for successful operation of CCTV system.
- Packing, forwarding, transportation and storage at site of complete CCTV system and accessories.
- Supply of special instrument or tools needed for testing, calibration and maintenance of offered CCTV system.
- Supply of consumables and commissioning spares as per requisition for CCTV system.
- Any other item or/and activity not listed/indicated specifically but necessary for successful operation of CCTV system.
- CCTV monitoring of the site & image capture in case of an intrusion
- Future hardware expansion facility.
- The CCTV system shall be support high resolution viewing & recording.
- The images shall be transferred to a central location or on Mobile using Internet connectivity.
- The System shall be CE & FCC certified
- Complete system shall be from the same manufacturer.
- System should be design to work on low bandwidth WAN with following considerations:

1) Camera stream : H.265
2) Camera resolution : 4CIF (704x480)
3) Video quality : Medium
4) Number of cameras : 01
5) Frame rate per camera at site :25FPS
6) Frame rate per camera at Centre :15FPS
7) Recording type : Continuous 24 Hours per day
8) Desired days of storage per camera : 30 Days

All cameras should support dual stream and configured in such a way that one stream should provide feed to central control centre and other stream should be capable to support edge recording (memory card on camera or NVR). System should be intelligent to monitor WAN and whenever there is outage or central control centre not reachable camera should start recording on memory card or NVR present on camera and capable to restore the data to the central system in the missing area.

4. SCOPE OF SERVICE :

- Installation, integration of complete CCTV system and associated accessories including calibration, cabling, junction boxes, power supply, distribution boxes, etc.
- Installation of CCTV Cameras. The Cameras to be mounted on top of Pole, so as no blind spot is created due to pole.
- Installation of CCTV monitors for monitors located in main control room and monitors located in security control room (gate / security house).
- Installation of monitor located in MCR and security control room.
- Installation of mounting poles wherever applicable.
- Installation of CCTV cabinets for various units.
- Installation of programming unit PC.
- Installation of various junction boxes (signal, power, control) supplied by vendor.
- Laying of co-axial / optical fiber cable between CCTV Camera & Control Console Cabinets.
- Laying of power cable between CCTV Cameras and CCTV Cabinet in MCR.
- Laying of CCTV Cables (video, control, data, power).
- Laying of CCTV fiber optic Cables between MCR and security control room.
- Termination, ferruling and glanding at both ends and interconnection of various cables (video, optical, control, power) supplied by vendor for complete CCTV system.
- Distribution of power supply and reduction to required levels to various CCTV equipment supplied by vendor.
- Integration of CCTV Camera with BRPL Network

The entire IP surveillance system to be designed to control and monitor the locations provided based on following considerations:

- Camera to be of 4 MP (all to be integrated in the VMS present and future)
- CCTV system should be design to work on WAN with at lower bandwidth as low as (256Kbps per camera). Objects or persons should be identified under low bandwidth Scenario
- Bandwidth should be configurable

- System should be design to work and record on 15fps and 1 MP centrally
- System should be design with event based and continuous recording as and when required

Four types of cameras shall be considered to monitor the movement of the people as follows:

1) Indoor
2) Outdoor
3) PTZ
4) 360 degrees outdoor

- All cameras shall be True Day/Night function IP camera
- Analytics to be in built at camera side like – Face capture, Trip Wire, Counter, Object removal, Motion detection.
- All accessories with the outdoor cameras like JBs, power supply, media converter etc. should be in water poof and dust proof housing
- All cabling including LAN network will be in scope of vendor in case of open through ISI mark PVC / GI pipes or concealed through ISI mark PVC / HDPE pipe
- L2 POE Cisco switches should be used to power-up the camera in case of 4 or more at a location else power adapter to be used to power up the cameras
- Servers should be either HP / IBM
- Servers should be planned in redundancy

5. TESTS.

All equipment with their terminal connectors, and other hardware etc., shall conform to type tests and shall be subjected to routine and acceptance tests in accordance with Latest Relevant IS .

6. COMPLETENESS OF EQUIPMENT:

Any fittings, accessories or apparatus which may not have been specifically mentioned in this specification but which are usually necessary for the satisfactory operation of the equipment, shall be deemed to have been included in this specification.

7. PACKINGS:

All material shall be suitably packed for transport, direct to site and Manufacturer shall be responsible for all damages/losses due to improper packing. All boxes shall be marked with signs indicating the up and down sides of the boxes along with the unpacking instructions, if considered necessary by the Manufacturers.

Note: All critical areas/rooms to be covered fully leaving no grey area. Placement of cameras shall be such that there should be no shadow portion.

BSES Rajdhani Power Limited
BSES Bhawan, Nehru Place, New Delhi- 19

TECHNICAL SPECIFICATION

FOR

FIRE DETECTION AND ALARM SYSTEM

Prepared by					**Rev: 0**
Reviewed by					**Date:**
Approved by					

Technical Specification Fire Detection and Alarm System

1.0 INTENT OF SPECIFICATION:

This specification is intended to cover the design, manufacture, assembly, testing at manufacturer's works, supply & delivery, properly packed for transport FOR site of Fire and smoke Detection & Alarm System for substation control room building complete with all materials and accessories for efficient and trouble free operation.

In the even of any discrepancy with the listed documents, the stipulation of this specification shall govern.

2.0 SCOPE OF WORK

2.1 Scope of Supply

The following equipment shall be furnished with all accessories :-

a) Smoke and heat detectors and installation.
b) Manual call point for the substation building.
c) Fire detection alarm panels which shall be SCADA compatible along with its integration with SCADA.
d) All wiring & accessories to complete the installation.
e) All installation hardware.
f) All relevant drawings, data & instruction manuals.

3.0 GENERAL REQUIREMENT

3.1 Codes and Standard

All equipment and material shall be designed, manufactured and tested in accordance with the latest applicable Indian Standards except where modified and/or supplemented by this specification.

Equipment and materials conforming to any other standard which ensures equal or greater quality may be accepted. In such case copies of the English version of the standard adopted shall be submitted along with the bid.

In particular, the following standards and specifications are applicable.

Indian Electricity Rules	Relevant safety regulation of CEA
Indian electricity act	
CBIP manual	
IS 2189	Code of practice for selection, installation & maintenance of automatic fire alarm system.
IS 2190	Selection, installation & maintenance of first aid, fire extinguisher.
IS 1646	Tariff Advisory Committee Manual
	Code for practice for fire safety of buildings

Technical Specification Fire Detection and Alarm System

This specification shall be read and constructed in conjunction with the bid documents and annexure to determine the scope of work.

4.0 DESIGN CRITERIA

General	1. The fire detection system shall consist of various types of fire detectors, control cabling, fire alarm panels, central monitoring station, annunciation/control panels, local panels. 2. The fire detection and alarm system shall be microprocessor based, analogue addressable system. 3. A central monitoring system shall be provided in the control room covering complete substation. 4. The control system shall be compatible to be interfaced with SCADA system through separate communication port.
Location	Fire detectors shall be provided for the entire substation building including control room, switchgear room, battery charger, corridors, Cable Celler etc.Fire detectors shall be located at strategic location in various rooms of the building.
Operation	The operation of any of the fire detectors / manual call point should result in the following : a) A visual signal exhibited in the alarm panel indicating the area where the fire is detected. b) An audible alarm (Hooter) sounded in the panel. c) An external alarm sounded in the building, location of which shall be decided during detailed engineering. d) An alarm should be signaled to the control room.
Detection & Alarm system	1. Each zone shall be provided with two zone cards in the panel so that system will remain healthy even if one the cards become defective which shall be indicated at SCADA . 2. The control panel shall be suitable for 230V AC and 220V DC as power supply.
Cabling	The detector cable and the other control cable shall be armoured, screened and twisted FRLS type in external areas and shall be of unarmoured FRLS type inside building (in conduits)
Tests	All equipment shall be completely assembled wired, adjusted and routine tested at the factory as per relevant standards.
	Following tests shall be performed on the system a) Response characteristics of fire detectors. b) Performance test on fire extinguisher as required in the code. c) A comprehensive visual and functional check for the fire alarm panel. d) Verification of wiring as per approved schematic. e) Testing of fire detection panel as per BS3116 Part IV.
Site Test	All the detectors installed shall be tested for actuation by bringing a suitable smoke source near the detector creating a stream smoke over the detector. After each test smoky atmosphere should be cleared so that the detector shall reset.

	Certify proper operation of all detectors and call points.
	One of each type of extinguisher shall be tested for its performance.

5.0 DEVIATIONS

Deviation from this specification, if any, shall be clearly brought out in the offer. Unless owner explicitly accepts such deviations, it shall be considered that the offer fully complies with the specification.

TECHNICAL SPECIFICATION

FOR

CABLE SEAL SOLUTION

Specification No- SP-GMS-01-R0

Prepared by	**Javed Ahmed**		**Rev: 0**
Reviewed by	**Abhinav Srivastava**		
Approved by	**Sheshadri Krishnapura**		**Date: 16th April 2018**

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1.0. SCOPE:

This specification covers design, engineering, manufacture, assembly, stage testing, inspection & testing before supply & delivery at site and installation testing and commissioning including handover the system to BRPL after successful execution of Cable Seal Solution
This Scope includes the following

a) Supply of Cable Seal System including its transportation to BRPL Site
b) Installation testing commissioning of Cable seal solutions with all the accessories including minor civil work if any.

2.0. Basic Features:

Following requirements shall be fulfilled and supported with valid test reports/certificates:

1. Minimum IP 65 Protection level Certificate for protection from Dust and Water.
2. Heat sink test report of Cable transit system.
3. Certificate/ Test Report for Protection from Rats and Rodents.
4. ATEX, PESO Approval for Explosive atmosphere.
5. NEMA Certificate as per UL 508A for the safety of Cabinets & Enclosures mandatory.
6. Material of Frame shall be of Aluminum (Grade EN AC 44300)/Stainless Steel.
7. System must have Bonding & grounding (Armour Earthing) feature as per IS 3043-1987 using a suitable Tin Plated Copper Braid to be used wherever required. It should be also tested for Impulse withstands as per IEC 62305-1 for minimum 50kA for 1 sec.
8. Manufacturer should have direct presence in India with all the after Sale & Service support from last 10 years.
9. Cable sealing system should have been tested for F- Rating Fire for 3 hrs as per UL 1479/ EN, Insulation and Integrity for 120 mins as mentioned in Indian National Building Code(EI 120) Certificate from BS 476 are mandatory.
10. Cable sealing system should have been tested for GAS tightness of 2.5 bar pressure.
11. EPDM modules in System must have Halogen content less than 200ppm with low smoke index-F1 Classification as per NF16-101 & NF16-102, Heat Radiation test in compliance with M2 classification, UV Ageing Test as per ISO-4892-2:2006 & ISO-815- 1:2008, Oxygen Index Test as per ASTM D 2863-00, Shock & Vibration Test as per NES 510.
12. System must have Bonding & grounding (ArmourEarthing) feature as per IS 3043-1987 using a suitable Tin Plated Copper Braid to be used wherever required. It should be also tested for Impulse withstand as per IEC 62305-1 for minimum 50kA for 1 sec.
13. Smoke Index shall be low. Type test reports for the same shall be provided by the supplier.
14. Shelf life of module - 25 Years
15. Solubility – Insoluble in water.

3.0. SERVICE CONDITIONS:

S.No	Particulars	Data
1	Design Ambient temperature	0°C to 50 °C
2	Seismic Condition	Zone IV as per IS 1893
3	Wind Pressure	195 kg/M² upto elevation of 30 M as per IS 875
4	Maximum Relative Humidity	100%
5	Maximum Altitude above Sea level	1000M
6	Rainfall	750mm (concentrated in 4 months)
7	Pollution level	Heavy/Dry
8	Average of no thunderstorm days	40 per annum

4.0. SYSTEM DESIGN

1. Modules with concentric peel able/removable layered multi-diameter cable sealing system consisting of frames, blocks and accessories shall be installed where the cables enter or leave any type of Electrical Panel/Cabinet/Transformer cable box.Each concentric module shall have a minimum of 10 mm range between smallest and largest adaptable diameter. System should be designed with minimum **+/-** 3 mm design margin. System should have provision for usable spares of 30**%** with no loose/ hanging / add layer / plug in type or to be stored components of modules / seals, each spare module should be concentric peelable/removable multi-diameter layered with complete range installed on Frame and solid Block are not acceptable..

2. It Shall cover following openings

   For all Cable entry from outside to control room building and between room to room

5.0. MAINTENANCE

Bidder shall furnish a maintenance manual and support maintenance activity.

6.0. APPROVED MAKES

Roxtec, MCT Brattberg

7.0. APPROVED MAKES

8.1	Submissions along with the bid	
8.1.1	Duly filled GTP and copy of	2 copies + 1 soft copy

	specification	

8.0. SHIPPING

9.1	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 Bidder shall be responsible for all transit damage due to improper packing.

9.0. HANDLING AND STORAGE

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

10.0. QUALITY

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

11.0. DEVIATION

12.1	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.

12.0. TESTING AND INSPECTION

Shall be as per latest relevant standards

13.0. TRAINING

Training on installation, commissioning, operation and maintenance shall be included in the proposal.

- at factory/site- 1 Manday

BSES Rajdhani Power Limited
BSES Bhawan, Nehru Place, New Delhi- 19

TECHNICAL SPECIFICATION

FOR

STRUCTURAL WORK

Prepared by			**Rev: 0**
Reviewed by			**Date:**
Approved by			

Technical Specification Structural Work

1.0 GENERAL

1.1 The scope of specification covers design fabrication, proto assembly, supply and erection of galvanized steel structures for towers, girders, and equipment support structures, towers which shall be lattice type structures fabricated from structural steel conforming to IS: 2062(latest) The scope shall include supply and erection of all types of structures including bolts, nuts, washers, hangers, shackles, clamps, anti climbing devices, bird guards, step bolts, inserts in concrete, gusset plates equipment mounting bolts, structure earthing bolts, foundation bolts, spring and flat washers, fixing plates and any other items as required to complete the job.

1.2 The connection of all structures to their foundations shall be by base plates and embedded anchor/foundation bolts. All steel structures and anchor anchor/foundation bolts shall be galvanized. The weight of the zinc coating shall be at least 0.610 Kg/m2 for anchor bolts/foundation bolts and for structural members. One additional nut shall be provided below the base plate which may be used for the purpose of leveling.

2.0 DESIGN REQUIREMENTS FOR STRUCTURES

2.1 For design of steel structures loads such as dead loads, live loads, wind loads etc. shall be based on IS: 802 Part 1 Sec 1

2.2 For material and permissible stresses IS: 802, Part-1, Section-2 shall be followed in general. However additional requirements given in following paragraphs shall be also considered.

2.3 Minimum thickness of galvanized tower member shall be as follows:

Member	Minimum thickness (mm)
Leg members, ground wire Peak members/main members	5
Other members	4
Redundant members	4

2.4 Maximum slenderness ratios for leg members, other stressed members and redundant members for compression force shall be as per IS-802

2.5 Minimum distance from hole center to edge to adjacent hole shall be minimum 1.5 X bolt diameter. Minimum distance between center to center of holes shall be 2.5 x bolt diameter.

2.6 The minimum bolt diameter shall be 16 mm.

2.7 Step Bolts

In order to facilitate inspection and maintenance, the structures shall be provided with climbing devices. Each tower shall be provided with step bolts not less than 16mm diameter and 175mm long spaced not more than 450mm apart, staggered on faces on one leg extending from about 0.5M above ground level to the top of the tower. The step bolt shall conform to IS: 10238

2.8 Design Criteria

a) All structures be designed for the worst combination of dead loads, live loads, wind loads as per code IS 802 seismic forces as per code IS : 1893, importance factor of 1.5, loads due to deviation of conductor, load due to unbalanced tension in conductor, torsion load due to unbalanced vertical and horizontal forces, erection loads, short circuit forces shall be calculated considering a fault level of 31.5KA for 3 secs. IEC-865 may be followed for evaluation of short circuit forces.

b) Switchyard girders structure shall be designed for the two conditions i.e. normal condition and short circuit condition. In both conditions the design of all structures shall be based on the assumption that stringing is done only on one side i.e. all the three (phase) conductors broken on the other side. Factor of safety of 2.0 under normal conditions and 1.5 under short circuit condition shall be considered on all external loads for the design of switchyard structures, which are of lattice type.

c) Vertical load of half the span of conductors/string and the earth wires on either side of the beam shall be taken into account for the purpose of design. Weight of man with tools shall be considered as 150KGs for the design of structures.

d) Terminal / line take off girders shall be designed for a minimum conductor tension of 1000Kg per sub conductor per phase for 66KV. The distance between terminal girders and the dead end tower shall be taken as per standard. The design of these terminal girders shall also be checked considering +/- 30 deg deviation of conductor in both vertical and horizontal planes. For other girders the structural layout requirements shall be adopted in design.

e) The girders shall be connected with lattice columns be bolted joints.

f) All support structures used for supporting equipments shall be designed for the worst combination of dead loads, erection load. Wind load/seismic forces, short circuit forces. Short circuit forces shall be calculated considering a fault level of 31.5KA for 3 seconds.

g) Foundation bolts shall be designed for the loads for which the structures are designed

3.0 DESIGN DRAWINGS, BILL OF MATERIAL & DOCUMENTS

3.1 The contractor shall furnish design, drawing and BOMs to the Owner after award of the contract. However contractor shall have to prepare and submit any other drawings, bill of material additionally required during design and construction stage which the Owner feels necessary. In case Owner feels that any design drawing, BOM are to be modified even after its approval, contractor shall modify the design & drawings and resubmit the design drawing, BOM as required in the specification.

3.2 The fabrication drawings are to be provided and furnished by the contractor shall be based on design approved by Owner. These fabrication drawings shall be based on the design approved by the Owner. These fabrication drawings shall indicate complete details of fabrication and erection including all erection splicing details, lacing details, weld sizes and lengths. BOM in the Performa approved by the Owner shall be submitted. Bolt details and all customary details in accordance with standard structural engineering practice whether or not given by the Owner.

3.3 The fabrication work shall start only after the final approval to the design and drawings is accorded by the Owner. The design drawing should indicate not only profile, but section, numbers and sizes of bolts and details of typical joints.

3.4 Such approval shall however not relieve the contractor his responsibility for the safety of the structure and good connections and any loss or damage occurring due to defective fabrication design or workmanship shall be borne by the contractor.

4.0 FABRICATION OF STEEL MEMBERS

4.1 The fabrication and erection works shall be carried out generally in accordance with IS 802. A reference however may be made to IS 800 in case of non-stipulation of some particular provision in IS 802. All materials shall be completely shop fabricated and finished with proper connection material and erection marks for ready assembly in the field.

5.0 PROTO – ASSEMBLY

5.1 The component parts shall be assembled in such a manner that are neither twisted not otherwise damaged and shall be so prepared that the specific camber, if any, is provided. In order to minimize distortion in member the component parts shall be positioned by using the clamps, Clips, lugs, jigs and other suitable means and fasteners (bolts and weld) shall be placed in a balanced pattern. If the individual components are to be bolted, paralleled and tapered drifts shall be used to align the part so that the bolts can be accurately positioned.

5.2 Sample towers, beams and lightning masts and equipment structures shall be trial assembled in the fabrication shop and shall be inspected and cleared by contractor based on the design approval accorded by the Owner before mass fabrication.

5.3 Pursuant to above the BOM's along with proto-corrected fabrication drawing shall be prepared and submitted by the main vendor to Owner as document for information. Such BOM, which shall be the basis for the Owner to carry out inspection.

6.0 BOLTING

6.1 Every bolt shall be provided with two flat and one spring washer under the nut so that no part of the threaded portion of the bolt is within the thickness of the parts bolted together. Locking nut shall be provided with each grouting bolt.

6.2 All steel items, bolts, nuts and washers shall be hot dip galvanized.

6.3 2.0% extra nuts and bolts shall be supplied for erection.

7.0 WELDING

7.1 The work shall be done as per approved fabrication drawings, which clearly indicate various details of joints to be welded, type of weld, length and size of weld, whether shop or site weld etc. Symbols for welding on erection and shop drawings shall be according to IS 813. Efforts shall be made to reduce site welding so as to avoid improper joints due to constructional difficulties.

8.0 FOUNDATION BOLTS

8.1 Foundation bolts for the towers and equipment supporting structures and elsewhere shall be embedded in first stage concrete while the foundation is cast. The contractor shall ensure the proper alignment of these bolts to match the holes in the base plate.

8.2 The contractor shall be responsible for the correct alignment and leveling of all steel work on site to ensure that the towers/structures are plumb.

8.3 All foundation bolts for lattice structures are to be supplied by the contractor.

8.4 All foundation bolts shall be fully galvanized so as to achieve 0.610 kg. Per Sq.m. of Zinc coating as per specifications.

8.5 All foundation bolts shall conform to IS 5624 but the material shall be MS conforming to IS 2062.

9.0 STABILITY OF STRUCTURES

The method of grouting the column bases shall be subject to approval of Owner and shall be such as to ensure complete uniformity of contact over the whole area of the steel base. The contractor will be fully responsible for the grouting operations.

10.0 GROUTING

The method of grouting the column bases shall be subject to approval of Owner and shall be such as to ensure complete uniformity of contact over the whole area of the steel base. The contractor will be fully responsible for the grouting operations.

11.0 GALVANISING

11.1 All structural steel works and support shall be galvanized after fabrication.

11.2 Zinc required for galvanizing shall have to be arranged by the manufacturer. Purity of zinc to be used shall be 99.95% as per IS 209.

11.3 The contractor shall be required to make arrangement for frequent inspection by the Owner as well as continuous inspection by a resident representative of the Owner, if so desired for fabrication work.

12.0 TOUCH UP PAINTING

The touch up primers and paint shall consist of Zinc phosphate / Zinc chromate conforming to the requirements of IS 2074 with a pigment to be specified by the Owner.

13.0 INSPECTION BEFORE DESPATCH

13.1 Each part of the fabricated steel work shall be inspected as per approved quality plans and certified by the Owner or his authorized representative as satisfactory before it is dispatched to the erection site.

13.2 Such certification shall not relieve the contractor of his responsibility regarding adequacy and completeness of fabrication.

14.0 TEST CERTIFICATE

Copies of all test certificates relating to material by the contractor for the works shall be forwarded to the Owner.

15.0 ERECTION

The contractor should arrange on his own all plant and equipment, welding set, tools and tackles, scaffolding, trestles equipments and all other accessories and ancillaries required for carrying out erection without causing any stresses in the members which may cause deformation and permanent damage.

16.0 SAFETY & PRECAUTION

The contractor shall strictly follow at all fabrication, transportation and erection of steel structures, raw m, materials and other tools and tackles, the stipulations contained in Indian standard code for safety during erection of structural steel work.

17.0 DEVIATIONS

Deviation from this specification, if any, shall be clearly brought out in the offer. Unless owner explicitly accepts such deviations, it shall be considered that the offer fully complies with the specification.

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BSES Bhawan, Nehru Place, New Delhi- 19

TECHNICAL SPECIFICATION

FOR

OUTDOOR SWITCHYARD MATERIAL

Prepared by					**Rev: 1**
Reviewed by					**Date:**
Approved by					

Technical Specification Outdoor Switchyard Material

1.0 INTENT OF SPECIFICATION

1.1 This specification is intended to cover the design, manufacture, assembly, testing at manufacturer's works, supply & delivery, properly packed for transport F.O.R site of 66KV Outdoor Switchyard Material and Hardware complete with all accessories for efficient and trouble free operation.

1.2 In the event of any discrepancy between listed documents, the stipulation of this specification shall govern.

1.3 The specification shall be read and constructed in conjunction with other sections of bidding document.

2.0 SCOPE OF WORK

2.1 **Scope of Supply**

Type, rating, connections etc. of the materials shall be as detailed in the drawings and annexure. The materials shall be furnished in strict compliance with the same.

2.2 Following materials and hardware's are to be furnished:

a) ACSR ZEBRA Conductor
b) Disc Insulator & Post Insulators
c) Conductor Spacers, Clamps, Connectors.

Any material or accessory, which may not have been specifically mentioned but which is usual and / or necessary shall be supplied free of cost to the Owner.

PG Clamps for ACSR Conductors shall not be acceptable. However, C-Wedge Connector can be offered in place of PG Clamp.

3.0 GENERAL REQUIREMENTS

3.1 **Codes and Standards**

i) All equipment and materials shall be designed, manufactured and tested in accordance with the latest applicable Indian Standards (IS) & IEC Standard except where modified and / or supplemented by this specification.

ii) Equipment and material conforming to any other standard, which ensures equal or better quality, may be accepted. In such cases, copies of the English version of the standard adopted shall be submitted along with the bid.

iii) The electrical installation shall meet the requirements of Indian Electricity Rules as amended upto date and relevant IS Codes of Practice. In addition other rules or regulations applicable to the work followed. In case of any discrepancy, the more restrictive rule shall be binding.

4.0 DESIGN CRITERIA

4.1 All the ACSR conductors, disc and string insulators, clamps & connectors, hardware's etc. will be used in extra high voltage system having characteristics as listed in the annexure.

4.2 All equipments, conductors, hardware's, insulators & clamps etc. will be installed outdoor in a hot, humid & tropical atmosphere.

4.3 The maximum temperature in any part of the clamps, connectors, conductors etc at specified rating shall not exceed the permissible limit as stipulated in the relevant standards.

4.4 All equipments, conductors, clamps, connectors, insulators etc shall be capable of withstanding the dynamic & thermal stresses of maximum short circuit current without any damages or deterioration.

4.5 In order to avoid concentration of stresses, all sharp edges of clamps, connectors etc. shall be rounded off.

4.6 Bi-metallic connectors shall be used for any connection between dissimilar materials.

5.0 SPECIFIC REQUIREMENT

5.1 **Equipment & Materials**

i) Equipment & material shall comply with description, rating etc. as detailed in this specification and annexure.

ii) All accessories, fittings, supports, bolts etc. which form part of the equipment or which are necessary for safe and satisfactory installation and operation of the equipment shall be furnished.

iii) All parts shall be made accurately to standard gauges so as to facilitate replacement and repair. All corresponding parts of similar equipment shall be interchangeable.

iv) After the treatment of steel surfaces damaged during transit sufficient quantity of anti-corrosive paint shall be applied and subsequently finished with two coats of final paint of approved shade.

5.2 **ACSR Conductor**

i) The Aluminum Standard conductor and steel reinforced shall have the technical parameters matching with the requirements given in Annexure. ACSR conductors shall conform to the latest revision of IS-398.

ii) The material for ACSR conductor shall conform to the following:

Aluminum

The Aluminum strands shall be hard drawn from electrolytic Aluminium rods having purity not less than 99.5% and a copper content not exceeding 0.04%.

Steel

The steel wire strands shall be drawn from high carbon steel wire rods and shall conform to the following chemical composition:

Element -% Composition

Carbon - 0.50 to 0.85 Manganese - 0.50 to 1.10 Phosphorous -not more than 0.035 Sulphur -not more than 0.045 Silicon - 0.10 to 0.35

Zinc

The zinc used for galvanizing shall be electrolytic High Grade Zinc of 99.95% purity. It shall conform to and satisfy all the requirements of IS: 209-1979.

5.3 Clamps and connectors

i) All clamps, connectors and hardware's shall be designed manufactured and tested as per relevant standards.

ii) All clamps & connectors for connection with ACSR conductors shall have high tensile Aluminum alloy grade A6 body. U- Bolt and nut for the clamp shall be made of non-magnetic material e.g. chromium steel.

iii) Bolt, nut, washer, shackle etc. required for other purpose shall be of forged steel with adequate strength and the surface shall be so protected as to offer maximum resistance to corrosion. Malleable iron wherever used for any part shall be of best quality and shall correspond to latest amendments of relevant IS.

iv) Various fittings & accessories of the clamps & connectors shall be so designed as to eliminate sharp edges & maintain bright smooth surface. All bolts, nuts, rivets etc. shall have round profiles.

5.4 **Disc Insulator**

i) All disc insulators shall be dimensioned appropriately so as to have the required Electro- Mechanical strength for EHV outdoor duties.

ii) Suspension and tension insulators shall be wet process porcelain with ball and socket connection. Glazing of the porcelain shall be uniform brown colour, free from blisters, burrs and other similar defects. Insulators shall be interchangeable and shall be suitable for forming either suspension or strain strings. Each insulator shall have rated strength markings on porcelain printed and applied before firing.

iii) When operating at normal rated voltage there shall be no electric discharge between conductor and insulator which would cause corrosion or injury to conductors or insulators by the formation of substances due to chemical action. No radio interference shall be caused when operating at normal rated voltage.

iv) Insulating shall be co-ordinated with basis impulse level of the system. The creepage distance shall correspond to very heavily polluted atmosphere (31mm/KV)

v) Porcelain used in insulator manufacture shall be homogeneous, free from lamination, cavities and other flaws or imperfection that might affect the mechanical or dielectric quality and shall be thoroughly vitrified, tough and impervious to moisture.

vi) The design of the insulator shall be such that stresses due to expansion and contraction in any part of the insulator shall not lead to deterioration. All ferrous parts shall be hot dip galvanized in accordance with the latest edition of IS: 209. The zinc coating shall be uniform, adherent, smooth, reasonably bright, continuous and free from imperfection such as flux, ash, rust stains bulky white deposits and blisters.

vii) Bidder shall make available data on the essential features of design including the method of assembly of discs and metal parts, number of discs per insulators, the manner in which mechanical stresses are transmitted through discs to adjacent parts, provision for meeting expansion stresses, results of corona and thermal shock tests, recommended working strength and any special design or arrangement employed to increase life under service conditions.

viii) Insulator hardware shall be of forged steel. Malleable cast iron shall not be accepted except for insulator disc cap. The surface of hardware must be clean, smooth, without cuts, abrasion or projections. No part shall be subjected to excessive localized pressure. The metal parts shall not produce any noise generating corona under operating conditions.

ix) The insulator hardware assembly and clamps shall be designed for 120KN Tensile load. The clamps shall be designed for 700 Kg tensile load. Earth wire tension clamp shall be designed for 1000 Kg tensile load with a factor of safety of two (2).

x) The tension string assemblies shall be supplied along with suitable turn buckle.

6.0 TESTS

6.1 Routine Tests

i) During manufacture and on completion of all equipment, conductors, insulators, clamps, connectors and accessories shall be routine tested as per applicable standards at manufacture's works.

ii) The suspension and tension strings, insulator discs and hardware shall be subjected to the following, acceptance tests and routine tests:

a) Visual examination
b) Verification of Dimensions as per Cl no. 10.5 of IS: 731
c) Temperature cycle test as per Cl no. 10.6 of IS: 731
d) Puncture test as per Cl no. 10.10 of IS: 731
e) Galvanizing test as per Cl no. 10.12 of IS: 731
f) Mechanical performance test as per IEC-575 Cl. 4
g) Test on locking device for ball & socket coupling as per IEC-372 (2)
h) Porosity test as per Cl no. 10.11 of IS: 731

Acceptance Tests

a) Visual examination as per Cl. 5.10 Of IS: 2468 (Part-1)
b) Verification of Dimensions as per Cl. 5.8 Of IS: 2468 (Part-1)
c) Galvanizing / Electroplating test as per Cl. 5.9 Of IS: 2468 (Part-1)
d) Slip strength test as per Cl. 5.4 Of IS: 2468 (Part-1)
e) Shore hardness test for the Elastomer (if applicable as per the value guaranteed by the Bidder)
f) Mechanical strength test for each component (including grading rings and arcing horns).
g) Test on locking devices for ball and socket coupling as per IEC: 372 (2)

Routine Tests on Disc Insulator / Long rod Insulator

a) Visual Inspection as per Cl No. 10.13 of IS: 731
b) Mechanical Routine Test as per Cl No. 10.14 of IS: 731
c) Electrical Routine Test as per Cl No. 10.15 of IS: 731

Routine Tests on Hardware Fittings

a) Visual examination as per Cl. 5.10 Of IS: 2468 (Part-1)
b) Mechanical strength Test as per Cl. 5.11 Of IS: 2468 (Part-1)

Test during manufacture on all components as applicable on Disc Insulator

a) Chemical analysis of zinc used for galvanizing:

Samples taken from the zinc ingot shall be chemically analyzed as per IS: 209. The purity of zinc shall not be less than 99.95%.

b) Chemical analysis, mechanical hardness tests and magnetic particle inspection for malleable casting:

The chemical analysis, hardness tests and magnetic particle inspection for malleable casting will be as per the internationally recognized procedure for these tests. The sampling will be based on heat number and heat treatment batch

Test during manufacture on all components as applicable on hardware fittings

a) Chemical analysis of zinc used for galvanizing

Samples taken from the zinc ingot shall be chemically analyzed as per IS: 209. The purity of zinc shall not be less than 99.95%.

b) Chemical analysis, mechanical hardness tests and magnetic particle inspection for malleable casting:

The chemical analysis, hardness tests and magnetic particle inspection for malleable casting will be as per the internationally recognized procedure for these tests. The sampling will be based on heat number and heat treatment batch

c) Chemical analysis, mechanical hardness tests and magnetic particle inspection for fabricated hardware.

The chemical analysis, hardness tests and magnetic particle inspection for fabricated hardware will be as per the internationally recognized procedure for these tests. The sampling will be based on heat number and heat treatment batch.

iii) The following, acceptance & routine tests and tests during manufacturing shall be carried out on the conductor.

Acceptance Tests

a)	Visual check for joints, scratches etc. and length of conductor	
b)	Dimensional check on steel and Aluminum strands	
c)	Check for lay ratio of various layers	
d)	Galvanizing test on steel strands	

e)	Torsion and Elongation test on steel strands	
f)	Breaking load test on steel and Aluminum strands	
g)	Wrap test on steel and Aluminum strands	IS: 398(Part-V) 1982 Clauses 12.5.2, 12.7 & 12.8
h)	DC resistance test on Aluminum strands	
i)	UTS test on welded joint of Aluminum strands	

NOTE: All the above tests except test mentioned at (i) shall be carried out on Aluminum and steel strands after stranding only

Routine Tests

a) Check to ensure that the joints are as per specification
b) Check that there are no cuts, fins etc. on the strands

iv) The following type, routine & acceptance tests and tests during manufacturing shall be carried out on the earth wire.

Acceptance Tests

a) Visual check for joints, scratches etc. and length of Earth wire
b) Dimensional check
c) Galvanizing test
d) Lay length check
e) Torsion test
f) Elongation test
g) Wrap test
h) DC resistance test : IS: 398 (Part lll) 1976
i) Breaking load test
j) Chemical Analysis of steel

Routine Tests

a) Check that there are no cuts, fins etc. on the strands.
b) Check for correctness of stranding

6.2 **Type Test**

Test certificates for type tests shall be from CPRI/ERDA/NABL approved lab, as stipulated in Indian Standards carried out on similar equipment shall be furnished. If test certificate for any of the type test is not available, the same shall be carried out free of cost from CPRI/ERDA/NABL.

6.3 **Test Witness**

Tests shall be performed in presence of Owner's representative if so desired by the Owner. The contractor shall give at least fifteen (15) days advance notice of the date when the tests are to be carried out.

6.4 **Test Certificates**

i) Certified copies of all tests carried out at works shall be furnished in requisite no. of copies as stated in the condition of contract for approval of the Owner. The certificates shall furnish complete identification, date including serial number of each material and accessory.

ii) Equipment shall be dispatched from works only after receipt of Owner's written approval of shop test reports.

iii) Type test certificate on any equipment, if so desired by the Owner, shall be furnished. Otherwise, the equipment shall have to be type tested, free of charge, to prove the design.

7.0 SPARES

The Bidder shall submit a list of recommended spare parts for three (3) years of satisfactory and trouble free operation, indicating itemized price of each item of the spares.

8.0 DRAWING & DOCUMENTS TO BE FURNISHED

8.1 **To be submitted with each copy of the Bid**

i) Typical general arrangement drawing of the equipment / items.
ii) Technical leaflets on equipment / items expending constructional features.
iii) Type test certificates on similar equipment / items.

8.2 **To be submitted for Approval and Distribution**

i) Dimensional general arrangement drawing showing disposition of various fittings for equipment, accessories, components etc.
ii) Assembly drawing for erection at site with part numbers and schedule of materials.
iii) Type & Routine test certificates
iv) Technical leaflets on equipment / items
v) Back-up calculation for:

a) Selection of equipment / material ratings.
b) Sag-Tension of ACSR.
c) Lighting protection system
d) Selection of rigid bus support spacing.

vi) Any other relevant drawing, documents, calculations and data necessary for satisfactory installation, operation and maintenance.

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 considered that the offer fully complies with the specification.

Technical Specification Outdoor Switchyard Material

RATINGS & REQUIREMENTS

1.0	**CONDUCTORS**	
1.1	**ACSR Conductor**	
1.1.1	Reference standard :	IS 398
1.1.2	Code Name :	ZEBRA
1.1.3	Type :	ACSR
1.1.4	Overall diameter	28.62mm
1.1.5	Stranding no. of wire and diameter :	54/3.18 (Al) 7/3.18 (St)
	Number of strands Core	1
	1st Layer	6
	2nd Layer	12
	3rd Layer	18
	4th Layer	24
1.1.6	Sectional area of Aluminum :	428.9 sq.mm
1.1.7	Total Sectional area :	484.5 sq.mm
1.1.9	Ultimate Strength (min) :	130.32 KN
1.1.10	Calculated DC resistance at 20 Deg C :	0.06868 ohm/Km

NOTE – The 66KV Main Bus Shall be with TWIN ZEBRA. The equipment bay shall be Single Zebra.

2.0	**GALVANISED STEEL SHIELD WIRE**	
2.1	Reference standard :	IS 398
2.2.	Number of strands	Steel core-1, outer Steel layer-6
2.3	Total sectional area	54.55 sq.mm
2.4	Overall diameter	9.45 mm
2.5	Approximate weight	428 kg/km
2.6	Calculated DC. resistance at 200C	3.37 ohms/km
2.7	Minimum ultimate tensile strength	56 KN
2.8	Direction of lay of outer layer	Right hand
2.9	Minimum tensile strength	110 Kgf/mm2
3.0	**CONNECTORS / CLAMP ASSEMBLY / SPACER**	
3.1	Reference standard :	
3.1.1	Clamp / Connector	IS 5561
3.1.2	Spacer	IS 10162
3.2	Material	Aluminum Alloy A6
3.3	Continuous current carrying capacity (r.m.s) at 50deg C ambient temp.	2000A (min)
3.4	Short time current carrying capacity	31.5KA for 3 sec
3.5	Maximum temperature rise over Ambient of 50	35 deg C

	deg C	
4.0	**INSULATORS**	
4.1	Reference standard	
4.1.1	String Insulators/Insulator fittings	IS 731/ IS 2486
4.1.2	Post Insulators	IS 2544
4.2	Type	Post Insulator-
	Cylindrical solid	
	Core type,	
	Suspension &	
	Tension Insulator	
4.3	Service	Outdoor
4.4	System details	
4.4.1	Voltage	66/72.5KV (Nom/Max)
4.4.2	Nos. of phases	3
4.4.3	Frequency	50Hz
4.4.4	System neutral earthing	Effectively earthed
4.5	Insulation Level	
4.5.1	Dry power frequency withstand	140KV r.m.s
4.5.2	Wet power frequency withstands	140KV r.m.s
4.6	Impulse withstand	325KV
4.7	Creepage	31mm/KV

Bus Post Insulators shall have minimum cantilever strength of 800Kg and minimum torsion moment of 500 Kg.

FITTINGS AND ACCESSORIES OF INSULATORS

Each insulator shall be furnished complete with the fittings and accessories as listed below according to requirement

1. Suspension top fitting
2. Suspension clamp fitting
3. Conductor suspension clamp
4. Tension end fitting
5. Tension (anchor) clamp adopter
6. Conductor tension (anchor) clamp
7. Top metal fitting
8. Bottom metal fitting
9. Nuts, Cotter pin, security clips etc.
10. Forged pin, studs etc.

Other standard accessories which are not specifically mentioned but usually provided with insulator of such type and rating for efficient and trouble free operation.

BSES Rajdhani Power Limited
BSES Bhawan, Nehru Place, New Delhi- 19

TECHNICAL SPECIFICATION

SPARES MAINTENANCE TOOLS AND TACKLES

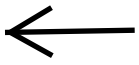
Prepared by	**JA / Alok**		**Rev: 0**
Reviewed by	**AS**		**Date: 30.06.2022**
Approved by	**Gopal Nariya**		

Volume-1 Technical Specification for Spares and maintenance tools and tackles

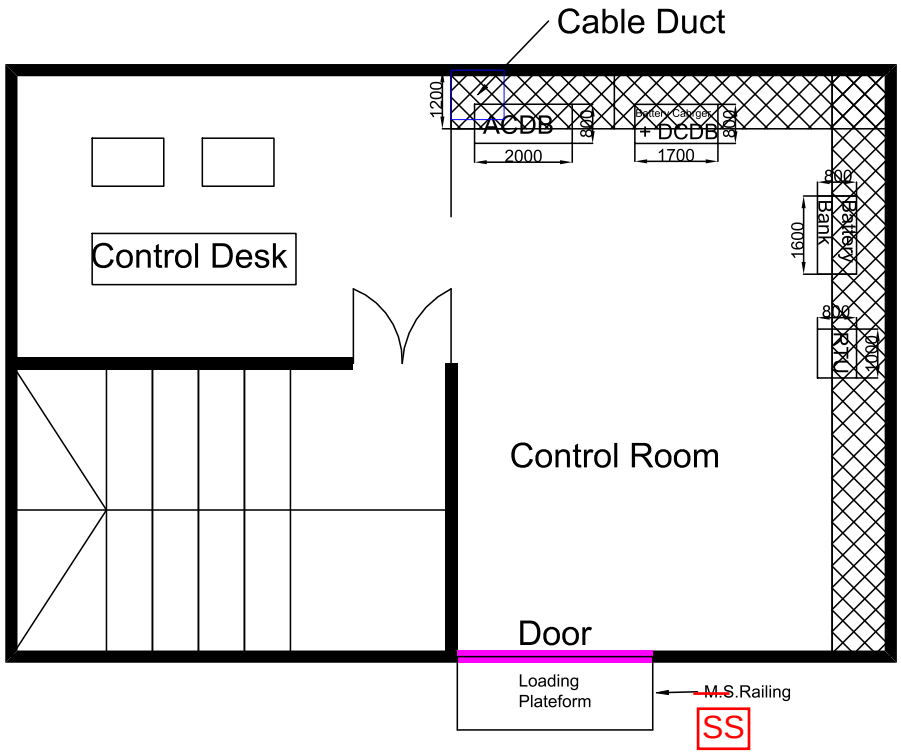
1.0 Spares Requirement: Following Spares shall be supply shall be in scope of Vendor for each package in addition to spares mentioned in individual equipment specifications, however in case of duplicacy/repetition only once shall be considered with quantity most stringent one quantity.

1. GIS Termination for Cables.
   a. 33KV GIS 3CX 400 Sqmm-2 Nos.
2. Spare Relay for 33kV RMU Panels
   a. O/C and E/F Relay- 2 Nos
   b. Trip Circuit Supervision relay- 2 No.
   c. Line differential relays – 2 Nos.
3. Communication cable and Probes one of each type
4. Spare Media Converters (Optical to Digital) -1 No
5. 33 Kv Spares
   a. CT and PT – 6 Nos each type
   b. Allen Keys-2 Nos
   c. Tool Kits-2 Nos
   d. Discharge Rod suitable for 33 kV- 2 Nos
   e. PT Fuse HRC – 10 Nos
6. MCB – 2 Nos for each type in loose.
7. Laptop – i7 1TB 8GB RAM of Dell/Lenovo- 2 No

Note: Approval of Model no and make wherever not defined shall be done at the time of Bid evaluation



DTC KALKAJI - FIRST FLOOR



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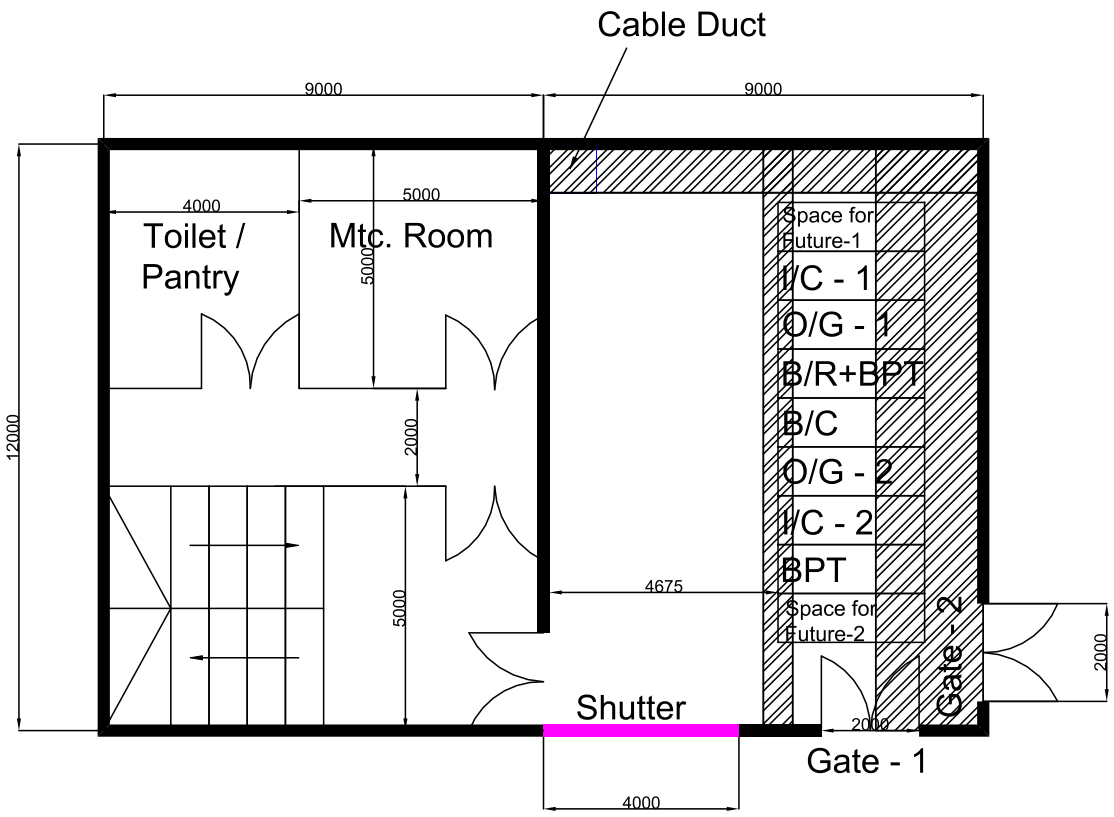
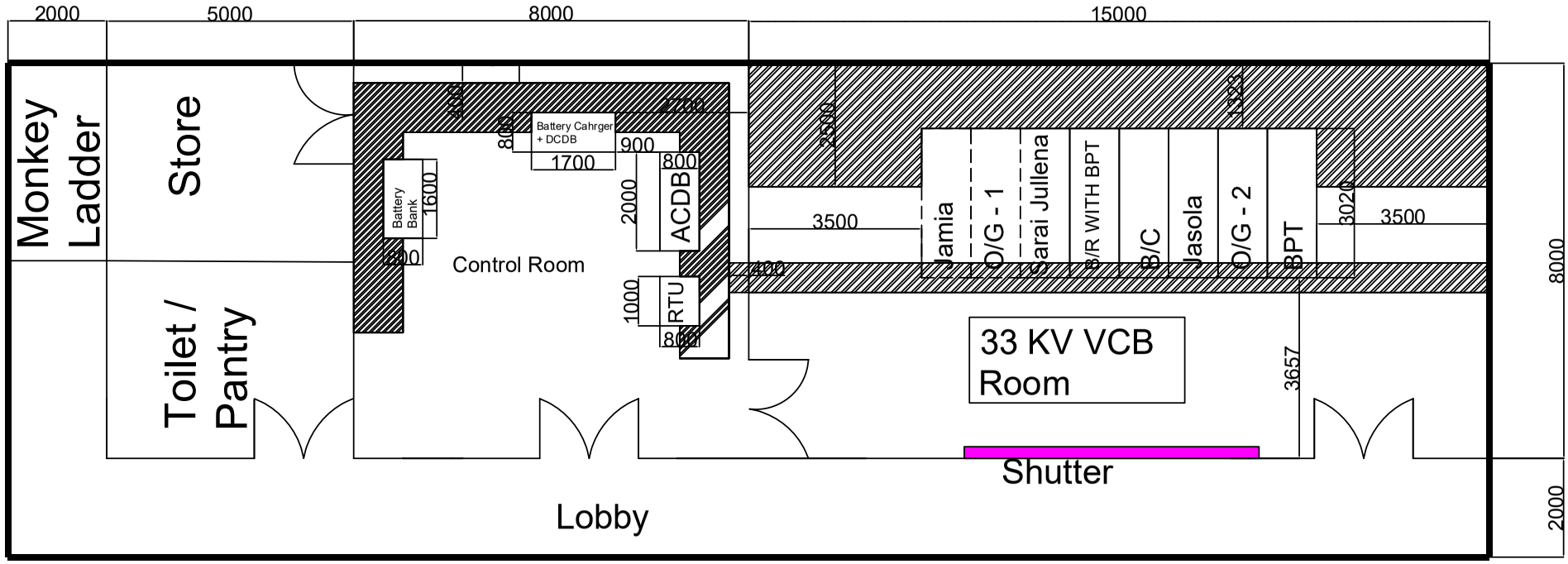


DTC SUKHDEV VIHAR



Notes :-

1. Layout is tentative & subject to modify during detailed engineering.
2. Complete 33KV swithing substation shall be Airconditioned except cable cellar, staircase,toilet/pantry.
3. Requisite minimum clearance of building shall be provided by DTC.
4. ROW for 33KV Cables -6 Nos. shall be provided by DTC. The same shall be finalized after site feasibility.
5. BRPL authorized construction team and O&M personnel shall be allowed 24x7 entry to the said proposed site.
6. 6M wide access shall be available infront of the substation, whenever it is required for any transportation of material or testing facility vehicle.